FLOOD RISK ASSESSMENT

Site Address
10 Limetree Gardens
Lowdham
Nottingham
NG14 7DJ

Client
Paul Simcock

Date
27/02/2024

1 Document Control

FLOOD RISK ASSESSMENT

Site Address:	10 Limetree Gardens Lowdham, Nottingham NG14 7DJ
National Grid Reference:	467295, 346194
STM Reference:	FRA – 2024 – 000009
Version No:	1.0
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Date:	27/02/2024
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Contents

2 Abbreviations

Abbreviation	Description
STM	STM Environmental Consultants Limited
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
NCC	Nottinghamshire County Council
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
AEP	Annual Exceedance Probability
CC	Climate Change
SuDS	Sustainable Urban Drainage Systems
GWSPZ	Groundwater Source Protection Zone
LLFA	Lead Local Flood Authority
mbgl	metres below ground level
DCLG	Department for Communities and Local Government
PPGPS	Planning practice guidance and Planning system

3 Disclaimer

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4 Executive Summary

SECTION	SUMMARY
Location	10 Limetree Gardens, Lowdham, Nottingham, NG14 7DJ Grid Reference: 467295 , 346194
Area	357m^2
Proposed Development	Single storey in-fill rear extension to existing dwelling.
Flood Zone	The site is located in Flood Zone 3a.
Topography	The site and surrounding area is largely flat. The site elevations range between 19.51mAOD and 20.00mAOD.
Sequential and Exception Tests	Development is minor so Sequential and Exception Tests should not be required.
Main Sources of Flooding	Cocker Brook, 130m South-West.
Flood Defences	High ground on both banks of Cocker Brook. Walled defences, with an embankment protecting Southwell Road.
Records of Historic Flooding	Extreme rainfall in late June and July 2007 caused flash flooding nearby, the site was impacted.
Fluvial (River) and Tidal (Sea) Flood Risk	High – During the 1% AEP + 30% CC, the site witnesses a maximum flood level of 20.34mAOD with potential flood depths of up to 840mm on site. In the 0.1% AEP, the site witnesses a maximum flood level of 20.37mAOD.
Pluvial (Surface Water) Flood Risk	Low – During the 1 in 100-year pluvial event, the site remains dry. The rear garden, and part of the proposed, is impacted during the 1 in 1000-year event up to 300mm.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Low - No significant artificial sources identified.
Groundwater Flood Risk	Low – According to the BGS, the site is potentially susceptible to groundwater flooding, no recorded incidents have been identified.
Development Impacts on Local Flood Risk	The development will decrease the impermeable and built up area by 1m^2, as such, it is considered unlikely that it will impact upon flood flow and surface water runoff rates.
Proposed Flood Risk Mitigation Measures	• Finished floor levels will be no lower than existing at approximately 19.86mAOD; • Occupants will sign up for EA Emergency Flood Warning Direct Service; • Safe egress to Flood Zone 1 Approximately an 8-minute walk to A612; • As the proposal results in a reduction in building footprint, it is considered its impact on floodplain storage is negligible.

SECTION	SUMMARY
Surface Water Management (SuDS)	Given the nature of the development and the size of the site, it is considered that there are good opportunities for implementing SuDS. Measures such as rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) should be considered.
Conclusions	Based on the information reviewed and taking into account the proposed mitigation measures, it is considered that overall flood risk to the proposed development is acceptable and that it will not increase local flood risk. As such, the development is considered to be in compliance with local planning policy and the NPPF.

5 Introduction

STM Environmental Consultants Limited (STM) were appointed by Paul Simcock (Client) to provide a Flood Risk Assessment (FRA) at a site located at 10 Limetree Gardens, Lowdham, Nottingham, NG14 7DJ.

6 Development Proposal

The FRA is required to support a planning application for the demolition of an existing conservatory and construction of a single storey in-fill rear extension.

Further details including drawings of the development plans are available in Appendix 2.

7 Report Aims and Objectives

The purpose of this report is to establish the flood risk to the site from all potential sources and, where possible, to propose suitable mitigation methods to reduce any risks to an acceptable level. It aims to make an assessment of whether the development will be safe for its lifetime, taking into account climate change and the vulnerability of its users, without increasing flood risk elsewhere.

The FRA assesses flood risk to the site from tidal, fluvial, surface water, groundwater, sewers and artificial sources. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF) and its supporting guidance.

8 Summary of Data Review Undertaken

The following research has been undertaken as part of the FRA:

- Desktop assessment of topographical, hydrological and hydrogeological settings through review of the information sourced from the British Geological Survey (BGS), the Environment Agency (EA) and the Ordnance Survey (OS);
- Review of publicly available flood risk mapping provided by the EA;
- Review of the Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA) produced by the LLFA outlining flood risk from various sources within the borough.

9 Legislative and Policy Context

9.1 Legislative Context

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

9.2 Policy Context

9.2.1 National Planning Policy Framework (NPPF)

The NPPF (updated July 2021) sets out the government’s planning policies for England and how these are expected to be applied. It also provides a set of guidelines and philosophy with which local planning authorities (LPAs) can build their own unique policies to appropriately regulate development within their jurisdictions.

Section 14 entitled “Meeting the challenge of climate change, flooding and coastal change” deals specifically with flood risk.

Paragraph 159 states that “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”.

In addition, Paragraph 161 outlines that “All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

- applying the sequential test and then, if necessary, the exception test as set out below;
- safeguarding land from development that is required, or likely to be required, for current or future flood management;
- using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management);
- where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations”.

The NPPF then states in Paragraph 163 that “if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification”.

It further states that when determining any planning application, LPAs should "ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[55]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- 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;
- development is appropriately flood resilient and resistant;
- it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- any residual risk can be safely managed; and
- safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55.

Footnote 55 states: "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been 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 future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

The NPPF also lays out requirements for how LPAs should deal with planning applications in coastal areas. They should ensure that should they "reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast."

Developments in Coastal Change Management Areas should only be considered appropriate where it is demonstrated that:

- it will be safe over its planned lifetime and will not have an unacceptable impact on coastal change;
- the character of the coast including designations is not compromised;
- the development provides wider sustainability benefits;
- the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

9.2.2 Local Planning Policy – Newark and Sherwood District Council

Core Policy 10 - Climate Change

The District Council is committed to tackling the causes and impacts of climate change and to delivering a reduction in the Districts carbon footprint. The District Council will work with partners and developers to:

- Promote energy generation from renewable and low-carbon sources, including community-led schemes, through supporting new development where it is able to demonstrate that its adverse impacts have been satisfactorily addressed. Policy DM4 ‘Renewable and Low Carbon Energy Generation’ provides the framework against which the appropriateness of proposals will be assessed;
- Ensure that development proposals maximise, where appropriate and viable, the use of available local opportunities for district heating and decentralised energy;
- Mitigate the impacts of climate change through ensuring that new development proposals minimise their potential adverse environmental impacts during their construction and eventual operation. New proposals for development should therefore:
- Ensure that the impacts on natural resources are minimised and the use of renewable resources encouraged; and
- Be efficient in the consumption of energy, water and other resources.
- Steer new development away from those areas at highest risk of flooding, applying the sequential approach to its location detailed in Policy DM5 ‘Design’.

- Where appropriate the Authority will seek to secure strategic flood mitigation measures as part of new development;
- Where appropriate having applied the Sequential Test move on to apply the Exceptions Test, in line with national guidance. In those circumstances where the wider Exceptions Test is not required proposals for new development in flood risk areas will still need to demonstrate that the safety of the development and future occupants from flood risk can be provided for, over the lifetime of the development; and
- Ensure that new development positively manages its surface water run-off through the design and layout of development to ensure that there is no unacceptable impact in run-off into surrounding areas or the existing drainage regime.

9.3 EA Standing Advice on Flood Risk

The Environment Agency's standing advice lays out the process that must be followed when carrying out flood risk assessments for developments.

Flood Risk Assessments are required for developments within one of the Flood Zones. This includes developments:

- in Flood Zone 2 or 3 including minor development and change of use more than 1 hectare (ha) in Flood Zone 1;
- less than 1 ha in Flood Zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs);
- in an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency

10 Site Description and Environmental Characteristics

10.1 Site Location and Area

The site is located at 10 Limetree Gardens, Lowdham, Nottingham, NG14 7DJ. It is centred at national grid reference 467295, 346194. The site has an area of 357m^2.

A site location map and aerial photo are shown below. Photographs of the site are available in Appendix 1.

10.2 Site Access

The site is accessed via Limetree Gardens.

10.3 Local Planning Authority

The site falls within the jurisdiction of Newark and Sherwood District Council in terms of the planning process.

10.4 Lead Local Flood Authority

Nottinghamshire County Council is the Lead Local Flood Authority (LLFA).

10.5 Flood Zone

For planning purposes, the site is located in Flood Zone 3a as defined by the EA and LLFA.

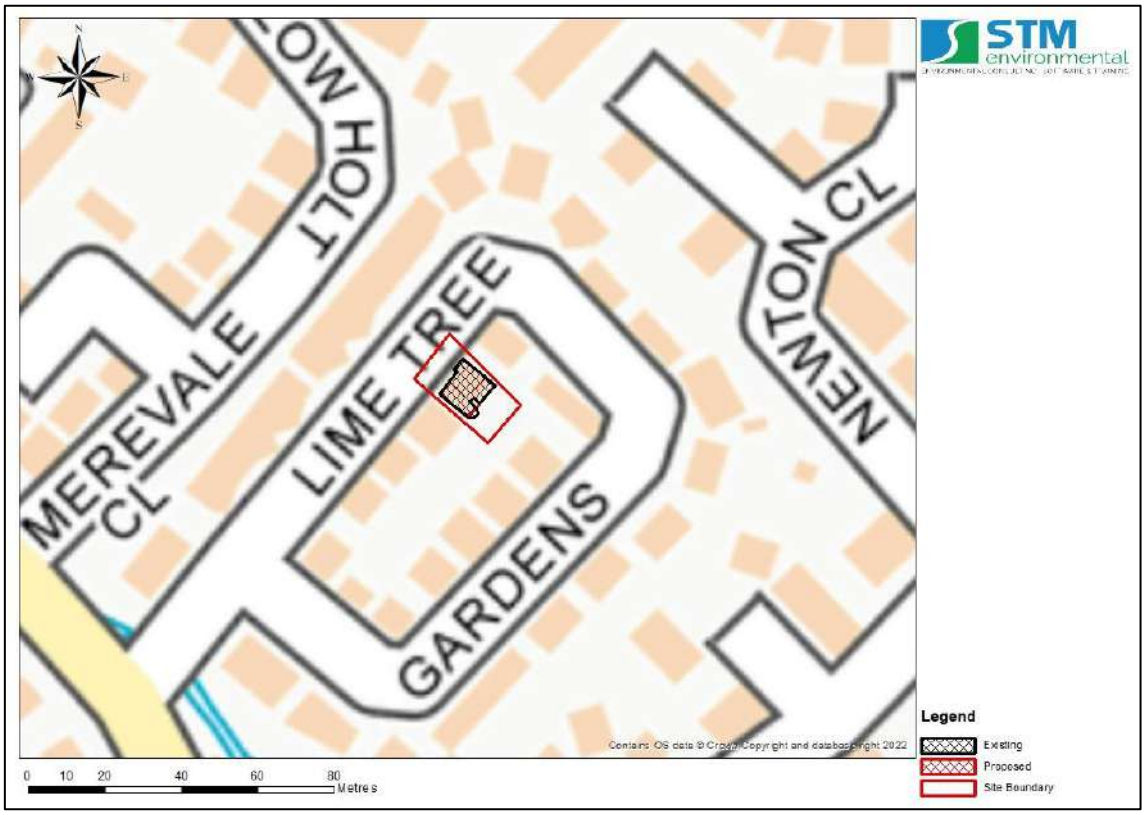


Figure 1: Site Location Map

Figure 2: Site Aerial Map

10.6 Site and Surrounding Land Uses

10.6.1 Site Current Land Use

The site currently houses a residential dwelling with associated hard and soft landscaping.

10.6.2 Surrounding Land Uses

A description of the current and surrounding land uses of the site is given in Table 1.

Table 1: Summary of surrounding land uses

Boundary	Land Use Description	
	Immediately Adjacent (Within 0 – 25m)	**General Local Area (Within 25 – 250m)**
Northern	Residential	Residential, Trinity Lakes playing fields
Eastern	Residential	Residential, Lowdham Colts Football Club , Railway line
Southern	Residential	Residential
Western	Residential	Residential

10.7 Hydrology

The nearest main watercourse is Cocker Beck, which is located 130m southwest. Some unnamed drainage dykes are located 150m Northeast of the site.

10.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as Alluvium (Clay & Silt). The underlying bedrock geology is characterized as Radcliffe Member (Sand & Silt).

10.9 Hydrogeology

The site lies upon a Secondary (Undifferentiated) superficial aquifer and a Secondary B bedrock aquifer.

Appendix 3 provides BGS mapping showing the hydrogeology at the site location.

10.10 Topography

A LIDAR DTM map showing the topography of the site and surrounding area is available in Appendix 3. As a topographic survey was not available, site levels were estimated using this.

The site and surrounding area is largely flat. Limetree gardens to the front of the property (NW) sits at approximately 20.00mAOD. The site then slopes downwards from the roadway, with the existing dwelling sat at approximately 19.60mAOD. The slope continues into the rear garden (SE), where the lowest area of the site is situated at approximately 19.51mAOD.

11 The Sequential and Exception Tests

11.1 The Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk. The test compares the proposed development site with other available sites, in terms of flood risk, to aid the steering process. The Sequential Test is not required if the proposed development is a minor development or if it involves a change of use unless the development is a caravan, camping chalet, mobile home or park home site.

Based on Government Guidance, Minor Development means:

- minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metre.
- alterations: development that does not increase the size of buildings eg alterations to external appearance.
- householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that

would create a separate dwelling within the curtilage of the existing dwelling eg subdivision of houses into flats.

With regard to residential and commercial developments, major development, as defined by the Town and Country Planning (Development Management Procedure) means one or more of the following:

- c(i) - the number of dwelling houses to be provided is 10 or more; or
- c(ii) - the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
- the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more;
- or development carried out on a site having an area of 1 hectare or more.

The development is considered to be minor and as such the Sequential Test should not be required by the LLFA.

11.2 The Exception Test

Where the Sequential Test is undertaken and alternative sites of lower flood risk are not available, then the proposed development may require an Exception Test in order to be granted planning permission. Where the exception test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications other than for minor developments. All three elements of the exception test have to be passed before development is allocated or permitted. For the exception test to be passed:

- It must demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by an SFRA, where one has been prepared;
- The development should be on developed land or on previously developed land;

- A flood risk assessment must demonstrate that the development will be safe without increasing flood risk elsewhere, and where possible will reduce the overall flood risk.

The requirements for an Exception Test are given in Table 2 and are defined in terms of Flood Zone and development vulnerability classification.

Table 2: NPPF Flood Zone vulnerability compatibility (source: NPPF).

Flood Zones	**Flood Risk Vulnerability Classification**				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Based on its scale and nature, the development is considered to be “minor”. As such, the Exception Test should not be required by the LLFA.

12 Site Specific Flood Risk Analysis

The PFRA and Level 1 SFRA produced by the LLFA and maps from the EA provide information regarding historic flooding events and incidents as well as predictions of flood extents and depths during extreme rainfall events.

12.1 Fluvial (River) and Tidal (Sea) Flood Risk

12.1.1 Mechanisms for Fluvial Flooding

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downstream tributaries, overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types:

- Overbank flooding – this occurs when water rises steadily and overflows over the edges of a river or stream;
- Flash flooding – this is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with little to no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow.

12.1.2 Definition of EA Modelled Fluvial Flood Risk Zones

Fluvial flood risk is assessed using flooding maps produced by the Environment Agency. These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps allow a site to be defined in terms of its flood zone (e.g. 1, 2, 3) and in terms of the overall flood risk (very low, low, medium or high). It is important to note that existing flood defences are not taken into account within the models or the maps. The EA fluvial flood zones are defined as follows:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 2: Between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 3: Greater than 1 in 100 (1%) annual probability of fluvial flooding.

Flood zone 3 is split into two sub-categories (3a and 3b) by LLFAs depending on whether the land is considered to be a functional flood plain (i.e. an important storage area for flood waters in extreme events).

- Flood zone 3a: Greater than 1 in 100 (1%) annual probability of fluvial flooding and/or greater than 1 in 200 (0.5%) annual probability of tidal flooding;
- Flood zone 3b: Functional flood plain (definition specific to the LLFA). Less than a 1 in 20 (5%) annual probability of fluvial and/or tidal flooding.

12.1.3 Main Potential Sources of Local Fluvial Flooding

The nearest potential source of fluvial flooding to the site is from Cocker Brook. Some unnamed drainage dykes are located 150m Northeast of the site which may also impact the site.

12.1.4 Records of Historic Fluvial Flooding Incidents

The EA's historic and recorded flood outline maps indicate that there has been historic flooding at or in the vicinity of the site in 2007, where the whole site was impacted. Extreme rainfall in late June and late July (2007) caused flash flooding to the floodplain. Copies of these maps are available in Appendix 4.

12.1.5 Designated Fluvial Flood Risk Zone for the Site

The site is considered to be located within Flood Zone 3a as defined by the Environment Agency and the LLFA indicating that it has a greater than 1% annual probability of fluvial flooding.

12.1.6 Mechanisms for Tidal Flooding

Tidal flooding may be described simply as the inundation of low-lying coastal areas by the sea, or the overtopping or breaching of sea defences. Tidal flooding may be caused by seasonal high tides, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action.

12.1.7 Definition of EA Tidal Flood Risk Zones

As with fluvial flood risk, tidal flood risk is assessed using flooding maps produced by the Environment Agency. The difference is in the probability return periods used to define tidal flood zones. The EA tidal Flood Zones are defined as:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 2: Between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of tidal flooding;
- Flood zone 3: Greater 1 in 200 (0.5%) annual probability of tidal flooding.

12.1.8 Potential Sources of Tidal Flooding

The area in which the site is located is considered unlikely to be affected by tidal flooding.

12.1.9 Flood Defences

The EA's flood defence map which is available in Appendix 7 shows that the site benefits from high ground on both banks of Cocker Brook. Further northwest there are also walled defences, with an embankment protecting Southwell Road.

12.1.10 Peak River Flow Climate Change Allowances

The EA's climate change allowances for peak river flow maps show that the site is considered to be in the Lower Trent Erewash Management catchment. The climate change allowances for this catchment are available in Appendix 11.

In flood zones 2 or 3a for:

- essential infrastructure – use the higher central allowance
- highly vulnerable – use central allowance (development should not be permitted in flood zone 3a)
- more vulnerable – use the central allowance
- less vulnerable – use the central allowance
- water compatible – use the central allowance

In flood zone 3b for:

- essential infrastructure – use the higher central allowance

- highly vulnerable – development should not be permitted
- more vulnerable – development should not be permitted
- less vulnerable – development should not be permitted
- water compatible – use the central allowance

The Central allowance for minor developments indicates that a climate change allowance of 29% should be used.

The modelled data provides the 1% AEP + 30% CC, which has been used in this assessment. This ensures the adequate climate change allowance has been applied without further modelling.

12.1.11 Climate Change - EA Modelled Predictions of Fluvial and Tidal Flood Levels and Extents

The EA Product 4 dataset which is presented in Appendix 11 provides modelled flood levels for model node points close to the site. No flood depths were provided.

The Product 4 dataset only provided on-site level values for the 1% AEP + 30% CC, 1% AEP + 50% CC and 0.1% AEP. All other scenarios were provided as in-channel nodes.

During the 1% AEP + 30% CC, the site witnesses a maximum level of 20.34mAOD at the northwestern edge (driveway), while the existing development and garden flood to a level of 20.30mAOD.

Based on the indicative flood levels at site and the 2022 LiDAR DTM data, the site may witness a maximum flood depth of up to 840mm within the rear gardens, and 480mm within the area of the existing dwelling.

In the 0.1% AEP, the site witnesses a maximum flood level of 20.37mAOD.

12.1.12 Long Term Fluvial/Tidal Flood Risk Considering Flood Defences

The EA's long term flood risk maps give an indication of the actual risk associated with flooding after taking into account the effect of any flood defences in the area. Copies of maps for the site which are available in Appendix 9 indicate that the long-term risk from fluvial flooding to the site is medium.

12.2 Pluvial (Surface Water) Flood Risk

A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water flooding occurs when high intensity rainfall leads to run-off which flows over the ground surface, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greater than the rate of infiltration, or return into watercourses. Surface water flooding can be exacerbated when the underlying soil and geology is saturated (as a result of prolonged precipitation or a high-water table) or when the drainage network has insufficient capacity.

12.2.1 Mechanisms of Pluvial Flooding

The chief mechanisms for surface water flooding can be divided into the following categories:

- Runoff from higher topography;
- Localised surface water runoff – as a result of localised ponding of surface water;
- Sewer Flooding – areas where extensive and deep surface water flooding is likely to be influenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas;
- Low Lying Areas – areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;

- Railway Cuttings –railway infrastructure cut into the natural geological formations can cause extra surface run off and pooling disrupting service and potentially affecting adjacent structures;
- Railway Embankments – discrete surface water flooding locations along the up-stream side of the raised network rail embankments where water flows are interrupted and ponding can occur;
- Failure of artificial sources (i.e. man-made structures) such as such as canals and reservoirs.

12.2.2 Main Potential Sources of Local Pluvial Flooding

The main potential source of pluvial flooding to the site is considered to be surface water ponding and flooding associated with heavy rainfall.

12.2.3 Records of Historic Pluvial Flooding Incidents

Examination of the LLFA's Level 1 SFRA revealed no evidence of pluvial flooding on or in the vicinity of the site.

A map showing the location of surface water flooding incidents is available in Appendix 4 .

12.2.4 Surface Water Flood Risk from Artificial Sources (Reservoirs and Canals)

An examination of OS mapping and the EA's mapping revealed no indications of significant reservoirs or canals in the area of the site.

The EA's reservoir flood risk map indicates that the site does not lie within an area that is at risk of reservoir flooding.

12.2.5 Sewer Flooding

Examination of the LLFA's Level 1 SFRA revealed no evidence of sewer flooding on or in the vicinity of the site.

A map showing recorded incidents of sewer flooding is available in Appendix 4.

12.2.6 Climate Change - Modelled Predictions of Surface Water Run-off Flooding

Mapping of the predicted extent and depth of surface water flooding for the 1 in 100-year, and 1 in 1000-year rainfall return periods provided by the EA are available in Appendix 6.

During the 1 in 100-year pluvial event, the site remains dry.

The rear garden, and part of the proposed, is impacted during the 1 in 1000-year event up to 300mm.

12.2.7 Long Term Surface Water Flood Risk

The EA's long term flood risk maps which are available in Appendix 9 indicate that the long term risk of flooding from surface water is considered to be low.

12.3 Groundwater Flood Risk

Groundwater flooding occurs when water rises from an underlying aquifer (i.e. at the location of a spring) to such a level where it intersects the ground surface and inundates the surrounding land. Groundwater flooding tends to occur after long periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels. A high groundwater table also has the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer/groundwater interactions.

12.3.1 Historic Records of Groundwater Flooding

Examination of the LLFA's Level 1 SFRA revealed no records of groundwater flooding at or within 500m of the site. The EA have stated that they have no records

of any incidents of groundwater flooding within Newark and Sherwood District (Newark and Sherwood District Council SFRA, 2009).

12.3.2 Susceptibility to Groundwater Flooding

The Groundwater Flood Susceptibility Map provided by BGS and presented in Appendix 10 indicates that the site has potential for groundwater flooding to occur at the surface. The Groundwater Depth map also provided by BGS indicates that the groundwater level may be at approximately 3mbgl.

12.4 Critical Drainage Area

A Critical Drainage Area (CDA) may be defined as “a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure”. A CDA is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 as “an area within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency”.

The site is located within the Trent Valley Internal Drainage Board. This is due to the complex drainage systems surrounding the site.

13 Potential Impacts of the Development on Local Flood Risk

13.1 Changes to Impermeable Area and Building Footprint

Changes in ground cover arising from the development are presented in **Error! R eference source not found.** and Table 5 below.

Table 3: Existing and proposed site ground cover.

	Impermeable Area		Permeable Area		Total Area
	m^2	**%**	**m2**	**%**	**m^2**
Existing Site	142	40	215	60	357
Proposed Site	141	39	216	61	357
Difference	-1	0	1	0	

Table 4: Break down of existing and proposed site uses

Ground Cover	Existing Development Area		Proposed Development Area		Difference (m2)
	m^2	**%**	**m^2**	**%**	
Buildings	110	31	109	31	-1
Driveways/Patio	32	9	32	9	0
Gardens/ Soft landscaping	215	60	216	61	+1
Total	357	100	357	100	

The development will decrease the impermeable area by 1m^2, as such, it is considered unlikely that it will impact upon flood flow and surface water runoff rates.

13.2 Impacts on Flood Storage and Flood Flow Routes

The development will change the site's built-up area, as the proposed development is an in fill extension. However, it is unlikely to have an impact on local flood storage and flood flow paths as the increase in the overall dwelling size is negligible (1m^2).

14 Flood Risk Mitigation Measures

14.1 SuDS

Planning practice guidance (PPG) which is prepared by the Ministry of Housing, Communities and Local Government (DCLG) states that developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

As such, the developer has the option to implement a SuDS strategy in line with the drainage hierarchy as outlined in Table 6 below to reduce surface water discharges from the site.

Table 5: SuDS Options

▪ Store rainwater for later use; ▪ Use infiltration techniques, such as porous surfaces in non-clay areas; ▪ Attenuate rainwater in ponds or open water features for gradual release; ▪ Attenuate rainwater by storing in tanks or sealed water features for gradual release; ▪ Discharge directly to a water course; ▪ Discharge rainwater directly to a surface water sewer/drain; ▪ Discharge to a combined sewer.

Figure 3: Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

Given the nature of the development and the size of the site, it is considered that there are good opportunities for implementing SuDS. Measures such as rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) should be considered. A full SuDS strategy is outside the scope of works of this FRA.

14.2 Flood Resilience

Flood resilient construction uses methods and materials that reduce the impact from a flood, ensuring that structural integrity is maintained, and the drying out and cleaning required, following inundation and before reoccupation, is minimised.

14.2.1 Finished Floor Levels

The approximate finished floor level of the existing is 19.86mAOD.

For **vulnerable developments**, the EA's Standing Advice states that the finished floor level of the lowest habitable room in any building, Finished Floor Levels (FFL) should be a minimum of 300mm above one of the following, whichever is higher;

- Average Ground level – 19.81mAOD;
- Estimated flood level 1% AEP plus 30%CC – 20.34mAOD;
- The Adjacent roadway – 20.00mAOD;

During the 1% AEP + 30% CC, the site floods to a maximum level of 20.34mAOD. The proposal should therefore be raised 300mm above this to approximately 20.64mAOD as to follow the EA's standing advice.

However, as the proposal is for a small infill extension with an increase in overall dwelling footprint of 1m^2, it isn't possible to raise the FFL by 0.78m. This is due to the restrictions in ceiling height and accessibility to the existing property. Therefore, the FFL should remain the same as existing at approximately 19.86mAOD.

14.2.2 Compensatory Flood Storage (CFS)

All new development within Flood Zone 3 must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

Where proposed development results in a change in building footprint, the developer must ensure that it does not impact upon the ability of the floodplain to store water, and should seek opportunities to provide a betterment with respect to floodplain storage.

The proposal results in a reduction in building footprint, the impact on floodplain storage is negligible, and likely provide an overall benefit to the flood plain storage capacity. As such CFS should not be required.

14.2.3 Flood Resilience Construction Measures

In terms of achieving resilience, there are two main strategies, whose applicability is dependent on the water depth the property is subjected to. These are:

- Water Exclusion (Flood Resistance) Strategy - should be employed where predicted flood depths are less than 0.3m and are likely to be for short duration. Emphasis is placed on minimising water entry and giving occupants time to relocate ground floor contents, maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning;
- Water Entry (Flood Resilience) Strategy - Flood resilience measures are designed to allow water in but to limit damage and allow rapid re-occupancy. Resilience measures should be employed where flood depths are greater than

0.6m and where it is likely that structural damage will occur due to excessive water pressure.

Given the nature of the development being a minor infill and as flood depths less than 0.6m are predicted above the finished floor level in extreme scenarios, the water exclusion strategy is considered most applicable for this site.

Water Exclusion Strategy:

There are a range of flood protection devices/methods that can be used in the Water Exclusion Strategy including:

- Using materials and construction with low permeability;
- Landscaping e.g. creation of low earth bunds (subject to this not increasing flood risk elsewhere);
- Raising thresholds and finished floor levels (e.g. porches with higher thresholds than main entrance);
- Flood gates with waterproof seals;
- Sump and pump for floodwater to remove waste water faster than it enters;
- Door guards and airbrick covers.

Flood resilience design and measures that will be implemented are outlined below. Water-resistant and resilient materials will be utilized throughout the construction to minimize the flood risk and potential impacts.

Floor construction:

- Use of resilient flooring materials as ceramic tiles or stone floor finishes;
- Use of a concrete slab 150mm thick;
- Use of ceramic tiles or stone floor finishes is recommended;
- Maintain existing under floor ventilation by UPVC telescopic vents above 400 mm to external face of extension;
- Damp proof membrane of impermeable polythene at least 1200 gauge;
- Avoid the use of MDF carpentry.

Wall construction:

- Include in the external face of the extension a damp – proof course, 250 mm above ground level, to prevent damp rising through the wall;
- Use rigid closed – cell material for insulation above the DPC;
- Spread hardcore over the site within the external walls of the building to such thickness as required to raise the finished surface of the site concrete. The hardcore should be spread until it is roughly level and rammed until it forms a compact bed for the oversite concrete. This hardcore bed will be 100 mm thick and composed by well compacted inert material, blinded with fine inert material.

Doors:

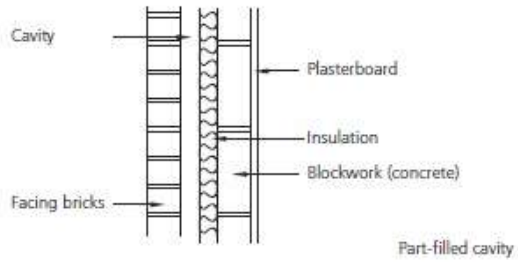
- Seal doors around edges and openings. UPVC or composite material will be used with passive protection meaning that minimal intervention will be required in the event of flooding.

Underground drainage:

- Avoid use of metal for any underground piping;
- Use closed cell insulation for pipes that are below the predicted flood level;
- Provide non – return valves for the drainage system to prevent back water flow;
- Use UPVC or clay pipework for fouls and surface water drainage.

Figure 4: Cavity External Walls

Figure 6.10 Cavity External Walls – Part-filled cavity with sacrificial plasterboard



Part-filled cavity

- External face consisting of engineering bricks up to required level for flood protection (up to d.p.c.). Other external facing materials can be used above this level, but ensure transition is watertight.
- Rigid insulation
- Internal cement based render, preferably with lime content. Composition depends on masonry; the following mix is effective:

  1 cement : 6 sand: 1 lime on concrete blocks.
- Stainless steel wall ties should be used to minimise corrosion and consequent staining.
- Sacrificial plasterboard can be used, but it needs to be removed between ground floor to flood level. The board should be laid horizontally to make removal easier.

As well as the above the following flood resilience features should be applied as part of the development:

- Electrical sockets should be installed above flood level for the ground floor;
- Utility services such as fuse boxes, meters, main cables, gas pipes, phone lines and sockets will be positioned as high as practicable;
- All external openings for pipes or vents below 400mm to be sealed around pipe or vent with expanding foam and mastic.

14.3 Emergency Plan

14.3.1 Assessment of Danger to People

The dangers associated with flood water to people are possible injury and/or death. This can occur as a result of drowning or being carried along by the waters into hard objects or vice versa. The risk to life is largely a function of the depth and velocity of the floodwater as it crosses the floodplain. Fast flowing deep water that contains debris would represent the greatest hazard.

The assessment of danger to people from walking in floodwater is described in the Flood Risks to People guidance documents (FD2321_TR1 and FD2321_TR2) by DEFRA/EA.

Danger can be estimated by the simple formula:

$$HR = d \times (v + 0.5) + DF$$

where, HR = (flood) hazard rating; d = depth of flooding (m); v = velocity of floodwaters (m/sec); and DF = debris factor.

The scoring methodology and calculation matrix for this is summarised in Appendix 13.

The EA Product 4 data did not provide a hazard rating. It can be presumed to be Danger to Some – as the flood depth is 0.48m for the development.

The use of a flood emergency plan is therefore sufficient for the proposed development. The key elements of the emergency plan are described below.

14.3.2 EA Flood Warnings Direct Service Subscription

The occupants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone, mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of flood, day or night, allowing timely evacuation of the site.

The agency operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. In addition, this information can also be found at https://fwd.environment-agency.gov.uk/app/olr/home along with recommendations on what steps should be taken to prepare for floods, what to do when warnings are issued, and how best to cope with the aftermath of floods.

14.3.3 Access and Safe Egress

Safe egress to Flood Zone 1 is available by heading southwest on Limetree Gardens to Station Road, turning right and continuing for 50m, turning left onto Nottingham Road and continuing onto the A612 for 220m. Approximately an 8-minute walk. Directions of this route are presented in Appendix 12 .

14.3.4 Safe Refuge

The development will have internal connections to upper floors in the property which will act to provide sufficient safe refuge in the event of an extreme flood event.

15 Conclusions and Recommendations

This assessment has considered the potential risks to the application site associated with flooding from fluvial, tidal, surface water, artificial and groundwater sources and the potential impacts of climate change.

A review of LLFA's PFRA and SFRA as well as data provided by the EA was undertaken. The main findings of the review and assessment are provided below:

- The development is minor and is therefore unlikely to require sequential and exception tests to be undertaken;
- The main sources of potential flooding to the site is Cocker Brook, 130m South-West.
- The EA define the site as being within Flood Zone 3a;
- The proposal will provide an overall decrease in the total dwelling footprint of 1m^2 upon completion and will provide a minor betterment to the flood plain storage capacity;
- It isn't possible to raise the FFL by 0.78m in line with EA Guidance. As the proposal is for a minor development, the FFL will remain the same as existing at approximately 19.86mAOD;

- CFS should not be a required as the building footprint reduces upon completion;
- High ground on both banks of Cocker Brook. Walled defences, with an embankment protecting Southwell Road;
- Historic fluvial flood event in 2007 - Extreme rainfall in late June and July caused flash flooding to the floodplain.
- The site is located within the Trent Valley Internal Drainage Board. This is due to the complex drainage systems surrounding the site.
- It is not in an area that has had a sewage flooding incidents;
- No records of groundwater flooding incidents were identified at or in the vicinity of the site;
- The development will decrease the impermeable area by $1m^2$, as such, it is considered unlikely that it will impact upon flood flow and surface water runoff rates;
- Given the nature of the development and the size of the site, it is considered that there are good opportunities for implementing SuDS. Measures such as rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) should be considered.
- Occupants will subscribe to the EA Flood Warnings Direct Service;
- Safe egress to Flood Zone 1 Approximately an 8-minute walk to A612.
- The development will have internal connections to upper floors in the property which will act to provide sufficient safe refuge in the event of an extreme flood event.

The proposed development is considered to be in general compliance with local planning policy and the NPPF.

16 References

1. Communities and Local Government - National Planning Policy Framework NPPF, July, 2021.
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. Strategic Flood Risk Assessment, Newark & Sherwood District Council, 2012
4. Local Plan, Newark & Sherwood District Council, 2019
5. Surface Water Management Plan, Newark & Sherwood District Council, 2012
6. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.

17 Appendices

17.1 Appendix 1 – Site Photographs

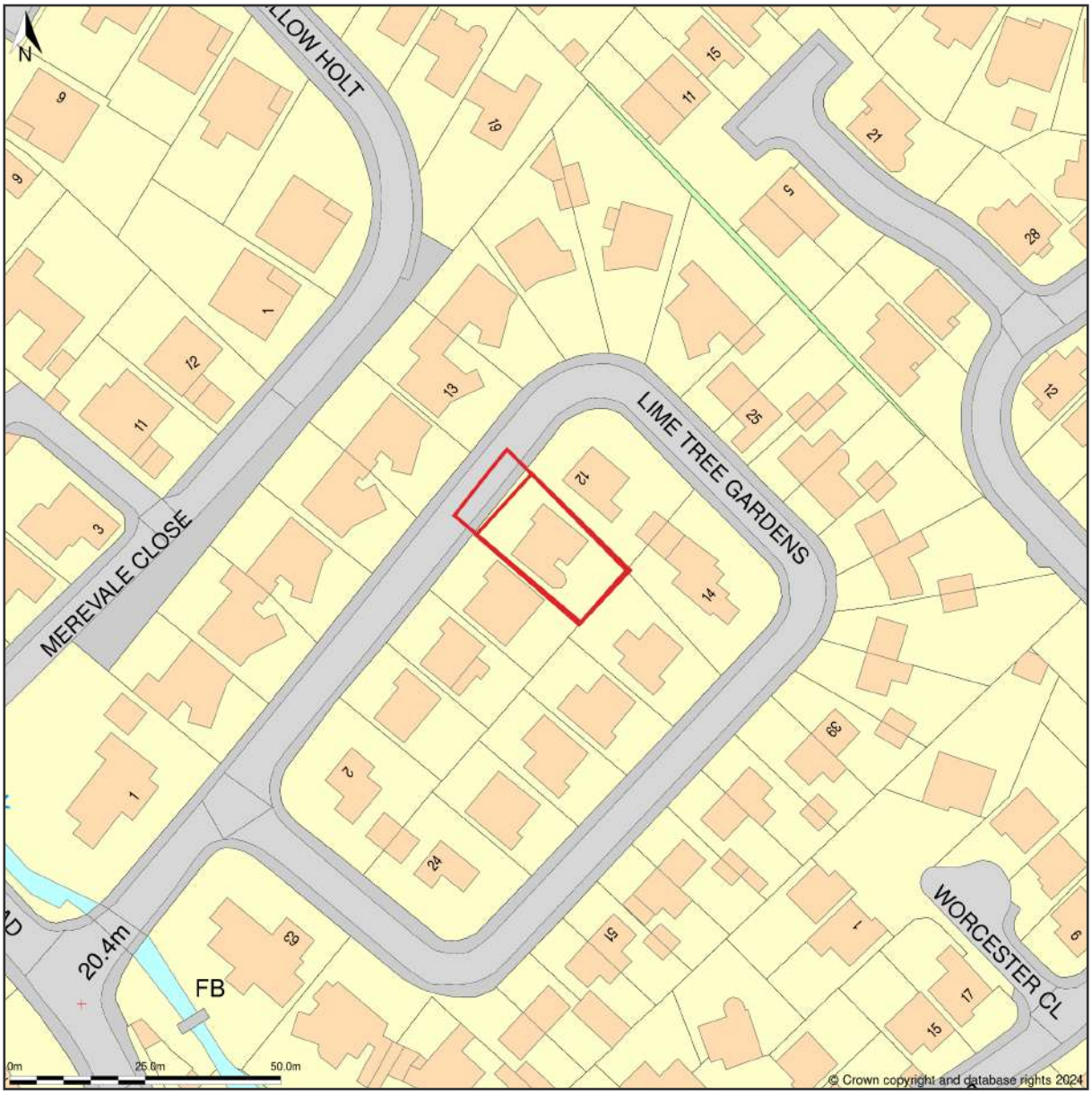
17.2 Appendix 2 – Development Plans

See next page.

Buy A Plan®

Ordnance Survey Licensed Data

10, Lime Tree Gardens, Lowdham, Nottinghamshire, NG14 7DJ



Location Plan shows area bounded by: 467194.92, 346089.84 467394.92, 346289.84 (at a scale of 1:1250), OSGridRef: SK67294618. The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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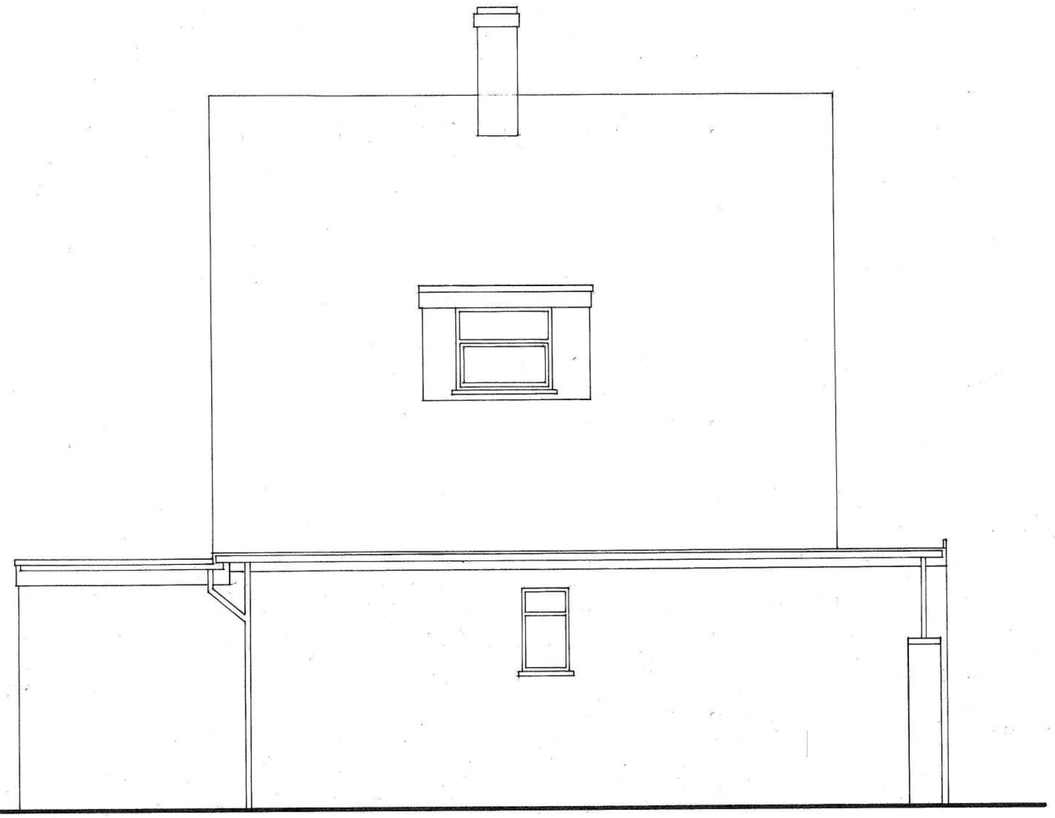
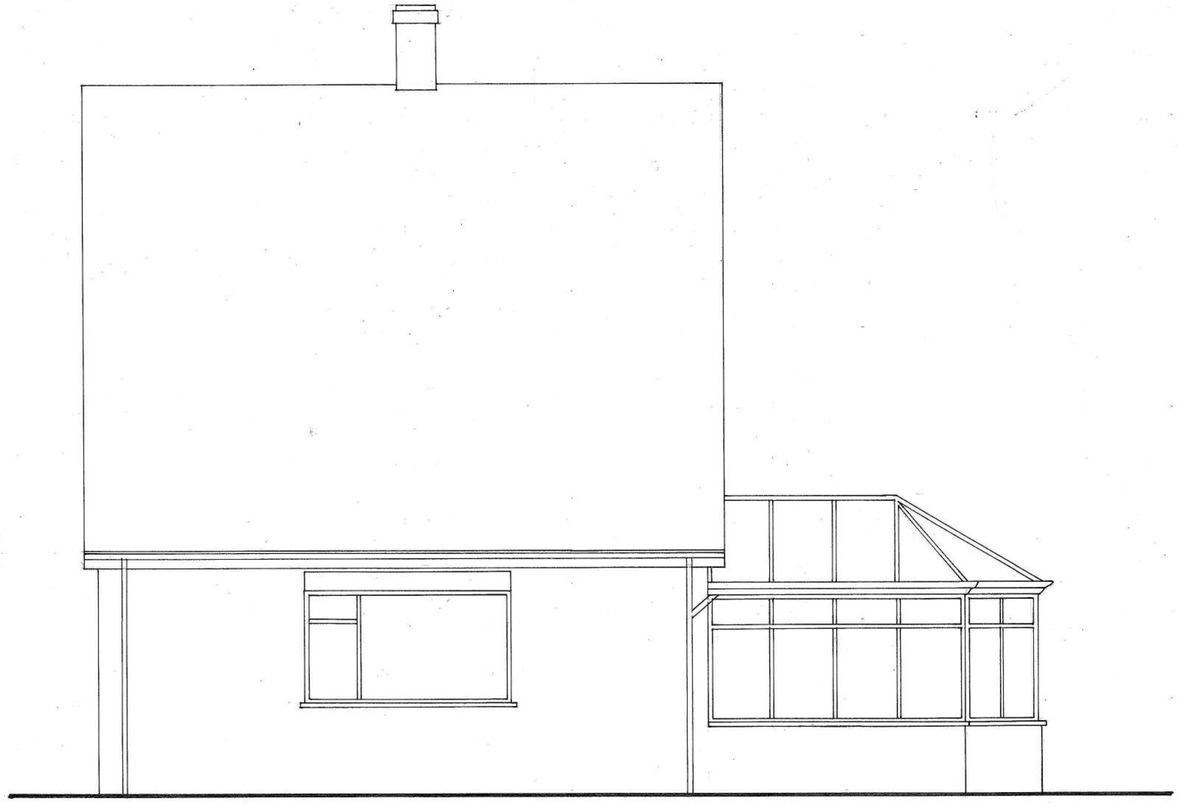
ELEVATION A



ELEVATION B



ELEVATION C

CLIENT:
MR NIGEL WHITBY

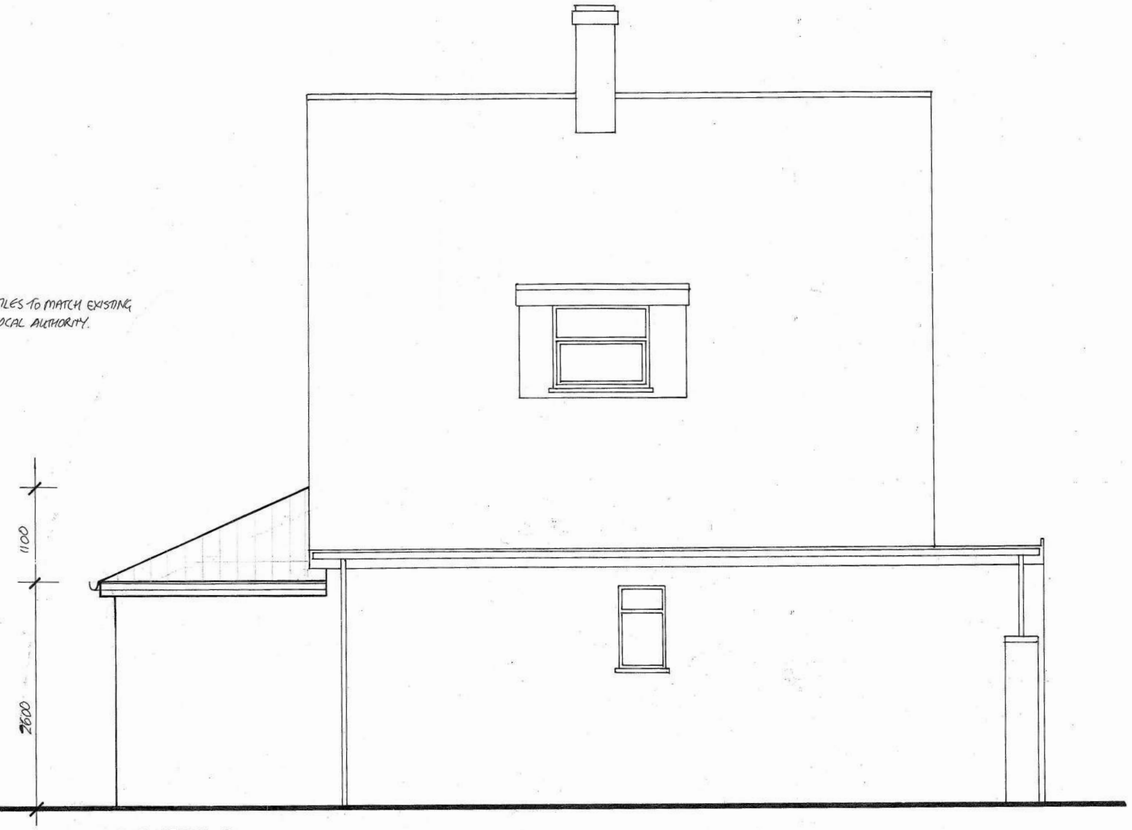
PROJECT:
PROPOSED REAR EXTENSION
10 LIME TREE GARDENS
LOWDHAM
NOTTINGHAM

TITLE:
EXISTING ELEVATIONS

SCALE: 1:50 DATE: DEC 23

DRAWING No. PS 2309:3

ELEVATION A



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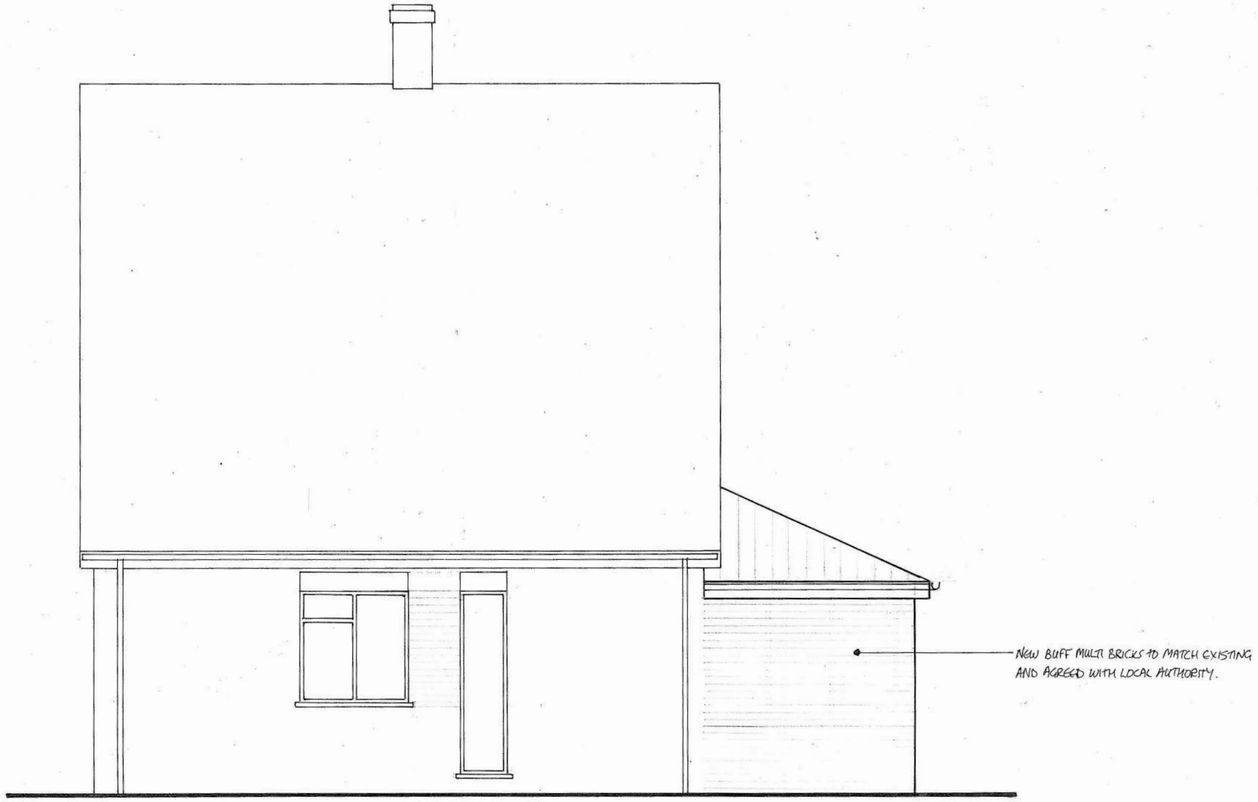


ELEVATION C

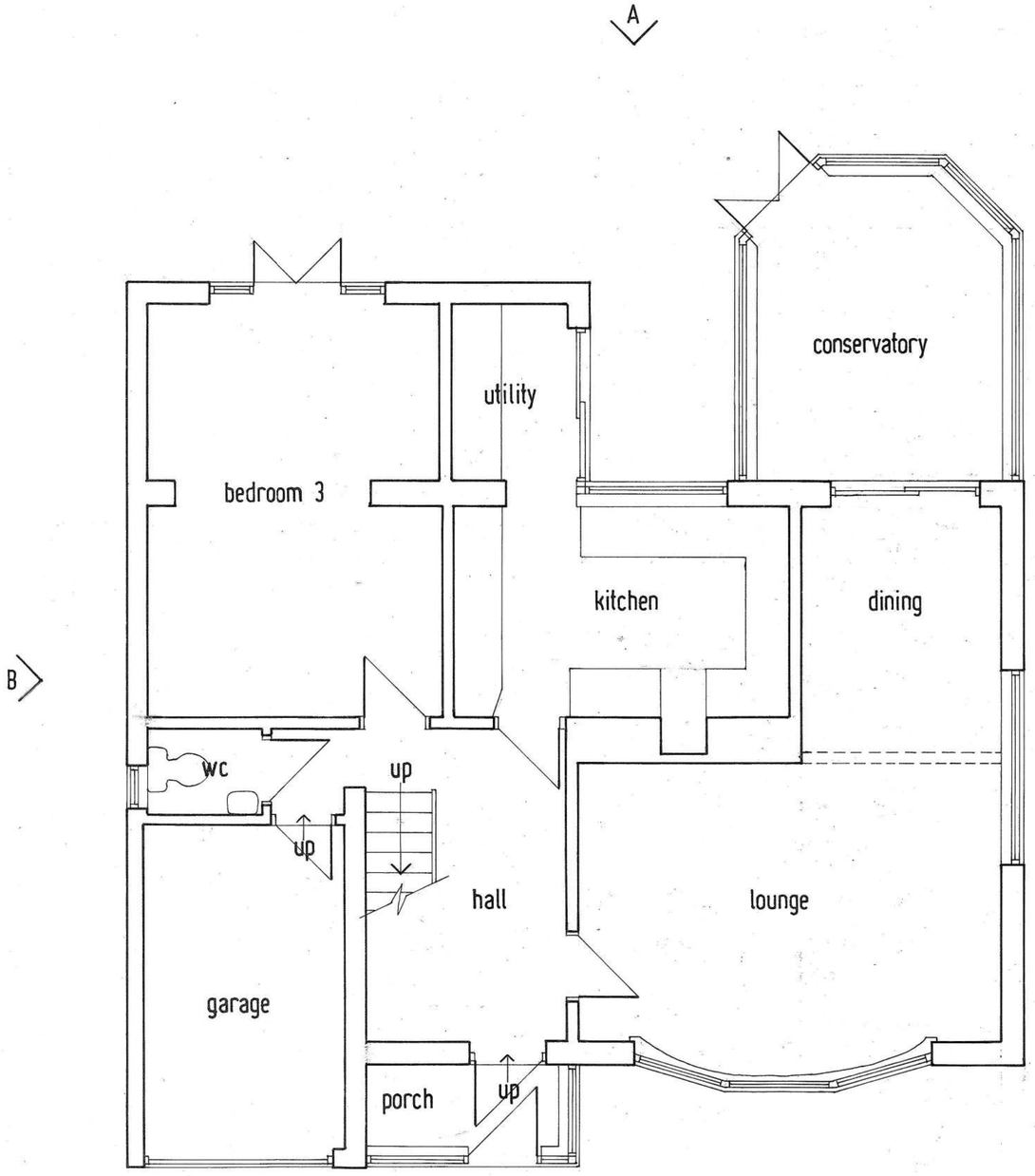
CLIENT:
MR NIGEL WHITBY

PROJECT:
PROPOSED REAR EXTENSION
10 LIME TREE GARDENS
LOWDHAM
NOTTINGHAM

TITLE:
PROPOSED ELEVATIONS

SCALE: 1:50 DATE: DEC 23

DRAWING Nº. PS 2309:4



GROUND FLOOR PLAN

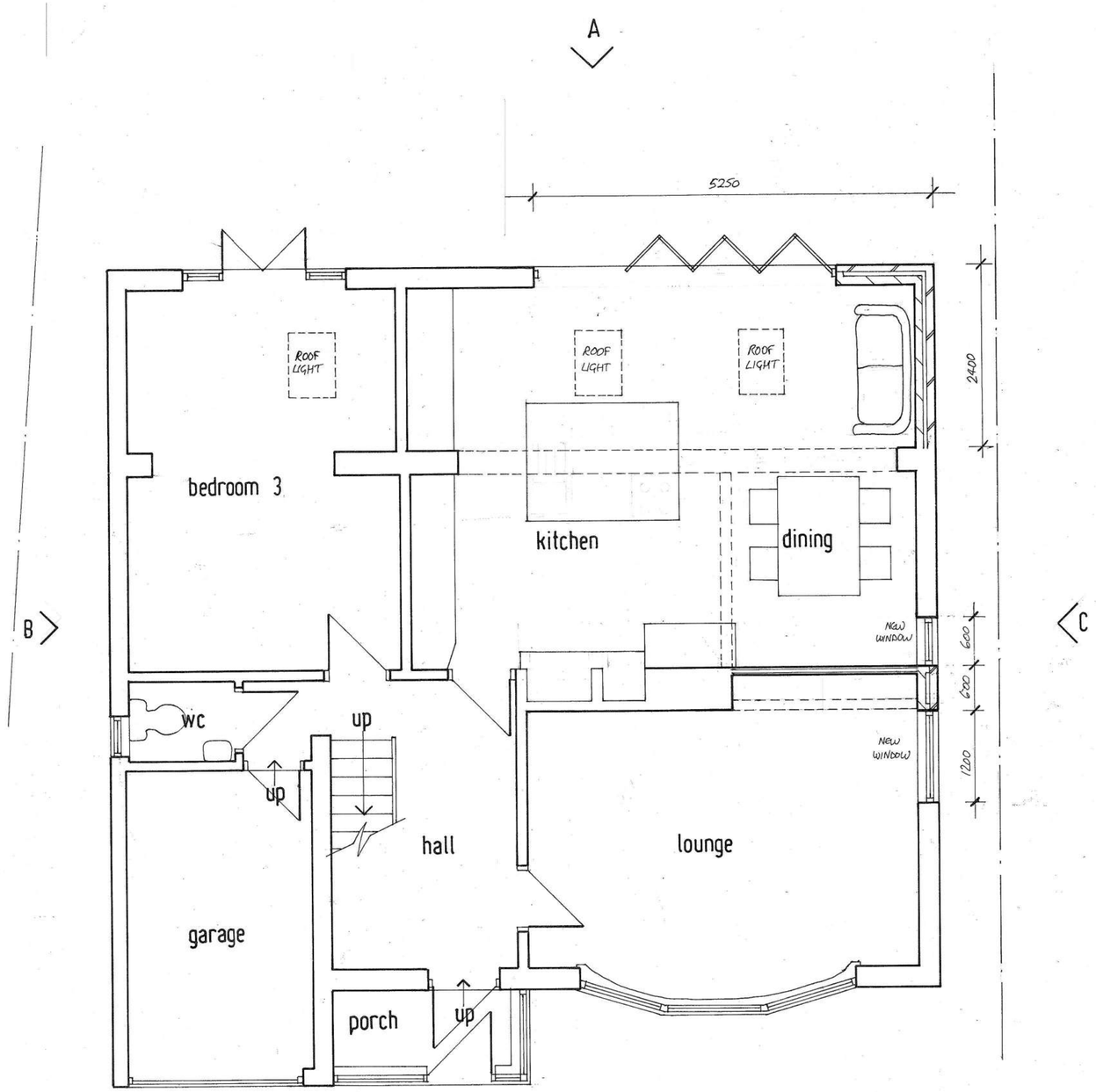
CLIENT:
MR NIGEL WHITBY

PROJECT:
PROPOSED REAR EXTENSION
10 LIME TREE GARDENS
LOWDHAM
NOTTINGHAM

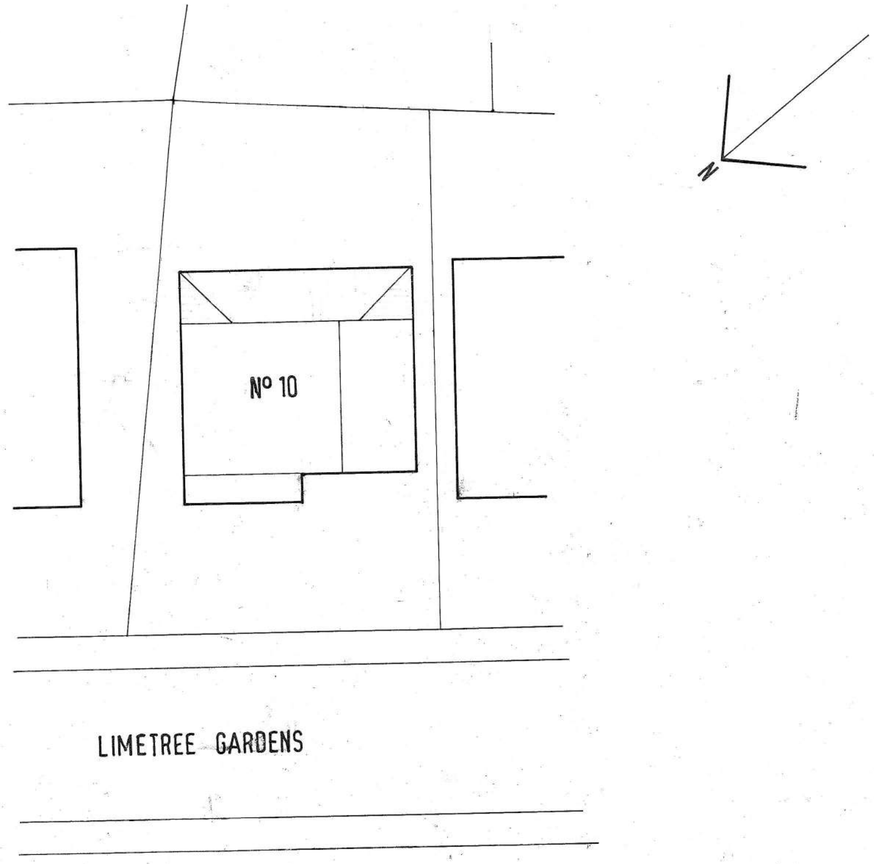
TITLE:
EXISTING PLAN

SCALE: 1:50 DATE: DEC 23

DRAWING No. PS 2309:1



GROUND FLOOR PLAN



SITE PLAN 1: 200

CLIENT:
MR NIGEL WHITBY

PROJECT:
PROPOSED REAR EXTENSION
10 LIME TREE GARDENS
LOWDHAM
NOTTINGHAM

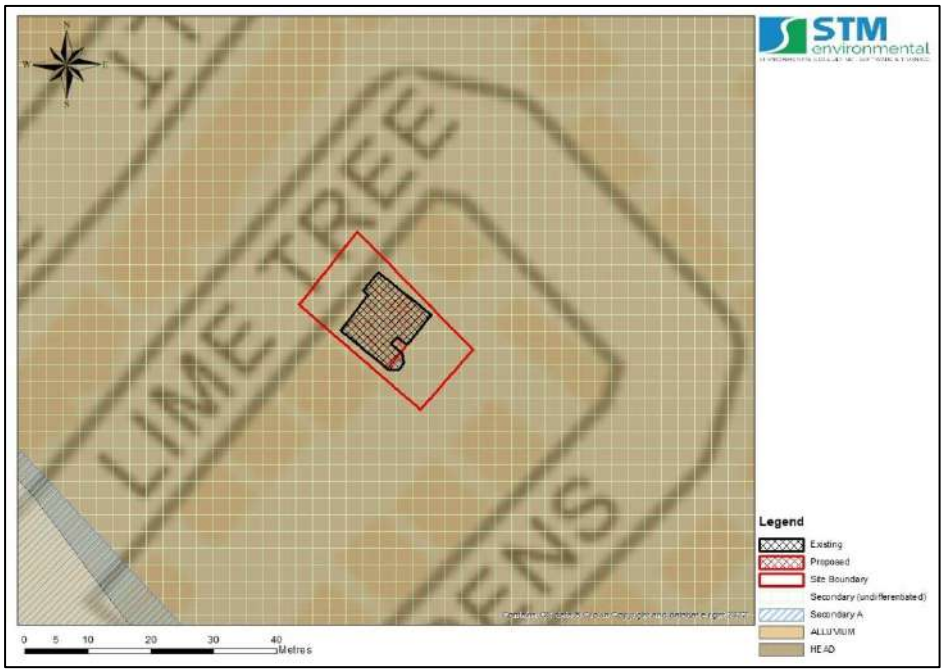
TITLE:
PROPOSED PLAN

SCALE: 1:50 DATE: DEC 23

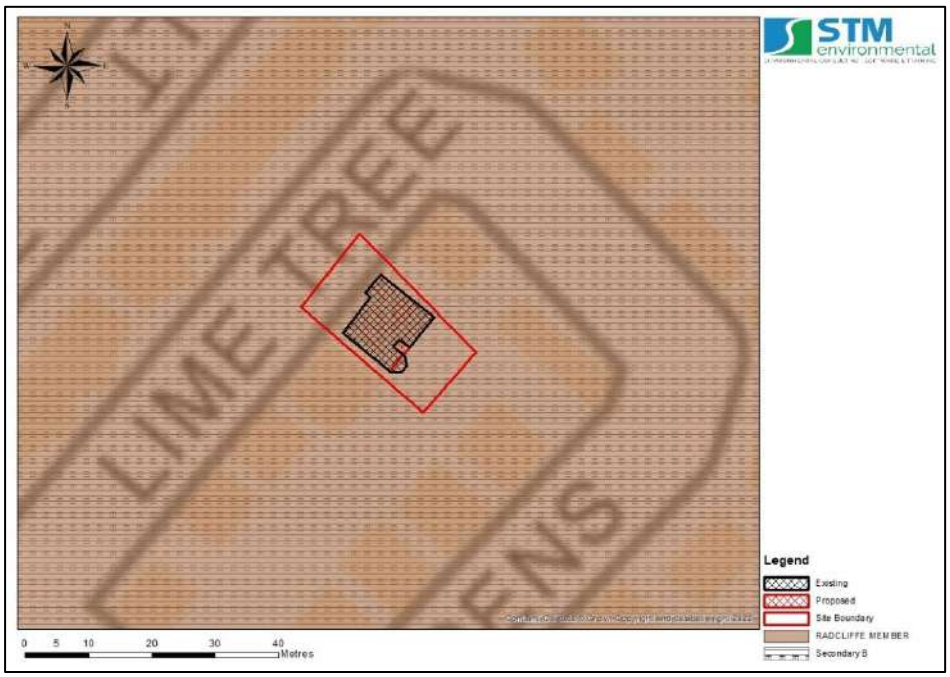
DRAWING Nº. PS 2309: 2

17.3 Appendix 3 – Environmental Characteristics

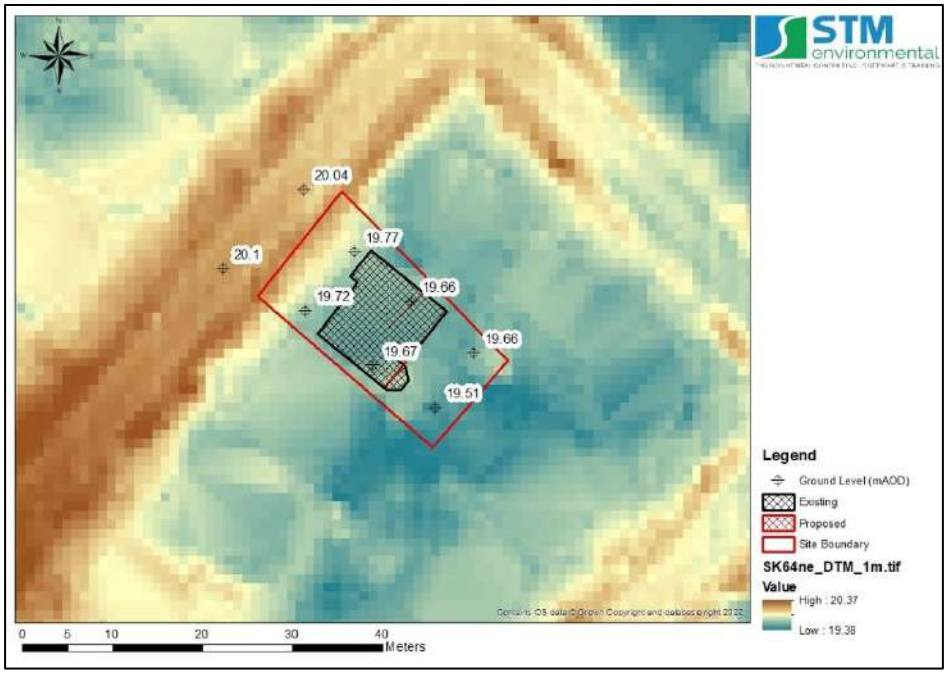
17.3.1 Superficial Hydrogeology Map

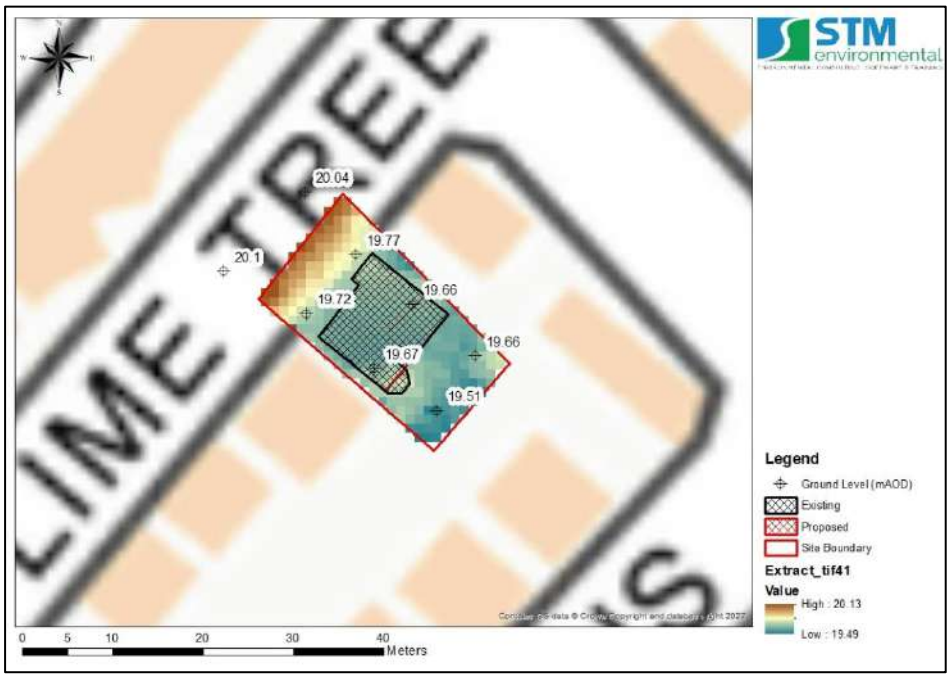


17.3.2 Bedrock Hydrogeology Map



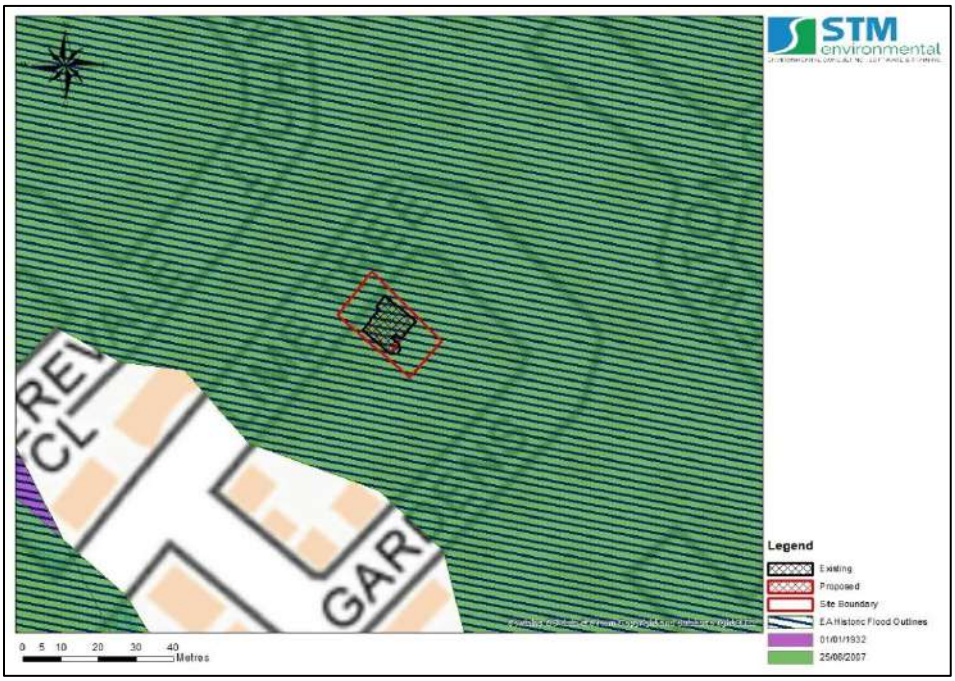
17.3.3 Topography Map





17.4 Appendix 4 – Historical Flood Incident Maps

17.4.1 EA Historic and Recorded Flood Outlines



17.4.2 Map Recorded Historic Flooding

See next page.

Date Modified: 02/11/2011

Drawn By: ukdid001

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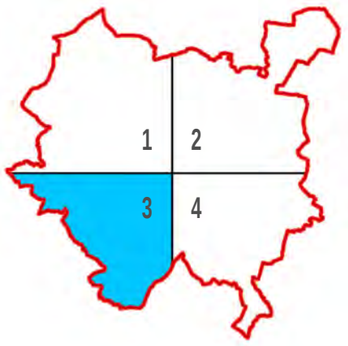
KEY

- District Boundary
- Potential Development Sites
- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Sewer)
- Historic Flooding (Pluvial)



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

HISTORICAL FLOOD MAPPING
1647 - B - 1-3

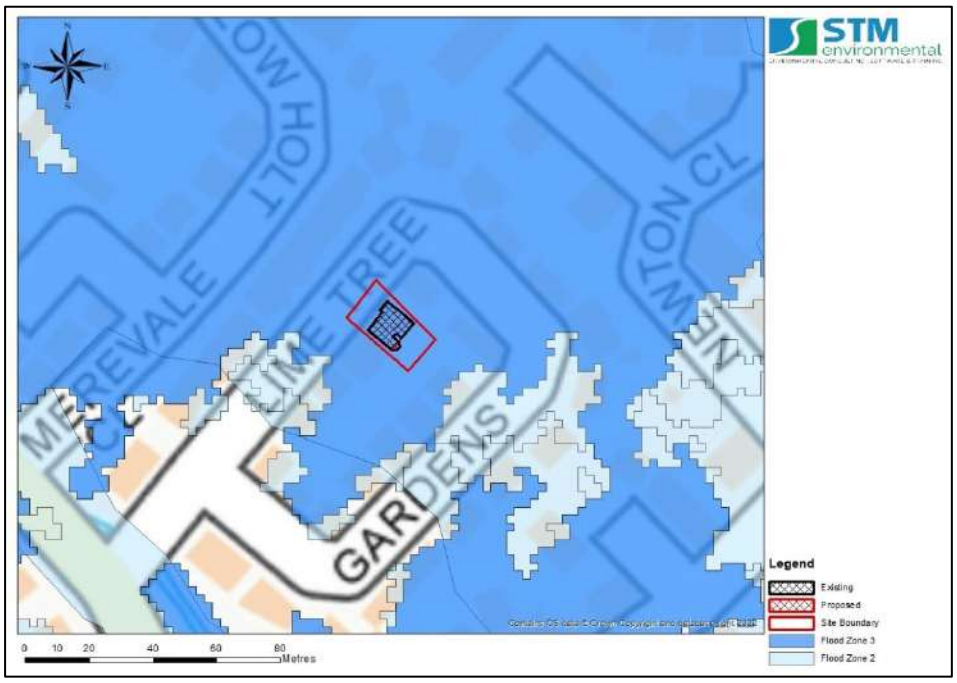
0 0.45 0.9 1.8 2.7 3.6 Kilometres

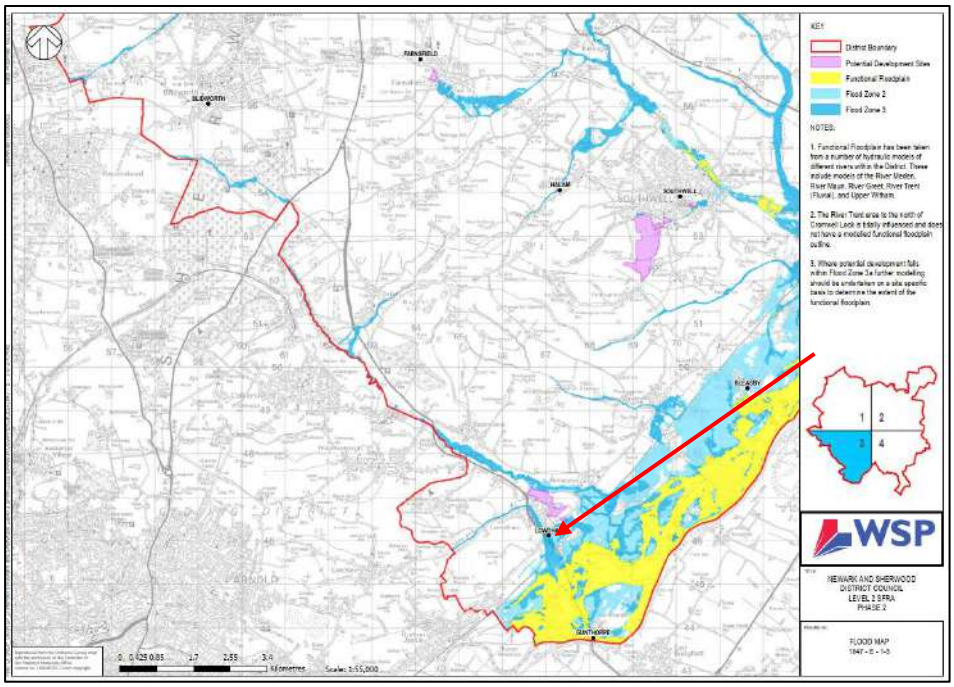
Scale: 1:55,000

17.4.3 Map of Recorded Sewer Flooding

NA

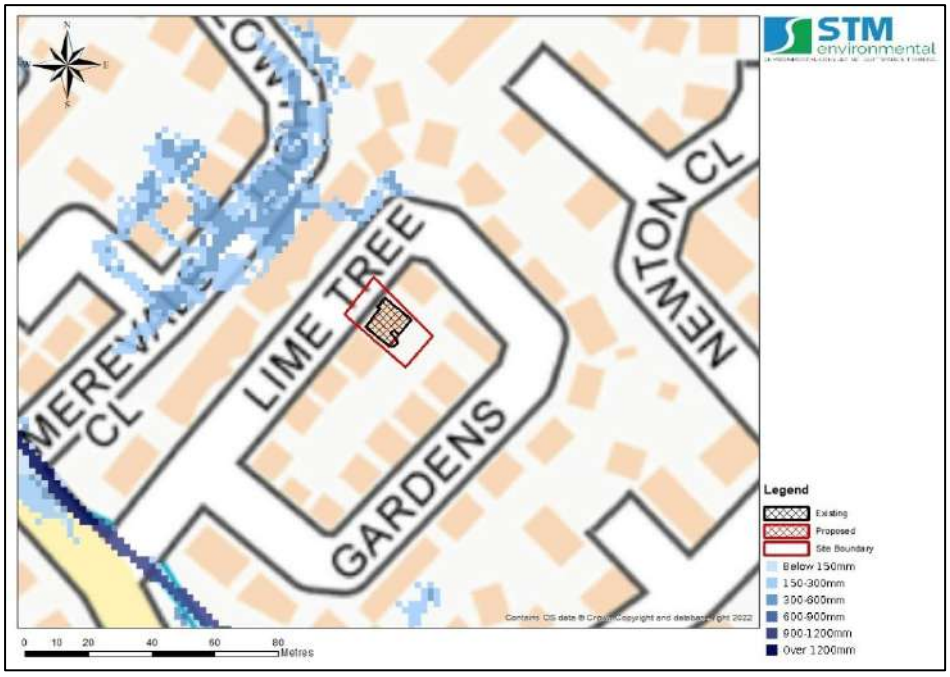
17.5 Appendix 5 - EA Flood Zone Map



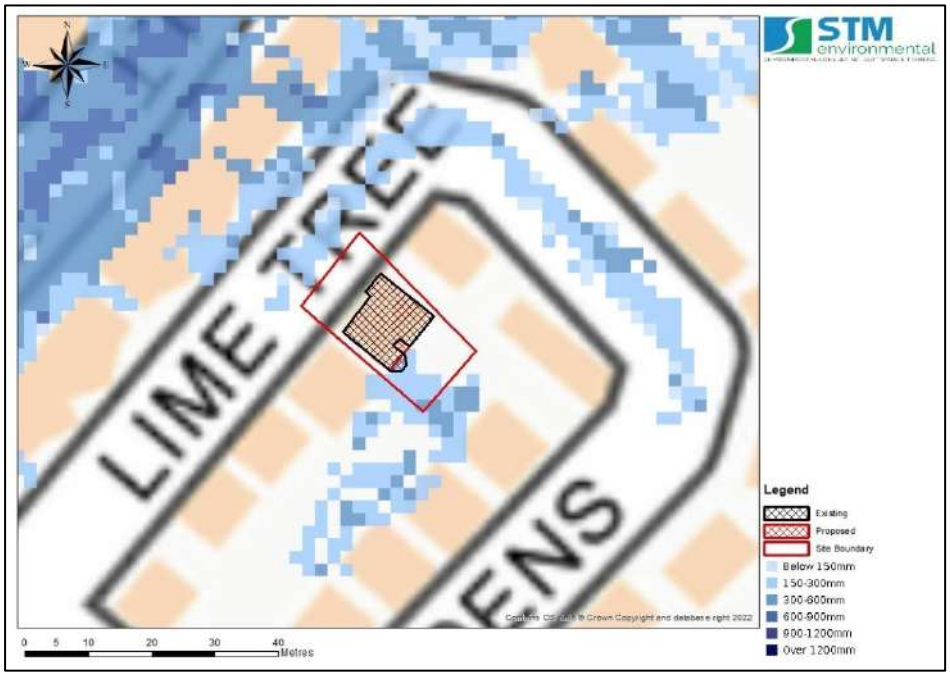


17.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

17.6.1 Predicted surface water flood depth for the 1 in 100-year return period (Source: EA, 2016).

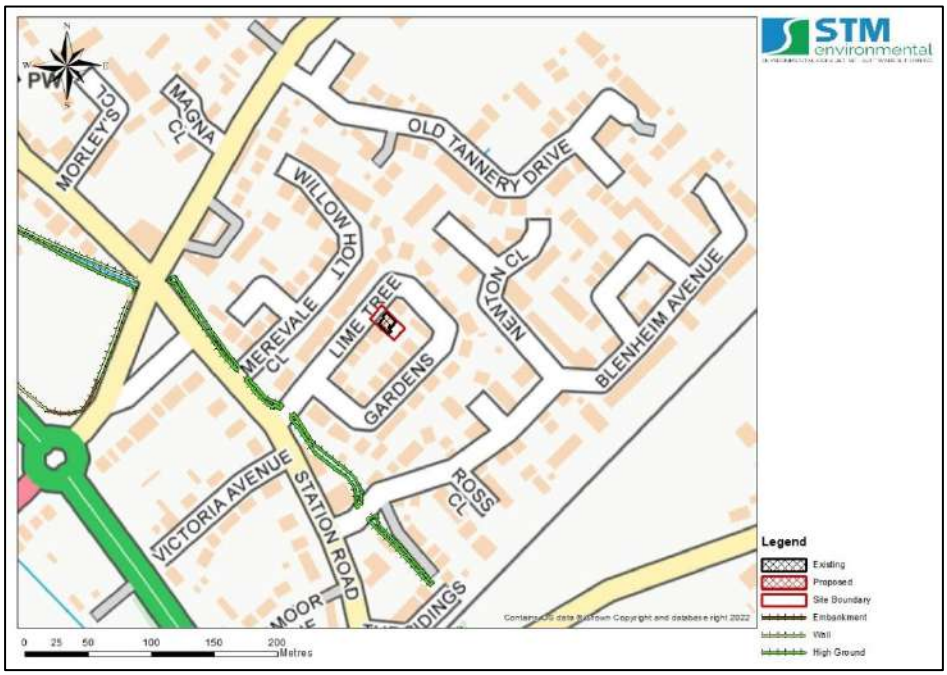


17.6.2 Predicted surface water flood depth for the 1 in 1000-year return period (Source: EA, 2016).

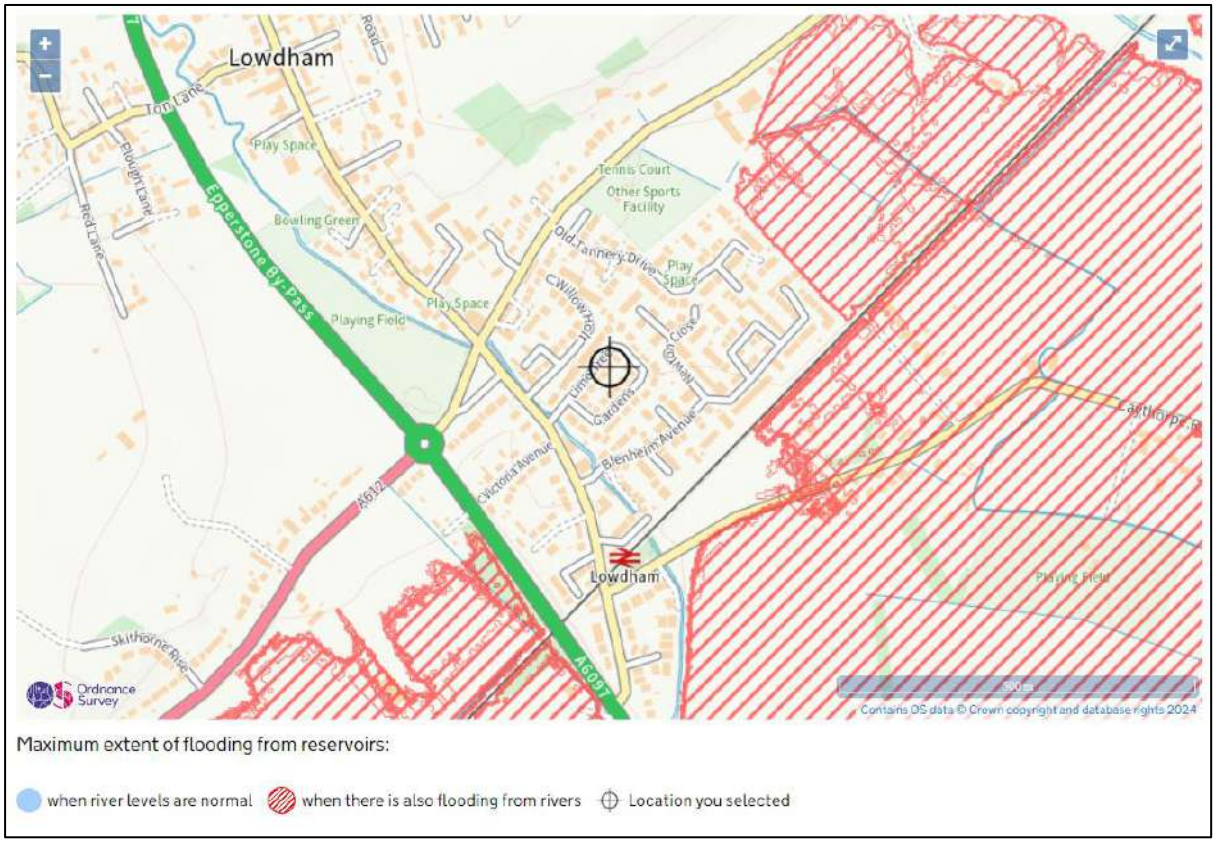


17.7 Appendix 7 –Flood Defence and Reservoir Flood Risk Maps

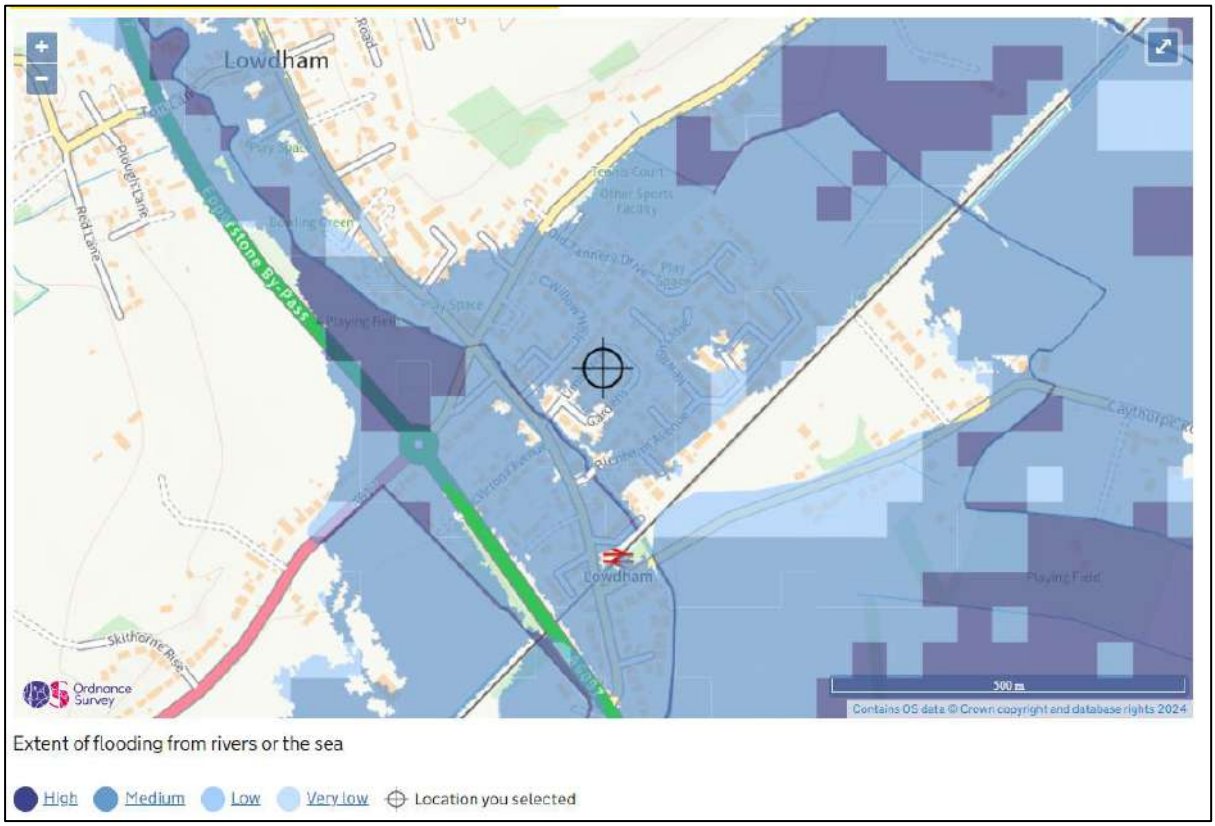
17.7.1 EA flood defence map



17.7.2 Reservoir Flood Risk Map

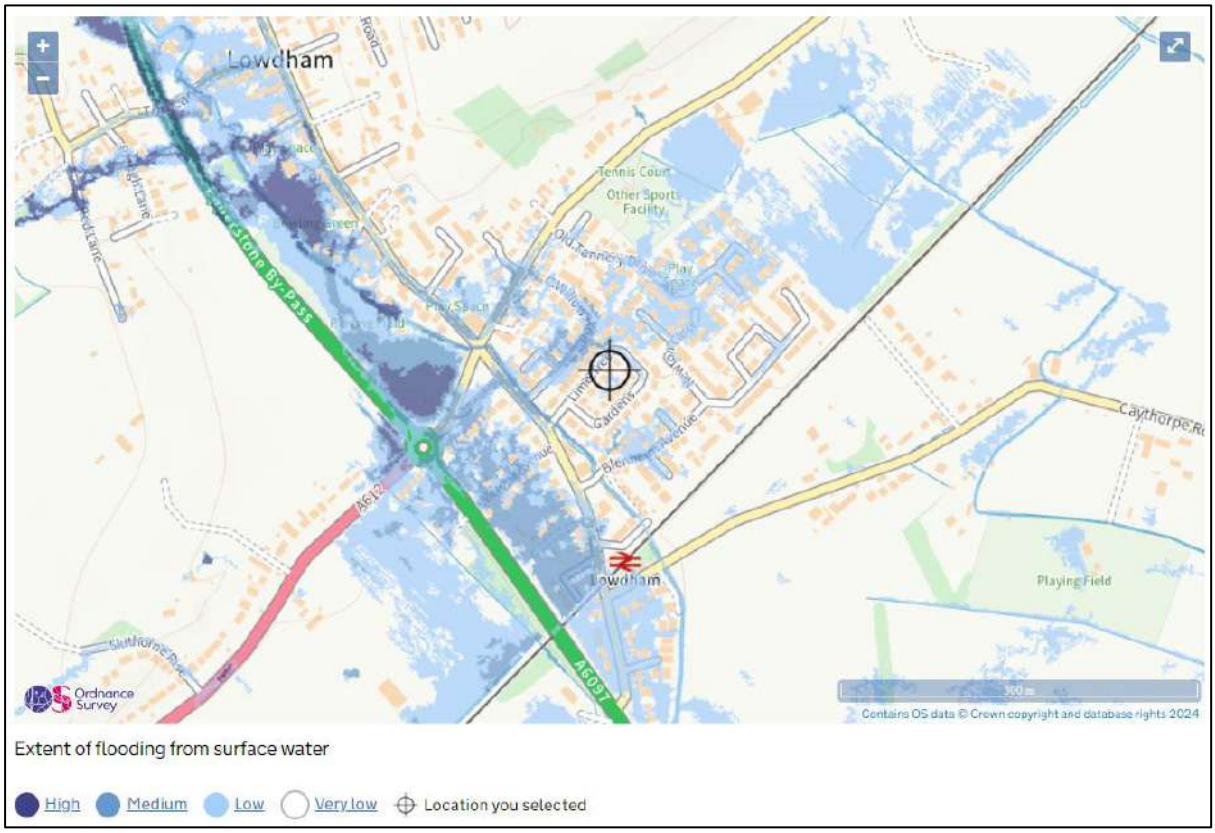


17.8 Appendix 9 – EA's Long Term Flood Risk Maps



Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

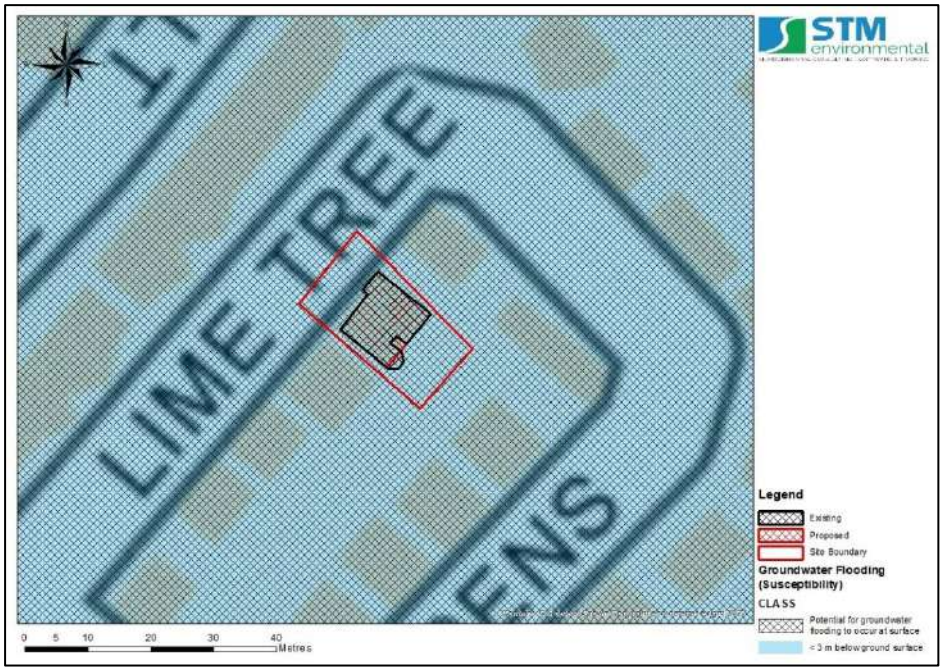


Extent of flooding from surface water

High Medium Low Very low Location you selected

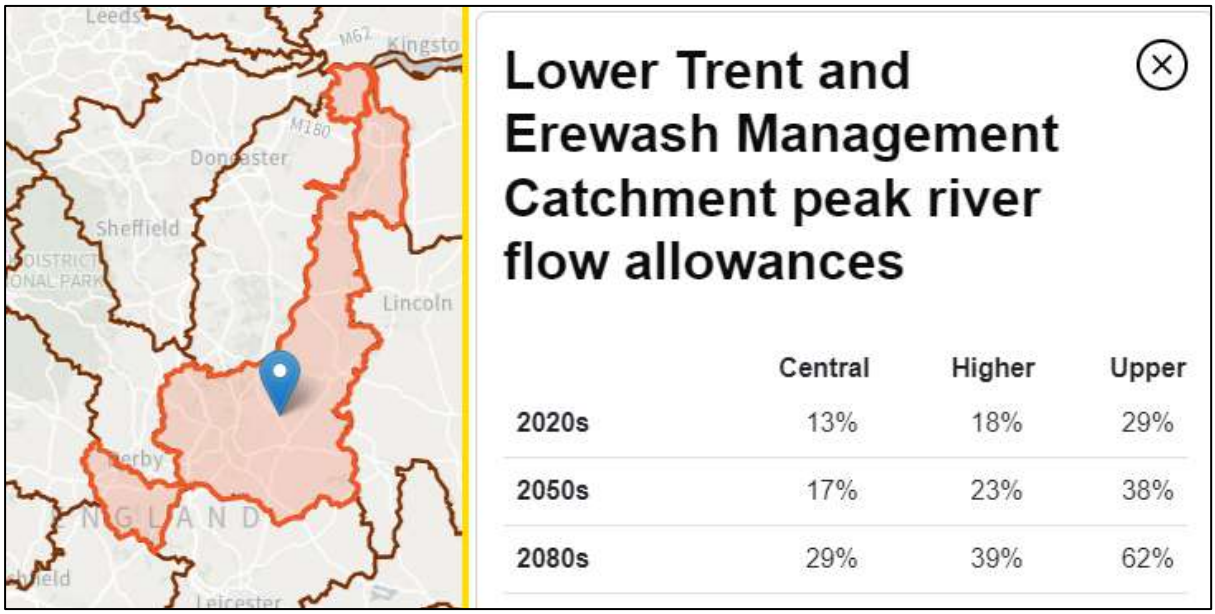
17.9 Appendix 10 – Groundwater Flood Maps

17.9.1 Groundwater Flooding (Susceptibility) Map (BGS) and Potential Depth to the Groundwater Water Map (BGS)



17.10 Appendix 11 - EA Product 4 (Detailed Flood Risk) Data

17.10.1 EA Climate Change Allowances for Peak River Flow



17.10.2 EA Product 4 Data

See Next Page.

Product 4: Flood Risk Data Package for
10 Limetree Gardens, Lowdham,
Nottingham, NG14 7DJ

EMD 343274 **Date: 26/01/2024**

Flood Map for Planning: The Flood Map for Planning is now classed as Open Data. As such it can be downloaded free of charge under an open data licence from the following addresses:

- https://data.gov.uk/publisher/environment-agency
- https://flood-map-for-planning.service.gov.uk/

This location is within Flood Zone 3.

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.
- ignore 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.
- The NaFRA 2 will be completed Summer 2024 and the flood zones will then be updated NaFRA2 (As such we are not accepting any flood map challenges at this time).

Zone 1: Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone2: Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a: High Probability	Land having a 1% (1 in 100) or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b: Functional Floodplain	• land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). • Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. • (Not separately distinguished from Zone 3a on the Flood Map)

Probability	Percentage chance of flooding each year
1 in 2 year	50%
1 in 5 year	20%
1 in 20 year	5%
1 in 50 year	2%
1 in 100 year	1%
1 in 1000 year	0.1%
Surface Water Flooding	
1 in 30	High Risk
1 in 100	Medium Risk
1 in 1000	Low Risk

Updated Climate Change Guidance: On 19th February 2016, the Flood risk assessments: climate change allowances' was published on www.gov.uk website. It has replaced previous guidance Climate Change Allowances for Planners. The climate change guidance can be found at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

The climate change allowances for this location are:

- **29% (central)**
- **39% (higher central),**
- **62% (upper)**

Modelled Information: Cocker Beck, Nottingham Tributaries, JBA, 2014

Node point reference	Location	50% (1 in 2 year) modelled level (mAOD)	50% (1 in 2 year) modelled flow (m^3/s)	20% (1 in 5 year) modelled level (mAOD)
CBK_2767	SK 67170 46156	20.72	6.14	20.86
CBK_2767d	SK 67180 46145	20.55	6.14	20.65
CBK_2724	SK 67202 46128	20.43	6.15	20.54
CBK_2734	SK 67192 46131	20.45	6.15	20.56
CBK_2724d	SK 67222 46111	20.43	6.15	20.54

Node point reference	Location	20% (1 in 5 year) modelled flow (m^3/s)	10% (1 in 10 year) modelled level (mAOD)	10% (1 in 10 year) modelled flow (m^3/s)
CBK_2767	SK 67170 46156	6.91	20.88	7.00
CBK_2767d	SK 67180 46145	6.91	20.66	7.00
CBK_2724	SK 67202 46128	6.82	20.55	6.88
CBK_2734	SK 67192 46131	6.82	20.57	6.89
CBK_2724d	SK 67222 46111	6.82	20.54	6.88

Node point reference	Location	5% (1 in 20 year) modelled level (mAOD)	5% (1 in 20 year) modelled flow (m^3/s)	2% (1 in 50 year) modelled level (mAOD)
CBK_2767	SK 67170 46156	20.89	7.06	20.89
CBK_2767d	SK 67180 46145	20.66	7.06	20.67
CBK_2724	SK 67202 46128	20.56	6.93	20.56
CBK_2734	SK 67192 46131	20.58	6.93	20.58
CBK_2724d	SK 67222 46111	20.55	6.93	20.56

Node point reference	Location	2% (1 in 50 year) modelled flow (m^3/s)	1.33% (1 in 75 year) modelled level (mAOD)	1.33% (1 in 75 year) modelled flow (m^3/s)
CBK_2767	SK 67170 46156	7.15	20.90	7.16
CBK_2767d	SK 67180 46145	7.15	20.67	7.16
CBK_2724	SK 67202 46128	6.98	20.56	7.00
CBK_2734	SK 67192 46131	6.99	20.59	7.00
CBK_2724d	SK 67222 46111	6.98	20.56	7.00

Node point reference	Location	1% (1 in 100 year) modelled level (mAOD)	1% (1 in 100 year) modelled flow (m^3/s)	0.5% (1 in 200 year) modelled level (mAOD)
CBK_2767	SK 67170 46156	20.90	7.18	20.91
CBK_2767d	SK 67180 46145	20.67	7.18	20.67
CBK_2724	SK 67202 46128	20.57	7.01	20.57
CBK_2734	SK 67192 46131	20.59	7.02	20.59
CBK_2724d	SK 67222 46111	20.56	7.01	20.56

Node point reference	Location	0.5% (1 in 200 year) modelled flow (m^3/s)	0.1% (1 in 1000 year) modelled level (mAOD)	0.1% (1 in 1000 year) modelled flow (m^3/s)
CBK_2767	SK 67170 46156	7.21	20.93	7.38
CBK_2767d	SK 67180 46145	7.21	20.68	7.38
CBK_2724	SK 67202 46128	7.04	20.59	7.10
CBK_2734	SK 67192 46131	7.04	20.61	7.11
CBK_2724d	SK 67222 46111	7.04	20.58	7.10

Node point reference	Location	1% + 20% flow (1 in 100 year plus climate change) modelled level (mAOD)	1% + 20% flow (1 in 100 year plus climate change) modelled flow (m^3/s)
CBK_2767	SK 67170 46156	20.91	7.24
CBK_2767d	SK 67180 46145	20.67	7.24
CBK_2724	SK 67202 46128	20.57	7.04
CBK_2734	SK 67192 46131	20.59	7.05
CBK_2724d	SK 67222 46111	20.56	7.04

Please note: The flows provided represent **in channel flow only** and do not consider flow on the floodplain.

All data is discussed as metres above Ordnance Datum (mAOD). This is based on the Ordnance Datum Newlyn in Cornwall. Tide gauges have been used over time to calculate a mean sea level datum point. This point is marked as height zero on maps in Britain. For more information please see: Ordnance Datum Newlyn reaches 100 years | Blog | Ordnance Survey

Defence Information Flood defence data in routinely updated and freely available at: AIMS Spatial Flood Defences (inc. standardised attributes) - data.gov.uk and AIMS Asset Bundle - data.gov.uk.

Historic Information: We have records of historic fluvial flooding at this location in 2007. Please note that we may or may not hold the original records in question. We do not make any claim as to the reliability of recorded flood extents or that all flood events in the area have been recorded. Please also be aware that flood defences may have been built after these historic flood events. Note - This information relates to the area the above-named property is in and is not specific to the property itself - it ***does not*** provide an indicator of flood risk ***at individual property level***.

Surface Water & Drainage: The Environment Agency (empowered under the Water Resources Act 1991) concentrates on the major elements of the drainage system, managing flood risk arising from designated "main rivers" and the sea. The Flood & Water Management Act (2010) has given Lead Local Flood Authorities (LLFAs) responsibility for the management of local flood risk, which includes surface runoff, groundwater, and flooding from ordinary watercourses (smaller rivers and streams). The LLFA for this area

is **Nottinghamshire County Council,** and we recommend that you contact them with concerns about any flooding issues for this area.

Critical Drainage Area: This area is also under the management of **Trent Valley Internal Drainage Board.** This is due to the complex drainage system.

Further information and maps for surface water, ordinary watercourses, and reservoir flooding can be found here:
https://www.gov.uk/check-long-term-flood-risk ; Reservoir flood maps: when and how to use them - GOV.UK (www.gov.uk)

Open Data Information: Many datasets are now classed as Open Data and as such can be downloaded free of charge under an open data licence from the following address: https://data.gov.uk/publisher/environment-agency

Permitting Information: Under the Environmental Permitting (England and Wales) Regulations 2016, any permanent or temporary works in, over or under a designated main river will require an Environmental Permit for Flood Risk Activities from the Environment Agency. Any permanent or temporary works within 8 metres of the top of bank of a designated main river, or landward toe of a flood defence may require an Environmental Permit for Flood Risk Activities from the Environment Agency. In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities. To find out whether your activity requires a permit or falls under a relevant exclusion, exemption or standard rule please follow this link: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits. The Environment Agency require access to the watercourse and free movement up to 8m from the river bank/ defence for maintenance purposes.

Please note that a permit is separate to and in addition to any planning permission granted.

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. 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.

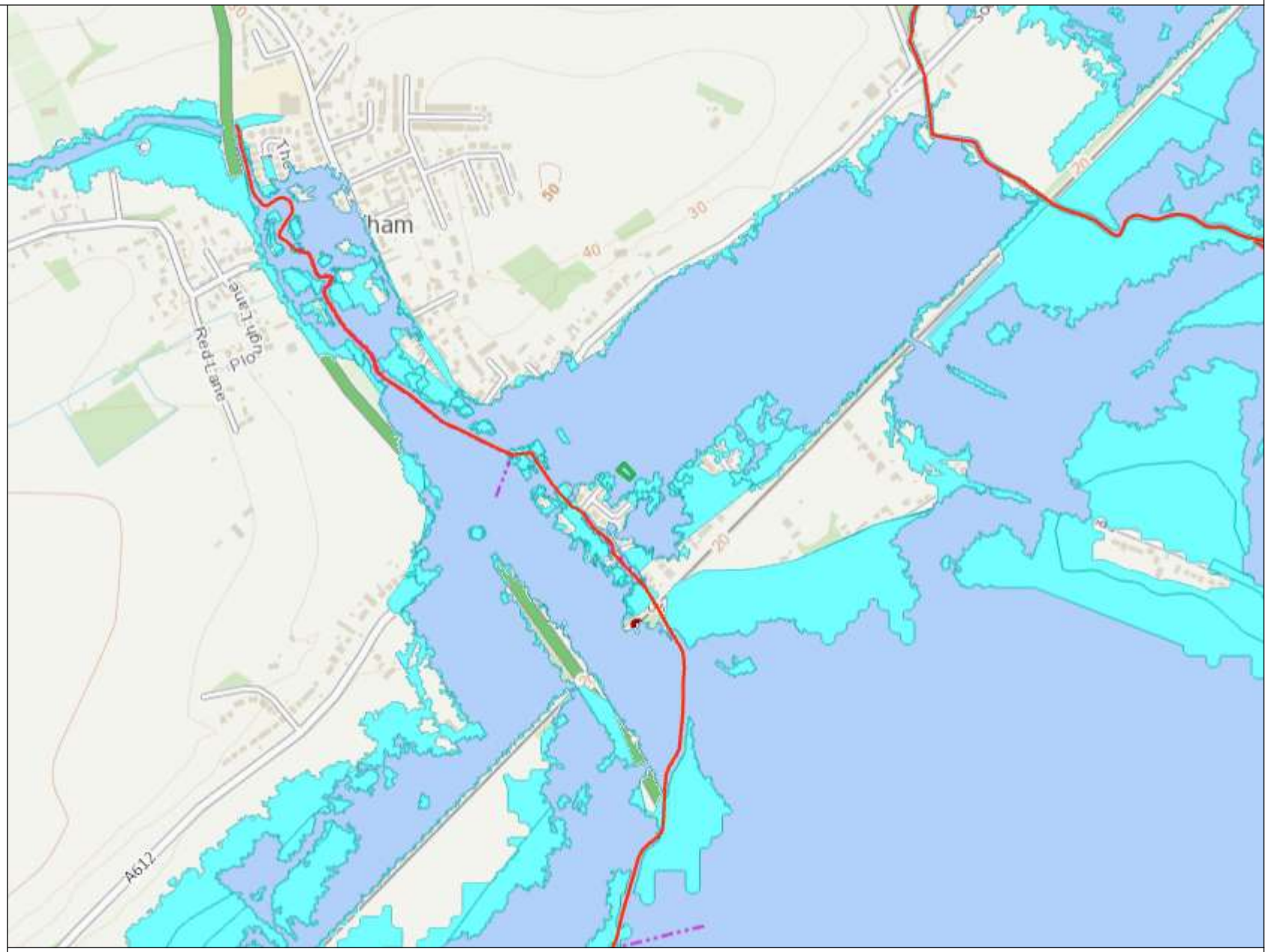
Flood Risk Assessment Advisory: All guidance on how to complete a full site specific Flood Risk Assessment (FRA) can be found here: Flood risk and coastal change - GOV.UK (www.gov.uk). Furthermore, professional assistance can be provided by our planning officers, by contacting planning.trentside@environment-agency.gov.uk.

Detailed Flood Map, centred on Limetree Gardens, Lowdham [EMD 343274]

Environment Agency

Legend

- Statutory Main Rivers
- Defences
- Flood Storage Areas
- Flood Zone 3
- Flood Zone 2



1: 10,000

0 250

Metres

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Detailed River Network Map, centred on Limetree Gardens, Lowdham [EMD 343274]

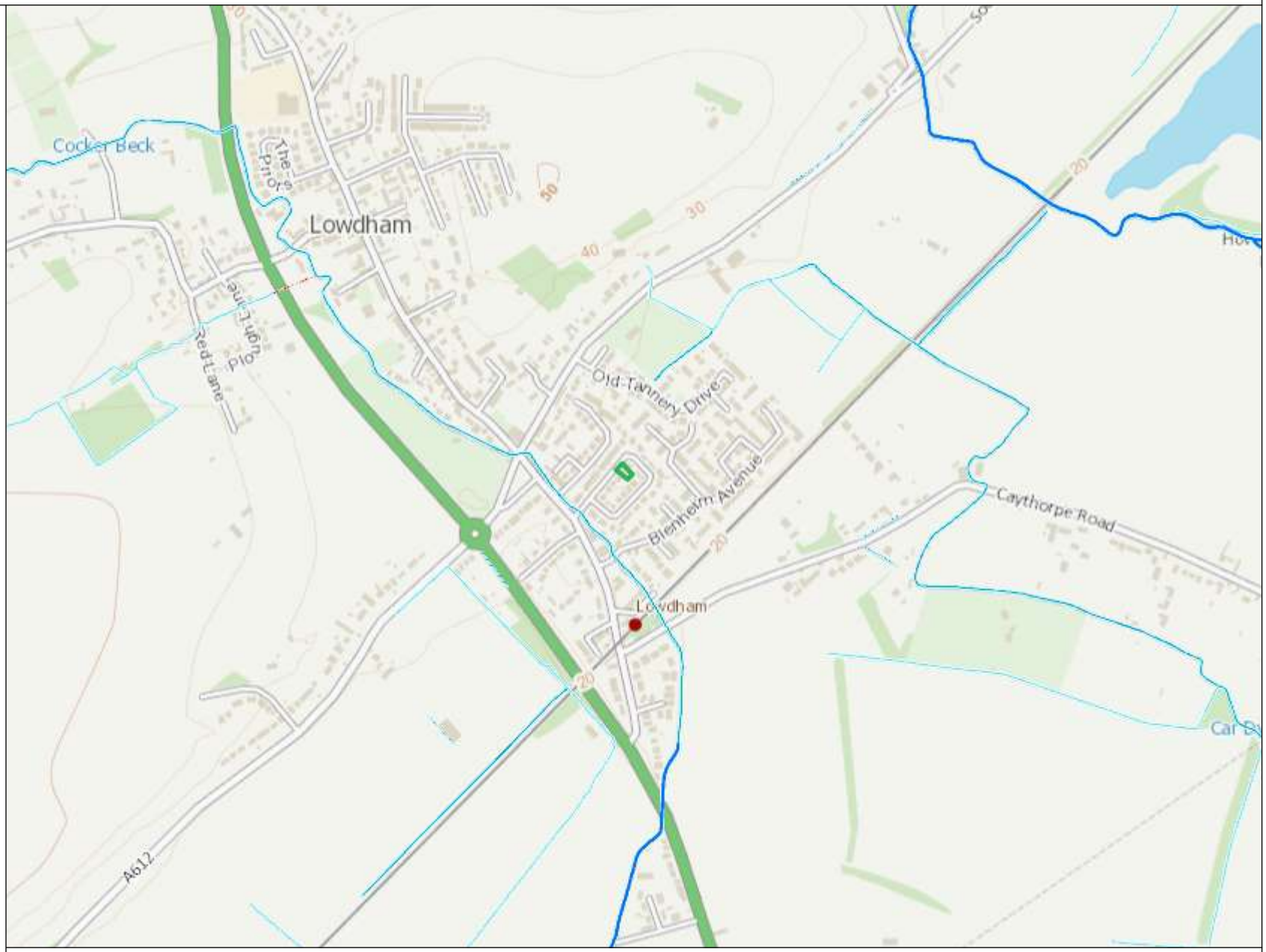
Environment Agency

Legend

Detailed River Network
- Primary River
- Secondary River
- Tertiary River
- Lake / Reservoir
- Canal
- Canal Tunnel
- Extended Culvert
- Multiple Channel Culvert
- Underground River (potential sewer)
- Underground River (inferred)
- Underground River (local knowledge)
- Undefined

Offline Drainage features

Detailed River Network
- Primary River
- Secondary River
- Tertiary River
- Lake / Reservoir
- Canal
- Canal Tunnel
- Extended Culvert
- Multiple Channel Culvert
- Underground River (potential sewer)
- Underground River (inferred)
- Underground River (local knowledge)
- Undefined



1: 10,000

0 250

Metres

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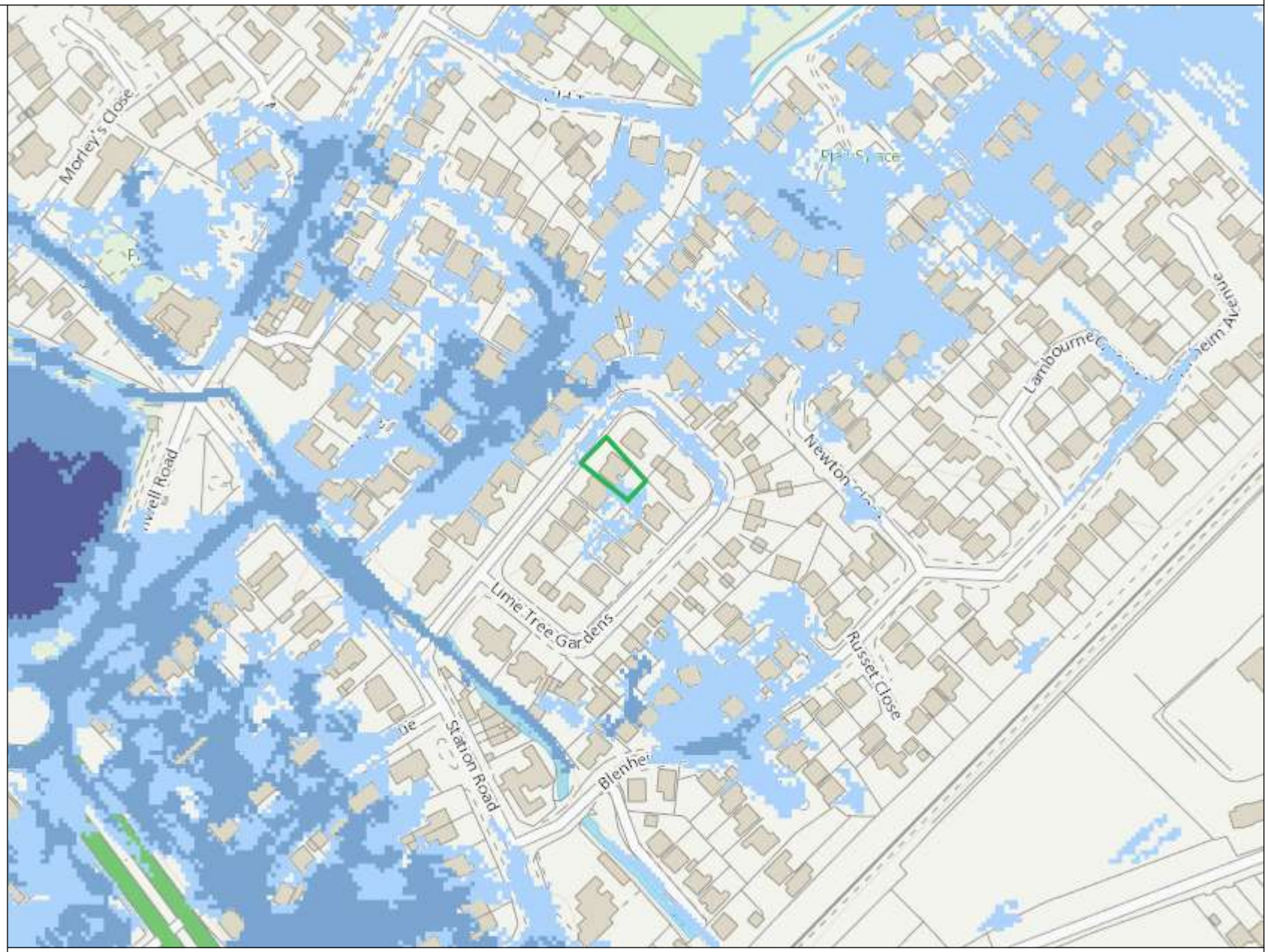
Surface Water Map, centred on Limetree Gardens, Lowdham [EMD 343274]

Environment Agency

Legend

- Flood Extent 1 in 30
- Flood Extent 1 in 100
- Flood Extent 1 in 1000



1: 2,500

0 62

Metres

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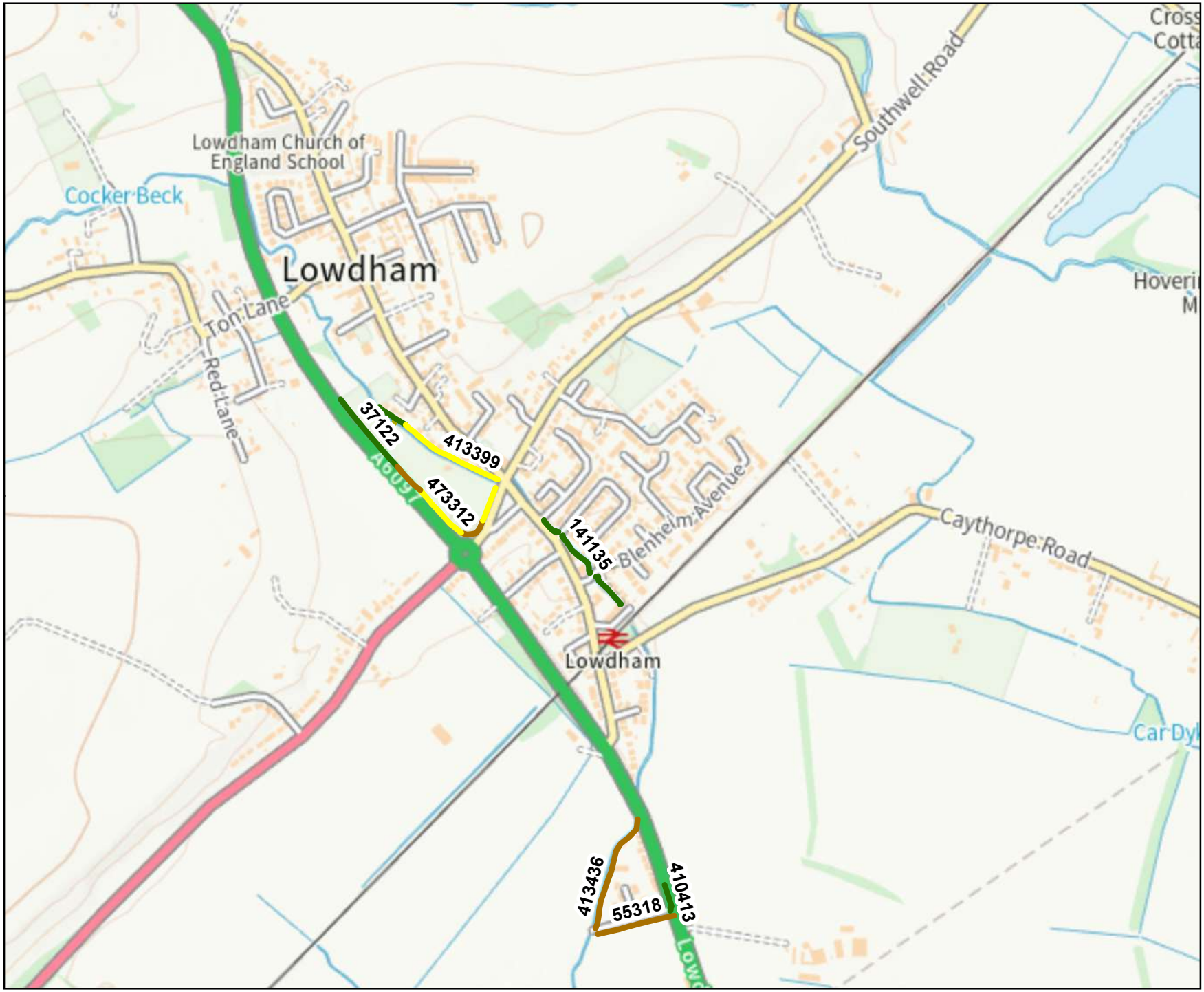
Flood Defence Map
Centred on Limetree Gardens, Lowdham [EMD 343274]



Environment Agency

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Scale 1:10,000

Date created: 26 January 2024

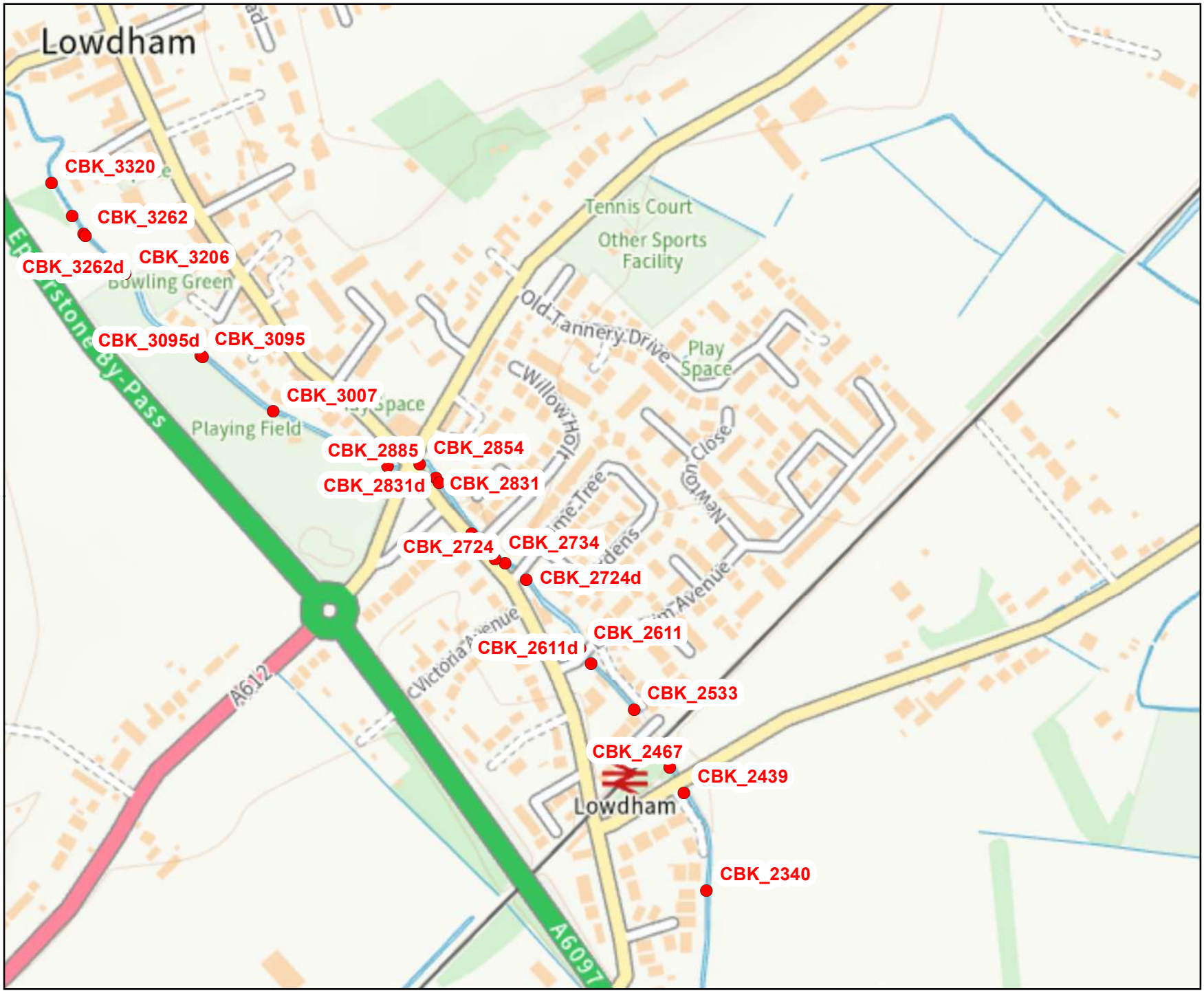
Legend

EMD Defences - March 2023

ASSETTYPE

- Bridge Abutment
- Demountable Defence
- Embankment
- Engineered High Ground
- Flood Gate
- Natural High Ground
- Spillway
- Wall

Modelled Nodes Map
Centred on Limetree Gardens, Lowdham [EMD 343274]



Environment Agency

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Scale 1:5,000

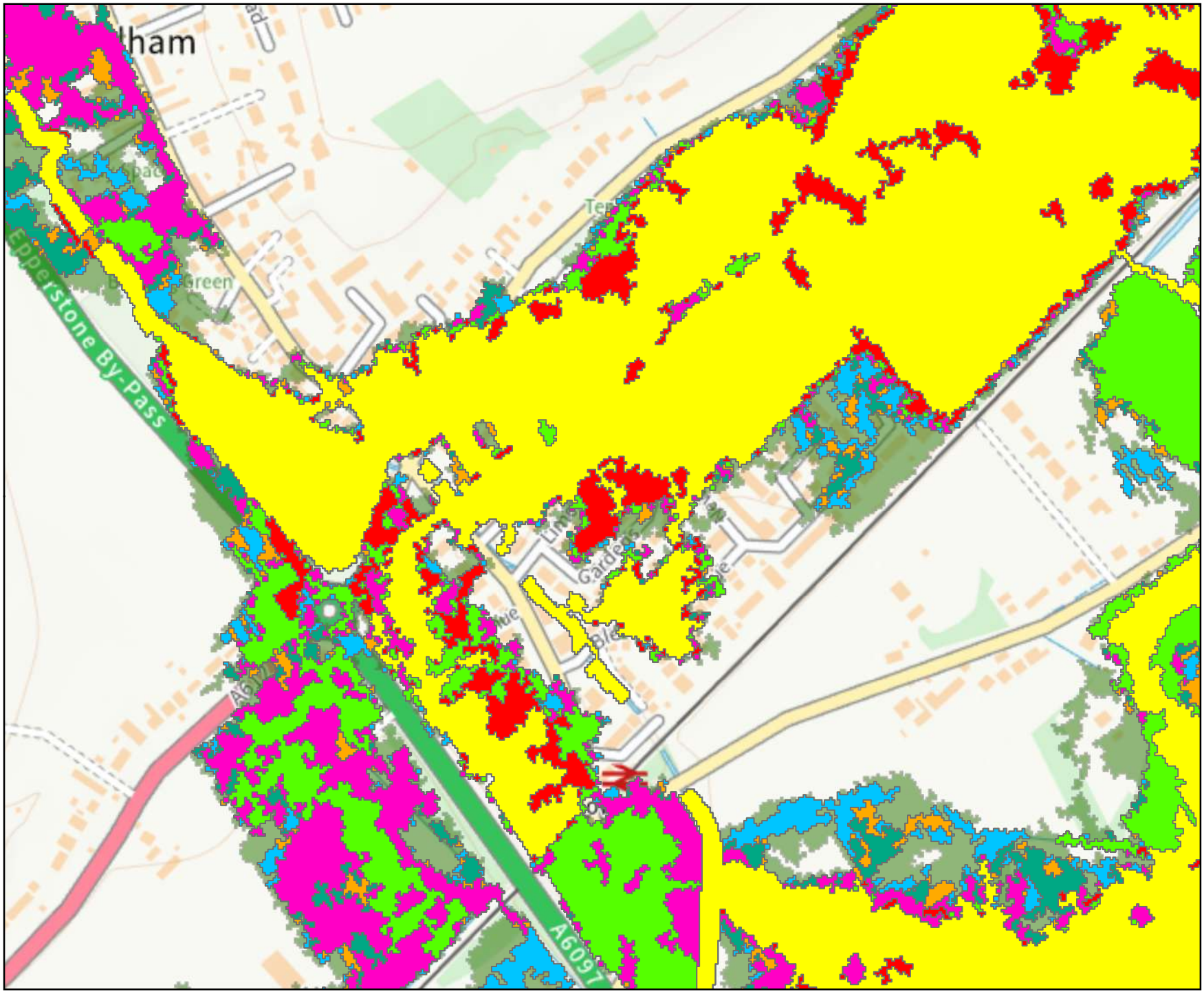
Date created: 26 January 2024

Legend

- Modelled Nodes_Cocker Beck

SOURCE:
Cocker Beck,
Notts Tribs, JBA, 2014

Modelled Flood Extents Map
Centred on Limetree Gardens, Lowdham [EMD 343274]



Environment Agency

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Scale 1:5,000

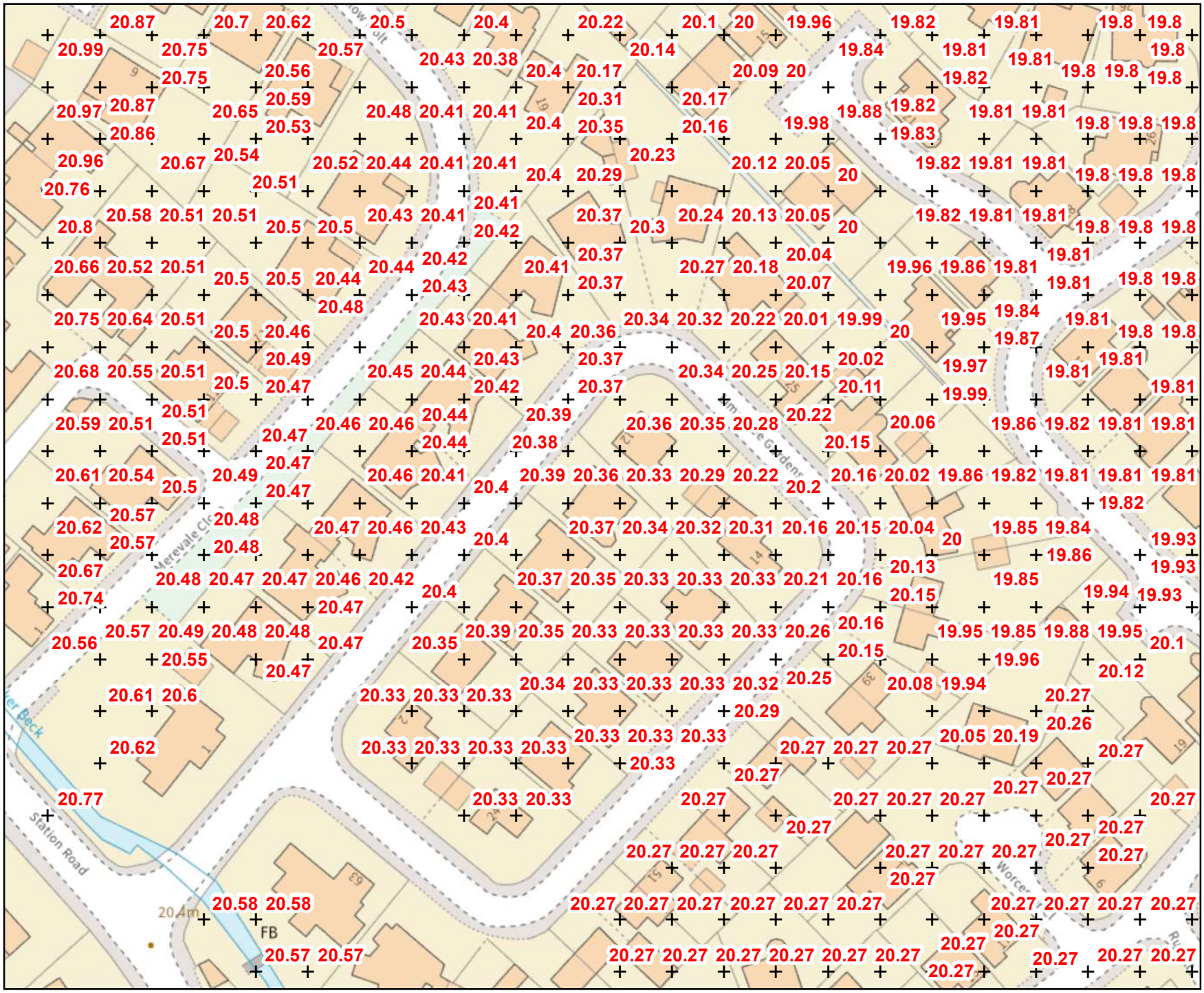
Date created: 26 January 2024

Modelled Flood Extents

- 1 in 5 year extent
- 1 in 10 year extent
- 1 in 20 year extent
- 1 in 75 year extent
- 1 in 100 year extent
- 1 in 200 year extent
- 1 in 1000 year extent

SOURCE:
Cocker Beck,
Notts Tribs, JBA, 2014

Floodplain Heights Map
Centred on Limetree Gardens, Lowdham [EMD 343274]



Environment Agency

Scale 1:1,000

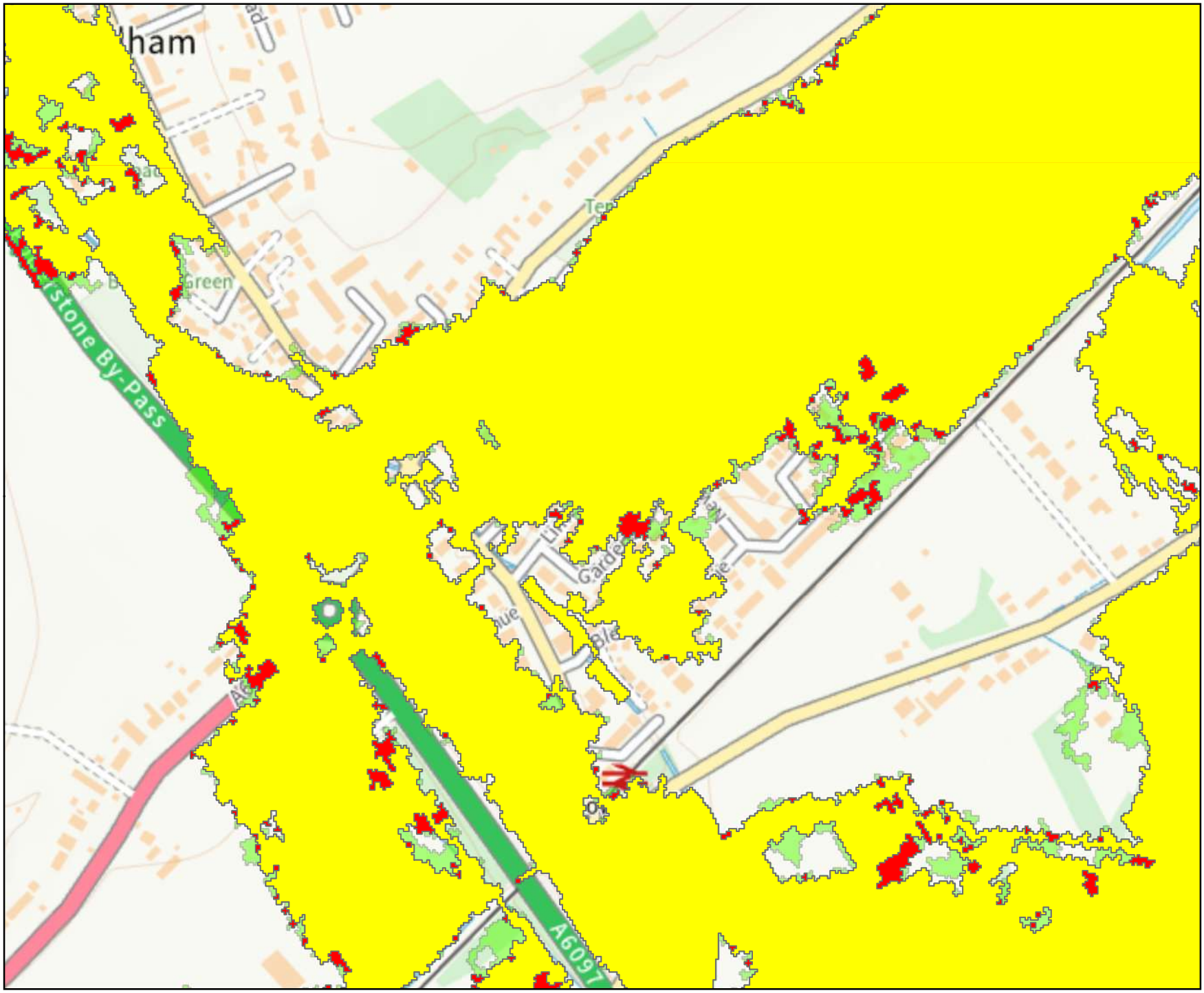
Date created: 26 January 2024

Legend

+ 1 in 1000yr Height (mAOD)

SOURCE:
Cocker Beck,
CC Scenarios, EA, 2021

Modelled Flood Extents Map
Centred on Limetree Gardens, Lowdham [EMD 343274]



Environment Agency

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Scale 1:5,000

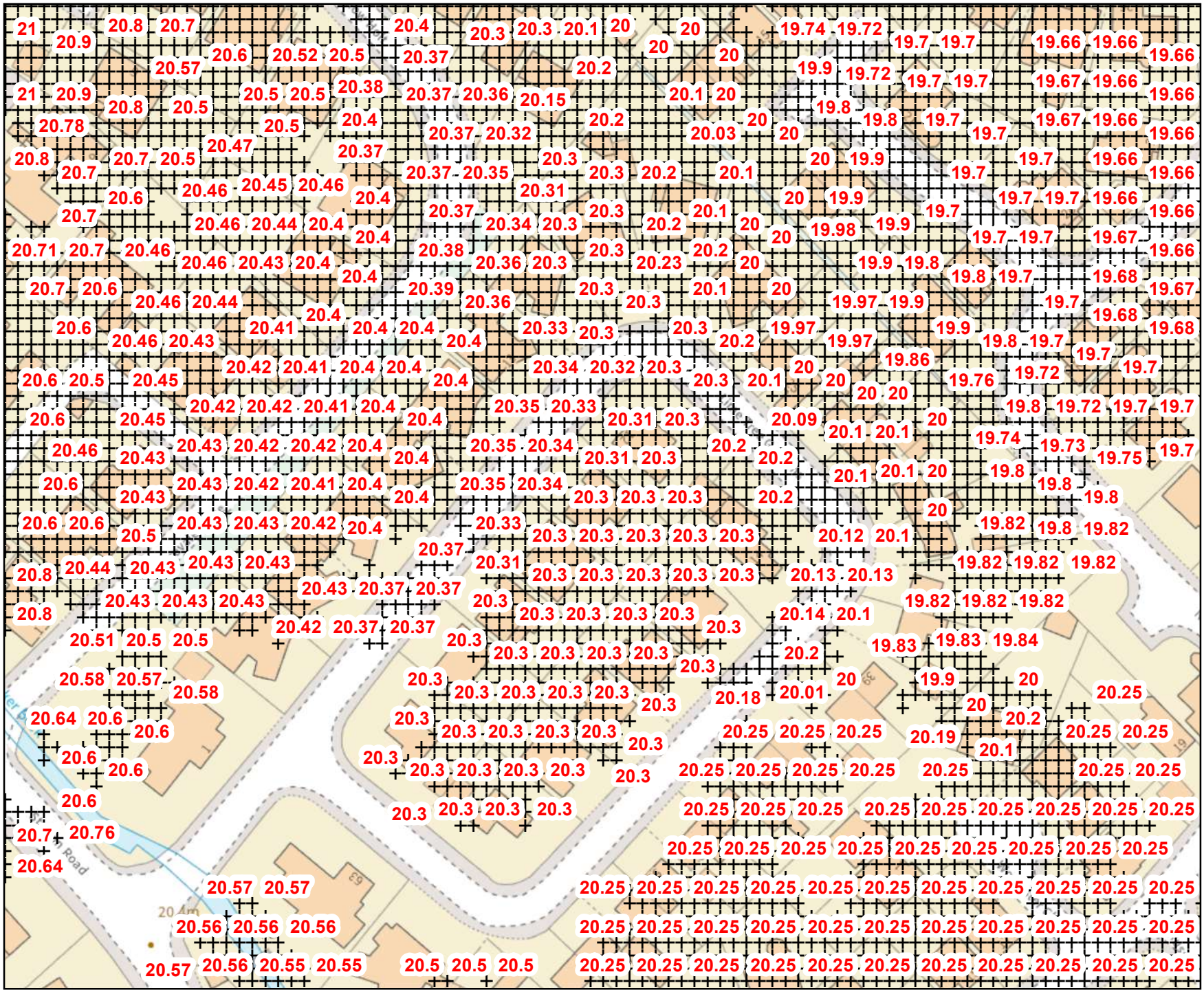
Date created: 26 January 2024

Modelled Flood Extents Climate Change Legend

- 1 in 100 year +20%CC extent
- 1 in 100 year +30%CC extent
- 1 in 100 year +50%CC extent

SOURCE:
Cocker Beck,
CC Scenarios, EA, 2021

Floodplain Heights Map
Centred on Limetree Gardens, Lowdham [EMD 343274]



Environment Agency

Scale 1:1,000

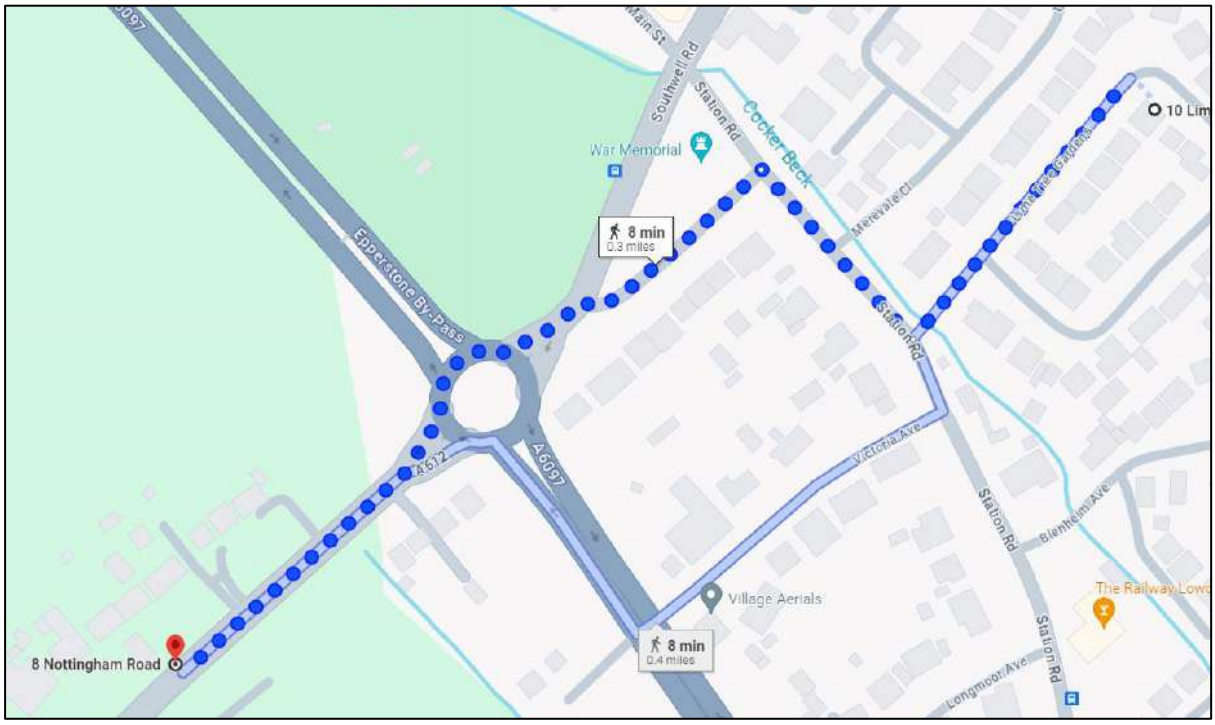
Date created: 26 January 2024

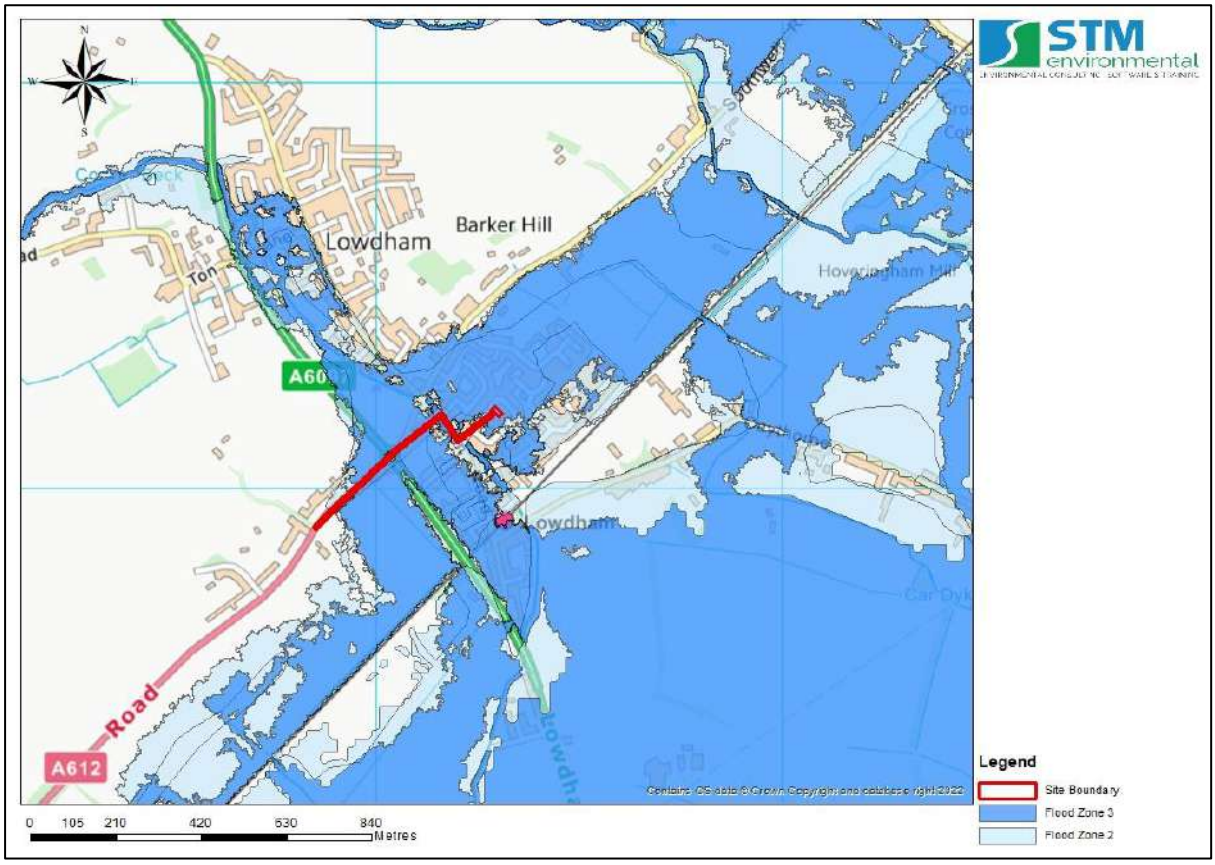
Legend

\+ 1 in 100yr +30%CC Height (mAOD)

SOURCE:
Cocker Beck,
CC Scenarios, EA, 2021

17.11 Appendix 12 – Safe Egress to Flood Zone 1 Map





17.12 Appendix 13 – Calculation of Flood Hazard Rating

Flood Hazard Rating Scores – based on DF score of 0

Velocity	Depth									
	0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.0**	**2.25**	**2.50**
0.0	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.5	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.0	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.5	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.0	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.0	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.5	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.0	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.0	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Summary of Scores

	Score From	Score To	Flood Hazard	Description
	<0.75	0.75	Low	Exercise Caution
Class 1	0.75	1.5	Moderate	Danger for some
Class 2	1.5	2.5	Significant	Danger for most
Class 3	2.5	20.0	Extreme	Danger for all

Values for Debris Factor for different flood depths

Depths	Pasture/Arable Land	Woodland	Urban
0 to 0.25	0	0	0
0.25 to 0.75	0.5	1	1
d>0.75 and/or v > 2	0.5	1	1

- The “danger to some” category includes vulnerable groups such as children, the elderly and infirm. “Danger: Flood zone with deep or fast
- flowing water”
- The “danger to most” category includes the general public.

- The danger to all category includes the emergency services.

A flood emergency plan is considered to be an acceptable way of managing flood risk where the flood hazard has been given a “very low hazard” rating. In some instances, flood emergency plans may also be acceptable where the rating is “danger for some”. However, it is unlikely to be an acceptable way of managing residual flood risk where the hazard to people classification is “danger for most” or “danger for all”.