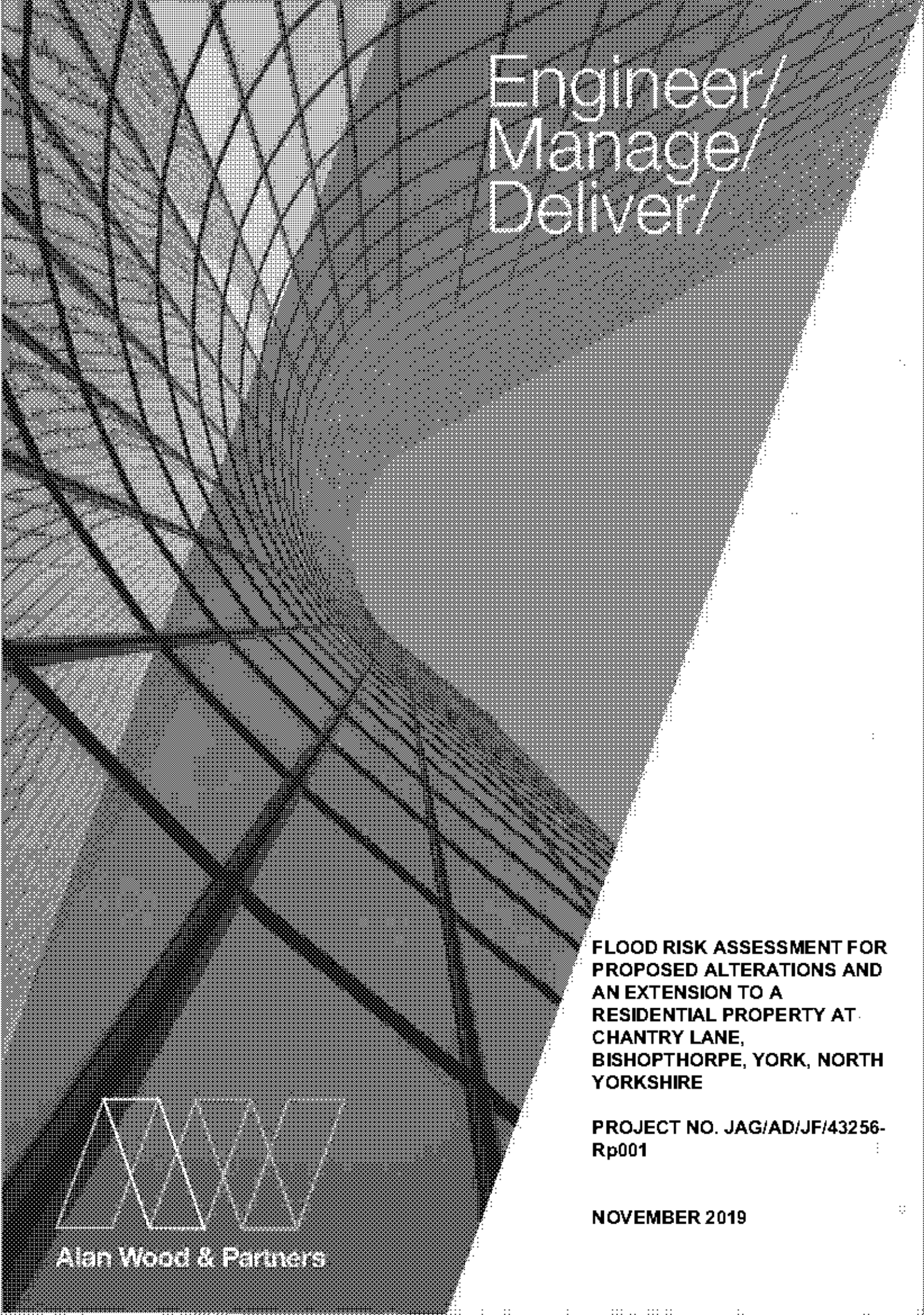


FLOOD RISK ASSESSMENT FOR PROPOSED ALTERATIONS AND AN EXTENSION TO A RESIDENTIAL PROPERTY AT CHANTRY LANE, BISHOPTHORPE, YORK, NORTH YORKSHIRE

PROJECT NO. JAG/AD/JF/43256-Rp001

NOVEMBER 2019

Alan Wood & Partners

Issuing Office
341 Beverley Road
HULL
HU5 1LD

Telephone: 01482 442138

Email: eng@alanwood.co.uk
Website: www.alanwood.co.uk

FLOOD RISK ASSESSMENT FOR PROPOSED ALTERATIONS AND AN EXTENSION TO A RESIDENTIAL PROPERTY (THE CHANTRY) AT CHANTRY LANE, BISHOPTHORPE, YORK, NORTH YORKSHIRE

Prepared by: A Dunn

Signed: .....
Date: 11th November 2019

Approved by: J Gibson, MEng (Hons), CEng, CWEM MCIWEM
Civil Engineering Director

Signed: .....
Date: 11th November 2019

Issue	Revision	Revised by	Approved by	Revised Date

TABLE OF CONTENT

APPENDICES

1.0 INTRODUCTION

1.1 Background

1.1.1 Alan Wood & Partners were commissioned by Mitchell Design Consultancy on behalf of Mr & Mrs P Cook to prepare a Flood Risk Assessment for a proposed development at The Chantry, Chantry Lane, Bishopthorpe, York, North Yorkshire.

1.1.2 A Flood Risk Assessment (FRA) for the proposed development is required to assess the development's risk from flooding.

1.2 Layout of Report

1.2.1 Section 1 provides an introduction to the FRA, explains the layout of this FRA and provides an introduction to flood risk and the latest guidance on development and flood risk in England.

1.2.2 Section 2 provides an introduction to the site. The site description is based upon a desktop study and information provided by the developer. In order to obtain further information on flood risk, consultation was undertaken with the Environment Agency.

1.2.3 Section 3 of this report details the information gathered through the consultation.

1.2.4 Section 4 of this report details the development proposals, and considers the development proposals in relation to the current planning policy on development and flood risk in England (and what type of development is considered appropriate in different flood risk zones). National Planning Policy Framework (NPPF): and its associated Technical Guidance (Communities and Local Government, March 2012) is the current planning policy on flood risk in England, and an introduction to NPPF is provided below.

1.2.5 Section 5 of this report considers the flood risk to site, and the potential for the development proposals to impact on flood risk. The assessment of flood risk is based on the latest planning policy and utilises all the information gathered in the preparation of the report.

1.2.6 Section 6 of this report provides details of any recommendations for further work to mitigate against possible flooding.

1.2.7 Section 7 of this report provides a summary of the report.

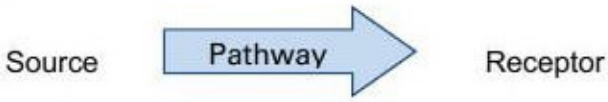
1.3 Flood Risk

1.3.1 Flood risk takes account of both the probability and the consequences of flooding.

1.3.2 Flood risk = probability of flooding x consequences of flooding

1.3.3 Probability is usually interpreted in terms of the return period, e.g. 1 in 100 and 1 in 200 year event, etc. In terms of probability, there is a 1 in 100 (1%) chance of one or more 1 in 100 year floods occurring in a given year. The consequences of flooding depends on how vulnerable a receptor is to flooding.

The components of flood risk can be considered using a source-pathway-receptor model.



1.3.4 Sources constitute flood hazards, which are anything with the potential to cause harm through flooding (e.g. rainfall extreme sea levels, river flows and canals). Pathways represent the mechanism by which the flood hazard would cause harm to a receptor (e.g. overtopping and failure of embankments and flood defences, inadequate drainage and inundation of floodplains). Receptors comprise the people, property, infrastructure and ecosystems that could potentially be affected should a flood occur.

1.4 National Planning Policy Framework

1.4.1 General

1.4.1.1 NPPF and its associated Technical Guidance replaces Planning Policy Statement 25 and provides guidance on how to evaluate sites with respect to flood risk.

1.4.1.2 A summary of the requirements of NPPF is provided below.

1.4.2 Sources of Flooding

1.4.2.1 NPPF requires an assessment to flood risk to consider all forms of flooding and lists six forms of flooding that should be considered as part of a flood risk assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Table1: Forms of Flooding

Flooding From Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the development can have a strong influence on flooding from rivers.
Flooding From the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.

Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e. groundwater issues). Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers
In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall, and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e. reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and /or as a result of dam or bank failure.

1.4.3 Flood Zones

1.4.3.1 For river and sea flooding, NPPF uses four Flood Zones to characterise flood risk. These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and are detailed in Table 2.

Table 2: Flood Zones

Flood Zone	Definition
1	Low probability (less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year).
3a	High probability (1 in 100 or greater annual probability of river flooding (>1%) in any year or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
3b	This zone comprises land where water has to flow or be stored in times flood. Land which would flood with an annual probability of 1 in 20 (5%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

1.4.4 Vulnerability

1.4.4.1 NPPF classifies the vulnerability of developments to flooding into five categories. These categories are detailed in Table 3.

Table 3: Flood Risk Vulnerability Classification

Flood Risk Vulnerability Classification	Examples of Development Types
Essential Infrastructure	- Essential utility infrastructure including electricity generating power stations and grid and primary substations - Wind turbines
Highly Vulnerable	- Police stations, ambulance stations, fire stations, command centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use.
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and educational establishments. - Sites used for holiday or short-let caravans and camping.
Less Vulnerable	- Building used for shops, financial, professional and other services, restaurants and cafes, hot foot takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. - Land and buildings used for agriculture and forestry.
Water Compatible	- Docks, marinas and wharves. - Water based recreation (excluding sleeping accommodation). - Lifeguard and coastguard stations. - Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.

1.4.4.2 Based on the vulnerability of a development, NPPF states within what Flood Zones(s) the development is appropriate. The flood risk vulnerability and Flood Zone 'compatibility' of developments is summarised in Table 4.

Table 4: Flood Risk Vulnerability and Flood Zone Compatibility

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

1.4.5 The Sequential Test, Exception Test and Sequential Approach

1.4.5.1 The Sequential Test is a risk-based test that should be applied at all stages of development and aims to steer new development to areas with the lowest probability of flooding (Zone 1). This is applied by the Local Planning Authority by means of a Strategic Flood Assessment (SFRA).

1.4.5.2 The SFRA and NPPF may require the Exception Test to be applied to certain forms of new development. The test considers the vulnerability of the new development to flood risk and, to be passed, must demonstrate that:

- There are sustainability benefits that outweigh the flood risk and;
- The new development is safe and does not increase flood risk elsewhere.

1.4.5.3 The Sequential Approach is also a risk based approach to development. In a development site located in several Flood Zones or with other flood risk, the sequential approach directs the most vulnerable types of development towards areas of least risk within the site.

1.4.6 Climate Change

1.4.6.1 This is a planning requirement to account for climate change in the proposed design. The recommended allowances should be based on the most relevant guidance from the Environment Agency and the Lead Local Flood Authority.

1.4.7 Sustainable Drainage

1.4.7.1 The key planning objectives in NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Drainage Systems (SuDS) provide an effective way of achieving some of these objectives, and NPPF and Part H of the Building Regulations (DTLR 2002) direct developers towards the use of SuDS wherever possible.

2.0 EXISTING SITE DESCRIPTION

2.1 General

2.1.1 The proposed development site is located at The Chantry on the southern side of Chantry Lane, Bishopthorpe, York to the north of Ferry Lane.

2.1.2 The development site comprises a residential property and an extensive area of landscaped gardens.

2.1.3 An aerial photograph and location plan are included in Figure 1 and Figure 2 below, which identify the location of the site.

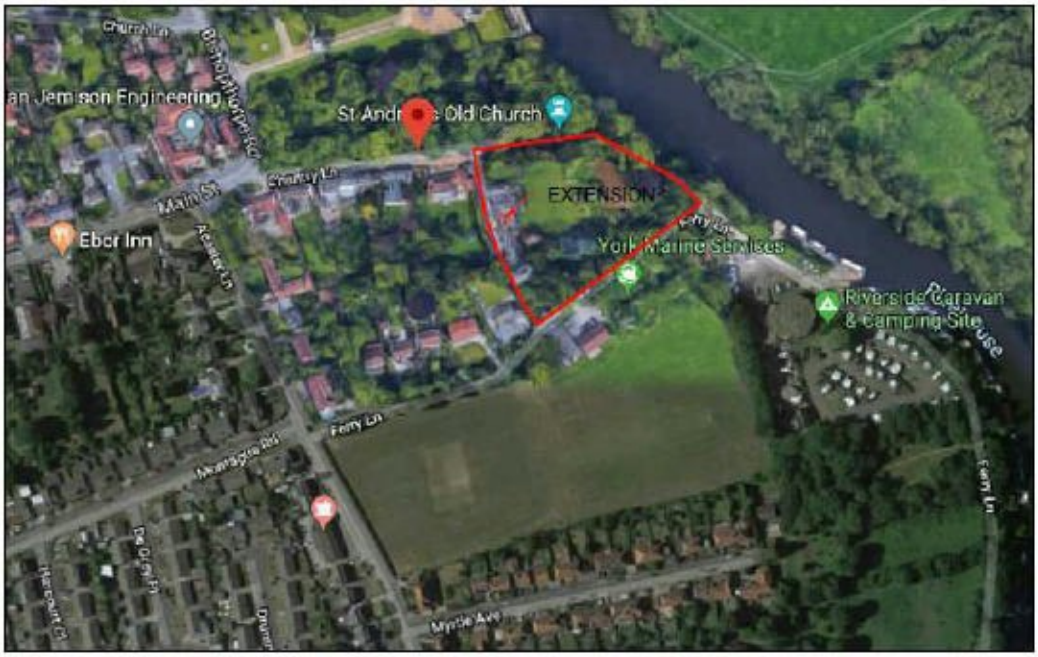


Figure 1: Aerial Photograph

Figure 2: Site Location Plan

2.1.4 The Ordnance Survey grid reference for the centre of the development site is approximately 459750, 447690.

2.1.5 The Ordnance Survey grid reference for the proposed extension is approximately 459760, 447687.

2.2 Surrounding Features

2.2.1 The development site lies within a residential area of York.

2.2.2 There are existing residential properties to the west of the development site.

2.2.3 The development site is bounded by Chantry Lane to the north and Ferry Lane to the south.

2.2.4 The River Ouse lies along the eastern site boundary.

2.3 Topography

2.3.1 A topographic survey of the development site has been undertaken. The survey reveals that external ground levels vary from approximately 7.81m to 10.16m OD(N) over the area of the full site.

2.3.2 The floor level of The Chantry was found to be at 10.33m OD(N).

2.3.3 A copy of the topographic survey drawing is included in Appendix A.

2.4 Ground Conditions

2.4.1 A desktop study of the British Geological Survey map of the region shows that the local geology comprises superficial deposits of Lacustrine Deposits – Clay overlaying bedrock comprising Sherwood Sandstone Group – Sandstone.

2.4.2 A study of the groundwater maps reveals that the site overlays a Principal Aquifer and lies within a Groundwater Vulnerability Zone – Minor Aquifer High.

3.0 CONSULTATION

3.1 Consultation has taken place with the Design Team in order to obtain relevant information pertaining to the proposed development.

3.2 Consultation has taken place with the Environment Agency in order to obtain relevant information in respect of flood mapping, details of which are included within this report.

4.0 PROPOSED DEVELOPMENT

4.1 The proposed development involves internal alterations to the property and the construction of a new single-storey extension. The development will be subject to an application for planning consent in respect of a Listed Building.

4.2 The plan area of the new extension has been calculated at approximately 23m^2.

4.2 An indicative layout drawing of the proposed development is included in Appendix B.

4.3 In terms of flood risk vulnerability, the development is classed as 'More Vulnerable' (Table 3).

4.4 In terms of flood zone compatibility, the construction of 'More Vulnerable' is considered to be appropriate in Flood Zone 2 (Table 4).

5.0 FLOOD RISK ASSESSMENT

5.1 Flood Zone

5.1.1 A copy of the Environment Agency Flood Map for Planning is included in Figure 3 below, which identifies the development site to be located within an area designated as Flood Zone 2, (medium probability of flooding), comprising land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between a 1 in 200 and 1 in 1000 annual probably of sea flooding in any year.

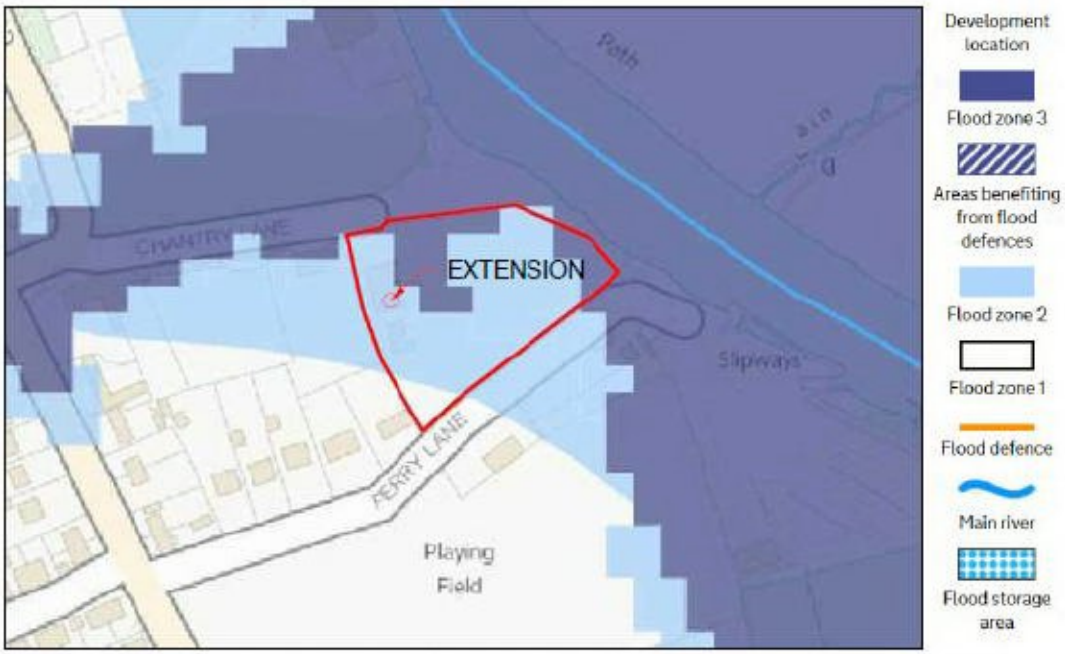


Figure 3: Environment Agency Flood Map for Planning dated November 2019

5.1.2 The map shows that the overall area of the development site varies from Flood Zone 1 (low probability of flooding), defined as having a less than 1 in 1000 annual probability of flooding in any year to Flood Zone 3 (high probability of flooding), defined as having a 1 in 100 or greater annual probability of river flooding or a 1 in 200 year or greater annual probability of flooding from the sea.

5.1.3 The residential property is generally shown to lie within Flood Zone 2 (medium probability of flooding), defined as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between a 1 in 200 and 1 in 1000 annual probably of sea flooding in any year, with the extreme north eastern corner of the building shown to lie in Flood Zone 3.

5.1.4 The area of the proposed extension is shown to lie within Flood Zone 2 (medium probability of flooding), defined as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between a 1 in 200 and 1 in 1000 annual probably of sea flooding in any year.

5.1.5 A Strategic Flood Risk Assessment has been prepared for City of York Council. The flood zones identified in the Strategic Flood Risk Assessment are a refinement of the Environment Agency flood zones based on local knowledge. As the flood defences in York provide varying levels of protection, the area defined as Flood Zone 3 has been further divided.

5.1.6 An abstract from the flood zone map is included in Figure 4 below.

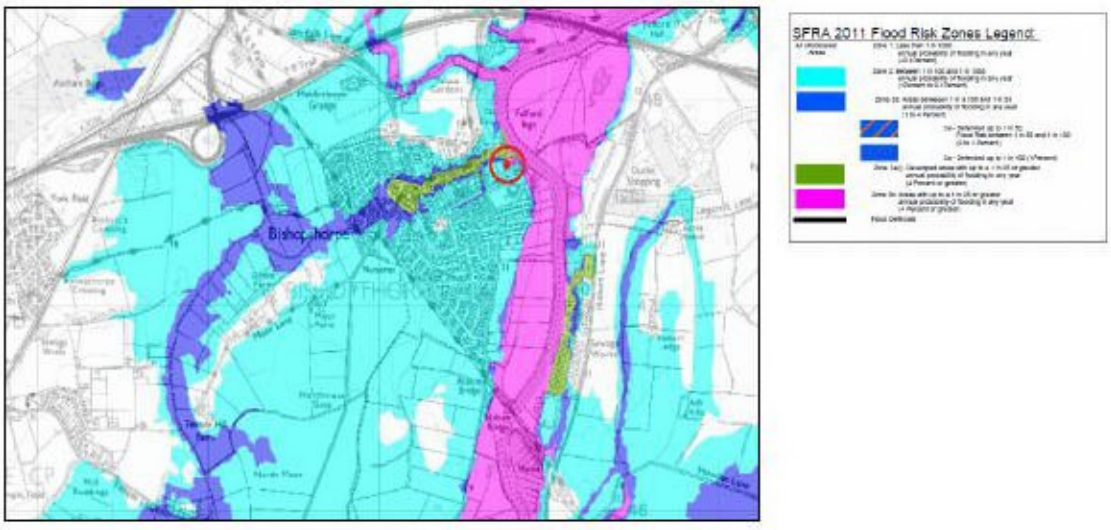


Figure 4: Abstract from SFRA Flood Zone Map (2011)

5.1.7 The area of the property is identified as lying in Flood Zone 2, with the eastern garden area lying in Flood Zone 3b, having a 1 in 25 or greater annual probability of flooding in any year.

5.2 Fluvial Flooding

5.2.1 General

5.2.1.1 The River Ouse, the largest river within York, drains the Yorkshire Dales catchment, formed from the rivers Swale, Ure and Nidd upstream of York.

5.2.1.2 The Ouse has various tributaries within the York boundary including Blue Beck, Holgate Beck, Burdyke, The River Foss and Germany Beck.

5.2.2 Existing Flood Defences

5.2.2.1 Flood defences in York were mainly constructed alongside vulnerable sections of the River Ouse between Rawcliffe Ings and Rowntree Park to protect properties in the area which has suffered during major flooding in the past.

5.2.2.2 The defences comprise a mixture of earthern embankments, brick or stone clad concrete walls and floodgates, incorporating pump stations to deal with excessive flows of water within the watercourses.

5.2.2.3 None of the defences currently 1 in 100 year flood protection in York.

5.2.2.4 A copy of the flood defence map is included In Figure 5 below.

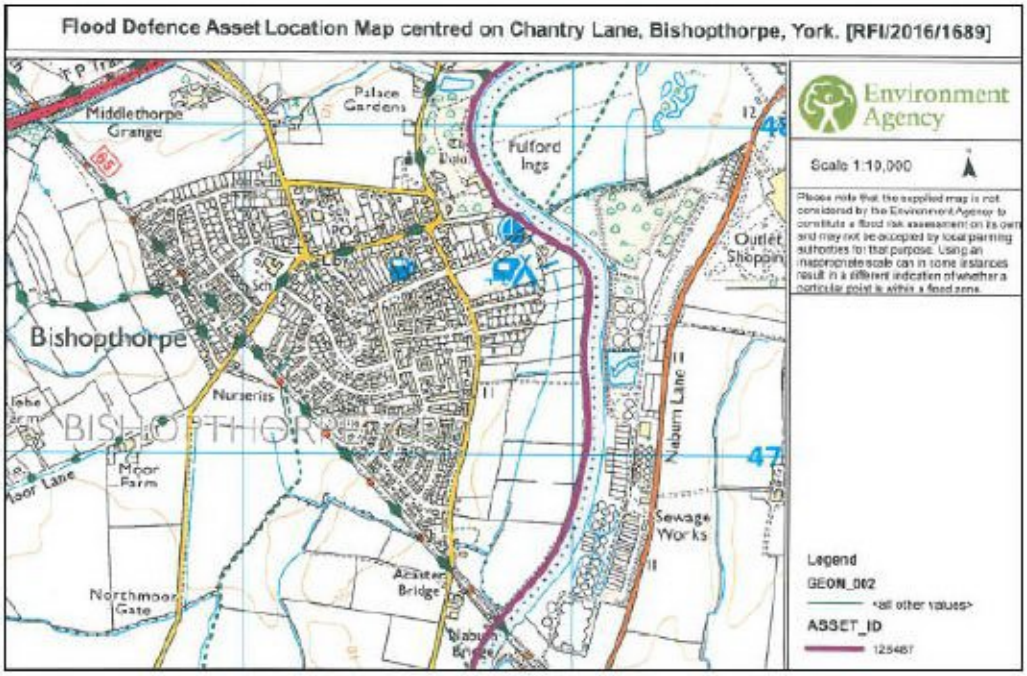


Figure 5: Flood Defence Map

5.2.3 Historical

5.2.3.1 Records of flooding in York go back to 1263 A.D.

5.2.3.2 Recent severe flood events occurred in 1947, 1978, 2000, 2012 and 2015.

5.2.3.3 Various areas of the city were affected and properties flooded.

5.2.3.4 This particular development is shown to have been affected during the by the 2000 flood event.

5.2.3.5 Copies of the maps showing the extent of historical flooding in the area are included in the flood data provided by the Environment Agency included in Appendix C.

5.2.4 Climate Change

5.2.4.1 Technical Guidance to the National Planning Policy Framework (NPPF) provides recommendations for the impact of climate change.

5.2.4.2 Table 5 of the Technical Guidance provides recommended additional allowances for peak rainfall intensity and peak river flow.

5.2.4.3 Peak rainfall intensity over the lifetime of the development is expected to increase by 30%.

5.2.4.4 Peak river flows over the lifetime of the development are expected to increase by 20%.

5.2.5 Flood Risk

5.2.2.1 The map produced by the Environment Agency showing the likely extent of flooding from rivers or the sea is included in Figure 6 below.

Figure 6: Environment Agency Map Showing The Extent of Flooding from Rivers or the Sea dated November 2019

5.2.5.2 The map shows that the risk of flooding varies over the full site area from No Risk in the south western corner of the site to High Risk over the majority of the site area, including the location of the residential property.

5.2.5.3 The area of the new extension is shown to lie within an area considered to be at 'Low Risk' of flooding.

5.2.5.4 Modelled maximum water levels in the River Ouse have been provided by the Environment Agency for various breach and overtopping scenarios.

5.2.5.5 The highest water level, including an allowance for climate change, is predicted at 9.79m OD(N) in the vicinity of the development.

5.2.5.6 A copy of the model information is included in the Environment Agency Flood Data included in Appendix C.

5.2.5.7 The topographic survey which has been undertaken has revealed that the ground floor level of the property is at approximately 10.33m OD(N).

5.2.5.8 It can therefore be seen that the property should not be at risk of flooding during a major flood situation.

5.2.5.9 The floor level of the proposed extension will need to be constructed at the same level as that of the main dwelling in order to maintain level access and consequently the extension should not be at risk.

5.2.5.10 However, as the area of the extension is shown to lie in Flood Zone 2 flood mitigation measures will need to be considered within the design of the extension.

5.2.5.11 Details of such mitigation measures are set out in Section 6 of this report.

5.3 Flood Risk from Open Drainage Ditches

5.3.1 There are no open drainage ditches in the vicinity of the development site which could pose a risk of flooding.

5.4 Flood Risk from Surface Water

5.4.1 A copy of the Environment Agency map showing the potential risk of flooding from surface water is included in Figure 7 below.

Figure 7: Environment Agency Map dated November 2019 Showing the Extent of Flooding from Surface Water

5.4.2 This indicates that the residential property is not considered to be at risk from surface water flooding.

5.5 Flood Risk from Existing Sewers

5.5.1 The residential property is served by drainage which connects to the public sewer network.

5.5.2 There are no known issues with regard to the capacity of the existing drainage system.

5.5.3 The risk to the development from this potential flood source is considered to be low and acceptable.

5.6 Flood Risk from Water Mains

5.6.1 The residential property is served by a water main which connects to the main water supply network.

5.6.2 There are no known issues with any such water mains.

5.6.3 The risk to the development from this potential flood source is considered to be low and acceptable.

5.7 Groundwater Flooding

5.7.1 There are no proposals to create a basement within the property.

5.7.2 The construction works will not involve excavation works and consequently the risk to the development from this potential flood source is considered to be low and acceptable.

5.8 Flooding from Reservoirs, Canals and Other Artificial Sources

5.8.1 Investigation indicate that there are no structures in proximity to the development which are likely to pose an risk from flooding.

5.8.2 A copy of the map produced by the Environment Agency showing potential risk of flooding from Reservoirs is included in Figure 8 below.

Figure 8: Environment Agency Map dated November 2019 Showing the Extent of Flooding from Reservoirs

5.8.3 This shows that the extreme eastern margain of the garden could be affected by reservoir flooding. However the site area in the vicinity of the residential property is not considered to be at risk.

5.8.4 The risk to the development from any such potential flood source is considered to be low and acceptable.

5.9 Flood Risk from proposed Sewers

5.9.1 The new drainage works involved with the new extension to the existing dwelling will be minimal, with minor pipe runs connected into the existing drainage network.

5.9.2 There will consequently be no additional significant risk of flooding due to drainage sources involved with the development.

6.0 FLOOD MITIGATION MEASURES

6.1 For new developments lying within Flood Zone 2, it is recommended that floor levels are raised to a minimum of 300mm above existing ground level, adjacent road level or predicted flood level, whichever is higher.

6.2 With an adjacent road level of 9.16m, an average ground level around the footprint of the building at 10.13m and a predicted flood level of 9.79m, this resultant floor level for a new development would be 10.43m.

6.3 An additional 300mm of flood resilience above floor level should be provided for any new development lying within the flood zone, thus resulting in a flood resilience level of 10.73m OD(N).

6.4 However, as the extension will need to tie into the existing floor for level access, it will be necessary to construct the floor of the extension at 10.33m OD(N).

6.5 Flood resilience will need to be incorporated within the new extension and also any new refurbishment works at ground floor level to an equivalent degree as for a new construction.

6.6 With the existing floor level being at 10.33m OD(N), it will therefore be necessary to incorporate flood resilient measures up to a height of 400mm above floor level to achieve the required level of flood resilience.

6.7 In order to minimise the risk of flood waters entering the building, it is recommended that a proprietary flood barrier system be fitted to the external doorways of the building. However, discussions have taken place with the Conservation Officer due to the historical nature of the building and it has been agreed that barriers will not be installed.

6.8 There should be no new voids created within the external walls of the extension within 400mm of adjacent ground levels, other than doorways, to prevent flood waters entering the extension.

6.10 All new electrical fittings should be raised to a minimum height of 400mm above floor level, with cabling routed at high level, dropping vertically to the fittings.

6.11 Any new partition walls at ground floor level should be constructed of masonry or of metal-stud partitioning to prevent damage occurring in the event that flood waters enter the building.

6.12 Any new plaster boarding should be undertaken with the lower board laid horizontally for ease of replacement.

6.13 Any flood sensitive electrical equipment, electrical appliances and the like should be installed at a minimum height of 400mm above floor level to minimise the risk of damage occurring should flood waters enter the building.

7.0 SUMMARY

7.1 The report has been prepared to assess the flood risk implications for the proposed alterations and extension to a residential property (The Chantry) at Chantry Lane, Bishopthorpe, York which is the subject to a listed building application.

7.2 The area of the extension is shown to lie in Flood Zone 2 (medium probability of flooding) on the Environment Agency maps.

7.3 The proposals are considered to be 'More Vulnerable' development in terms of flood risk vulnerability (Table 3).

7.4 The primary risk to the site is from flooding from the River Ouse resulting from the river defences being breached or overtopped during an extreme flood event.

7.5 The primary focus for flood risk assessment is to protect life, then consideration should be given to buildings, contents, operation and re-use. As the scheme is progressed the design should consider exceedance and routing of flows away from the buildings.

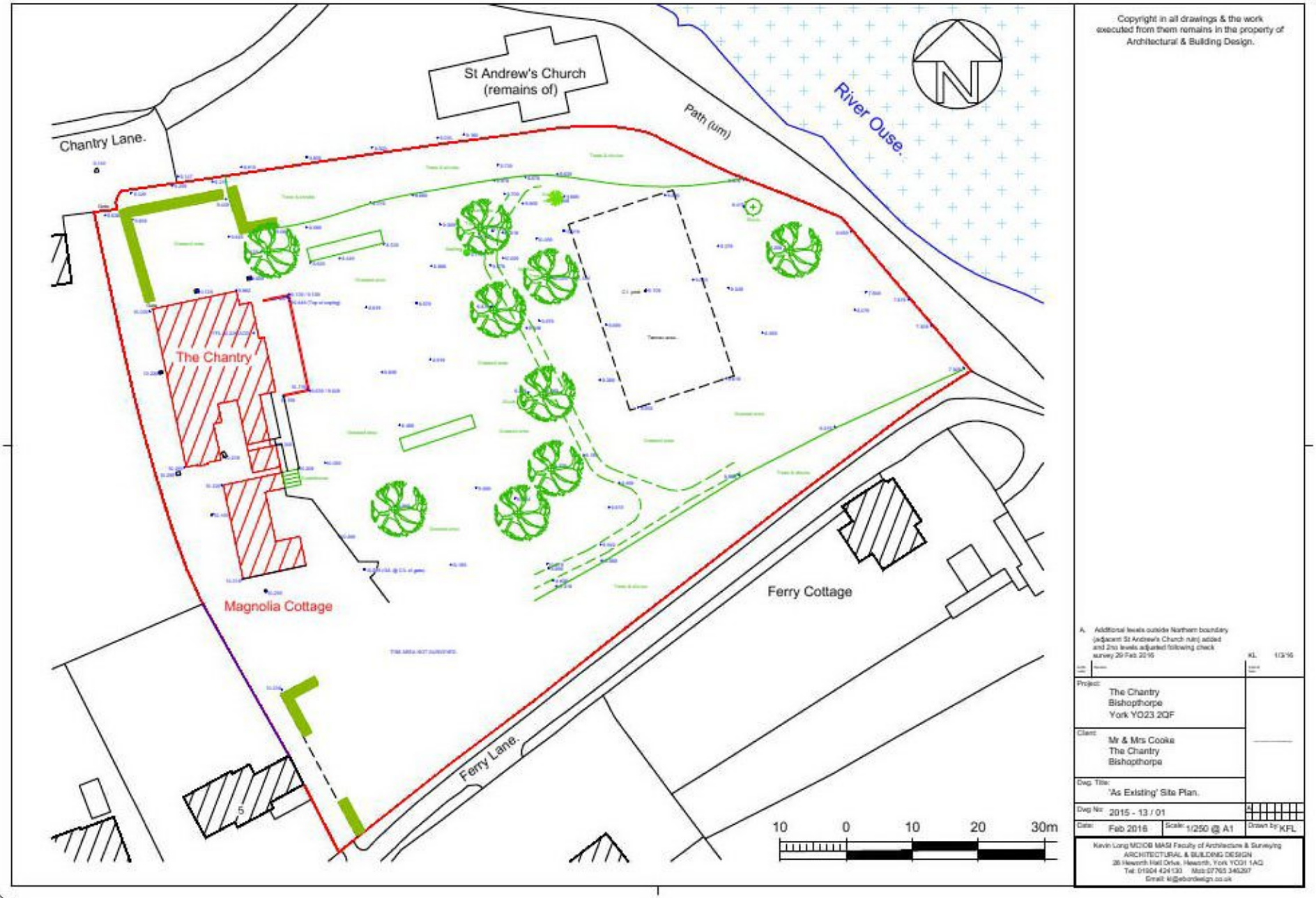
7.6 Mitigation works are proposed which we consider will reduce the risk to the development from flooding down to an acceptable level.

7.7 This report has considered other potential sources of flooding to the site, including groundwater, surface water, existing sewers, water mains and other artificial sources.

7.8 Overall, this report demonstrates that the flood risk to the development is reasonable and acceptable providing the recommended mitigation measures are adopted.

APPENDIX A

Topographic Survey Drawing



A. Additional levels outside Northern boundary (adjacent St Andrew's Church ruin) added and 2no levels adjusted following check survey 29 Feb 2016 — KL 10/3/16

Project:
The Chantry
Bishopthorpe
York YO23 2QF

Client:
Mr & Mrs Cooke
The Chantry
Bishopthorpe

Dwg. Title:
'As Existing' Site Plan.

Dwg No: 2015 - 13 / 01 — A1

Date: Feb 2016 — Scale: 1/250 @ A1 — Drawn by: KFL

Kevin Long MCIOB MASI Faculty of Architecture & Surveying
ARCHITECTURAL & BUILDING DESIGN
26 Haworth Hall Drive, Haworth, York YO31 1AQ
Tel: 01904 424130 Mob:07765 346297
Email: kl@abordesign.co.uk

APPENDIX B

Indicative Layout Drawing

The copyright of this drawing rem
Consultancy Ltd and must not be
written permission of Mitchell Des

Contractors to check all dimensio
before commencing work.

Do Not Scale

Notes

Revisions

TREES MARKED.
24TH SEPTEMBER 2019

Client

MR AND MRS P COOK
THE CHANTRY
CHANTRY LANE
BISHOPTHORPE
YORK

Title

TOPO / SITE PLAN
PROPOSED

Date

AUGUST 2019

Scale

A1 @ 1:200

Drawing No.

TC2 SP TOPO PROP

MITCHELL DESIGN CONSULTANCY LTD

APPENDIX C

Environment Agency Flood Data

Alan Dunn

From: Reilly, Hilary [Hilary.Reilly@environment-agency.gov.uk]
Sent: 09 March 2016 14:16
To: Alan Dunn
Subject: Your Enquiry: RFI/2016/1689 - Product 4 Proposed Development at the Chantry, Chantry Lane, York.
Attachments: Standard_Notice sept 2012.pdf; flood risk & flood consequence assessments.pdf; AssetID128487.pdf; Autumn2000andSept2012FloodEventOutlineMap.pdf; December1978andFebruary1991FloodEventOutlineMap.pdf; DetailedFRAMap.pdf; FloodDefenceAssetLocationMap.pdf; Jan1982, Jan1995 March1968FloodEventOutlineMap.pdf; ModelledFloodLevelNodePointLocationMap.pdf; ModelledFloodLevels.pdf; NPPF TG Climate Change extract.pdf; SurfaceWaterFloodMap.pdf

Our Ref: RFI/2016/1689

Your Ref:

Dear Alan

Provision of Product 4 Proposed Development at the Chantry, Chantry Lane, York.

Thank you for your request of 25th January 2016 to use Environment Agency data, Product 4, in the development of the **4 Proposed Development at the Chantry, Chantry Lane, York.** The information is attached.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments.

Flood Map

We have provided you with a map which shows areas of land that we believe to be at risk of flooding from rivers and does not cover other sources of flooding such as local drainage, surface water or groundwater. These areas do not take into account defences as water can overtop or they can fail in extreme conditions.

- **Flood Zone 2** - This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) in any year

- **Flood Zone 3** - This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year

Bank Top ePlanning Tool

Bank Top ePlanning Tool is required as a result of recently changed statutory consultation requirements for Local Planning Authorities (LPA) as set out in the "Town and Country Planning (General Development Procedure) (Amendment) (No2) (England) Order 2006. Local Authorities have the responsibility to consult the Environment Agency on any new development falling within 20 metres of the top of the bank of a Main River. The Bank Top Tool allows the LPA to determine if new development falls within these areas and triggers the consultation.'

Areas benefiting from flood defences - areas that benefit from the flood defences shown, in the event of a river flood with a 1% (1 in 100) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200) chance of happening each year. If the defences were not there, these areas would flood.

Please see the PDF **'DetailedFRAMap'**.

Model data

According to our records there are Modelled Flood Levels in the vicinity of the site for the River Ouse.

Please see the PDF **'ModelledFloodLevels'.** The PDF **'ModelledFloodLevelNodePointLocationMap'** shows the location where the Levels were taken from.

The Levels are given in Metres above Ordnance Datum
The Flows are given in Cubic Metres per Second

The 101 year Return Period is the 100 year plus an allowance for Climate Change. The PDF **'NPPF TG Climate Change Extract'** gives further details of how to interpret Climate Change Data.

Selby and Cawood Scenario
Selby and Cawood are located on the lower reaches of the river system and there are embankments for several miles both upstream and downstream of these locations.

The presence of the embankments mean that flood water is contained within the river channel and is higher than it would be if the defences weren't there.
If we were to map the flood extent at Selby and Cawood using the standard 'without defences' situation that we apply elsewhere, we would find that our flood map would not best reflect what would happen in a real flood at these locations i.e. the depth and extent of the flood water would not be realistic.

Therefore, we have created additional scenarios, that keep the upstream and downstream embankments in place and removes the embankments through Selby and Cawood resulting in the "Selby scenario" and the "Cawood scenario".

Updated Flood Map for Surface Water

This shows areas where surface water only would be expected to flow or pond in England & Wales. It is shown on our website as the Risk of Flooding from Surface Water map. It supersedes earlier Environment Agency national scale maps, the Areas Susceptible to Surface Water Flooding (2008/9) and Flood Map for Surface Water (2010). All land in England and Wales will be within 'one' of a possible 'four' categories. The four categories shown on the map are:

1. **High** - This area has a chance of flooding greater than 1 in 30 in any given year (annual probability of flooding 3.3%)
2. **Medium** - This area has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%) in any given year
3. **Low** - This area has a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%) in any given year
4. **Very low** - This area has a chance of flooding of less than 1 in 1000 (0.1%) in any given year

Historic information

According to our records there is some Flood History for the site. The PDFs **'Autumn2000andSept2012FloodEventOutlineMap', 'December1978andFebruary1991FloodEventOutlineMap'** and **'Jan1982, Jan1995 March1968FloodEventOutlineMap'** show the extent of the flooding, The table below gives further details.

odEventGroupCode	FloodEventOutlineName	FloodEventOutlineComments	StartDate	EndDate
2AUTM2000	Autumn 2000 Event	Dates shown are for the full event - not for individual flood outlines.	30-Oct-00	15-Nov-00
2DEC1978	1978 Flood Event	Digitised from 1:50000 scale map - differs from	01-Dec-	31-Dec-

		extent mapped at 1:10000 scale	78	78
2FEB1991	1991 Flood Event	Dates shown are for the full event - not for individual flood outlines.	21-Feb-91	27-Feb-91
2JAN1982	January 1982 Event	Dates shown are for the full event - not for individual flood outlines.	03-Jan-82	16-Jan-82
2JAN1995	1995 Flood Event	Dates shown are for the full event - not for individual flood outlines.	28-Jan-95	04-Feb-95
2MAR1968	March 1968 Flood Event		24-Mar-68	26-Mar-68

Asset information

Please see the PDF **'Flood Defence Asset Location Map'** for the location of the nearest Flood Defences. Further information regarding the defences is given in the PDF' **'AssetID28487**.

Risk of Flooding – Environment Agency Defences
The risk of flooding is reduced by the presence of flood defences that we maintain, but there is still a residual risk of flooding if these were to breach or be overtopped by a flood greater than that for which they were designed.

Risk of Flooding – Privately Maintained Defences
We do not maintain any of those defences. However we undertake regular risk based visual inspections. We do not hold design levels and have no height information on these defences or structures.

Asset Condition Ratings
The performance of a flood defence asset is recorded as the condition of the asset. Our asset inspectors subjectively assess the conditions of assets (during visual inspection site visits) with reference to a national standard template. Each asset is given a rating between one and five with one being very good condition and five being very poor. A condition rating of 3, or 'fair' is the minimal acceptable standard for a critical asset, such as a defence wall that protects properties. We are striving to improve all assets below 'fair' to an acceptable standard.

Asset inspections are done on average every six months, although some critical assets are assessed on a more regular basis. It is possible that adjacent assets are inspected on different dates, which may result in two assets of a similar state of repair having different condition ratings.

Condition ratings of assets may also be affected by the time of year the surveys are conducted, as vegetation may obscure the asset in the summer months, or accessibility may be an issue during winter months. These factors would not usually affect the recorded condition rating of an asset unless the asset is on a borderline between two ratings.

This information is provided subject to the enclosed *notice*, which you should read.

If you have any queries or would like to discuss the content of this letter further please contact us on the telephone number below.

We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive:

http://www.smartsurvey.co.uk/s/EnvironmentAgencyCustomerSurvey/?a=Y

Yours sincerely,

Hilary Reilly

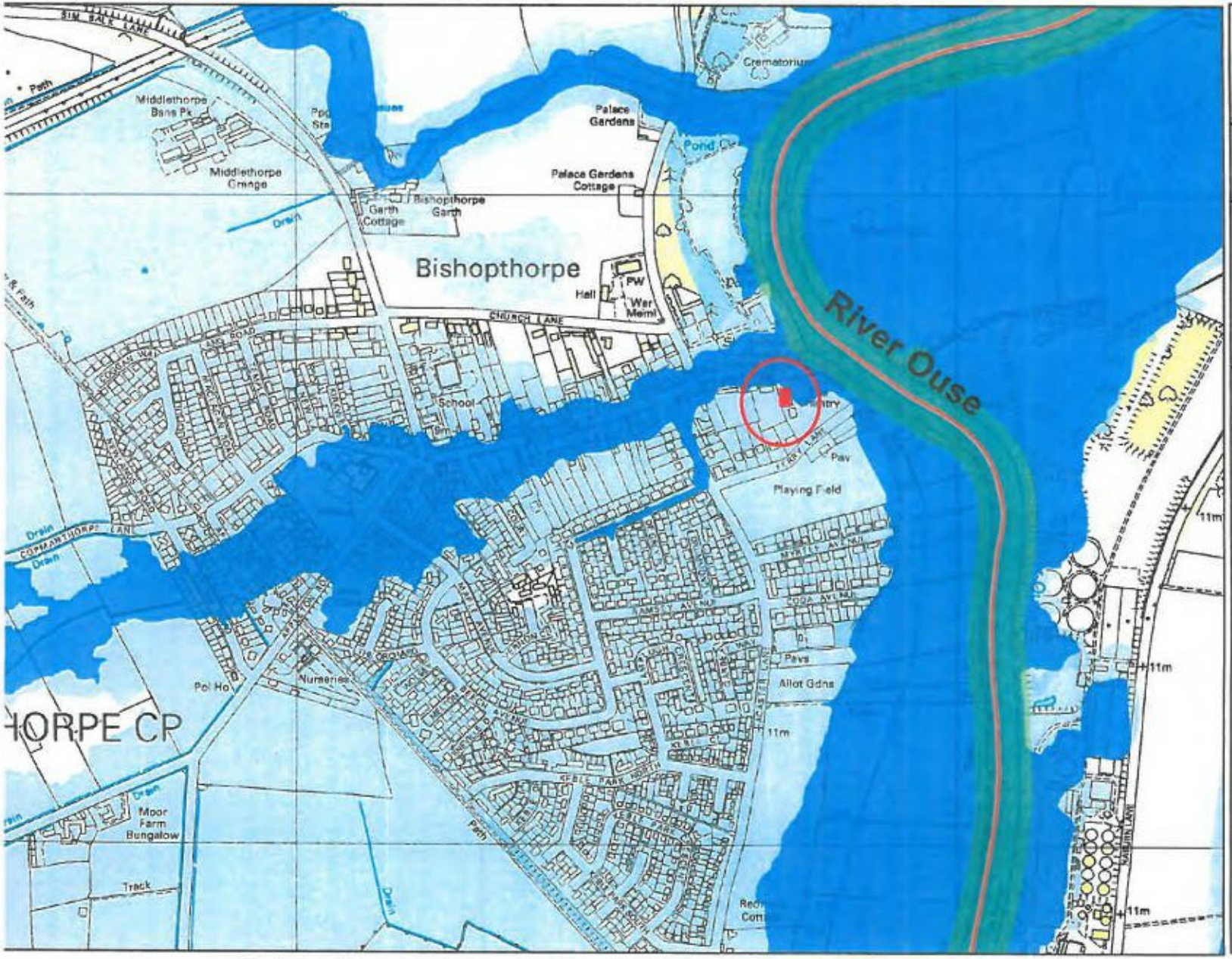
Customers and Engagement Team, Yorkshire Area
0113 819 6364

*** Environment Agency, Lateral, 8 City Walk, Leeds. LS11 9AT**
8 hilary.reilly@environment-agency.gov.uk

P Please consider the Environment before printing this email.

DO YOU KNOW WHAT TO DO? FLOODS DESTROY BE PREPARED

Detailed FRA map centred on Chantry Lane, Bishopthorpe, York. [RFI/2016/1689]



Environment Agency

Scale 1:10,000

N

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Legend

- Flood Defences
- Bank Top E-Planning Tool
- Areas Benefiting
- Flood Zone 3
- Flood Zone 2
- Main River

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Figure13d

Key

Flood defences

Flooded properties/gardens

STRATEGIC FLOOD RISK ASSESSMENT - 2011 UPDATE

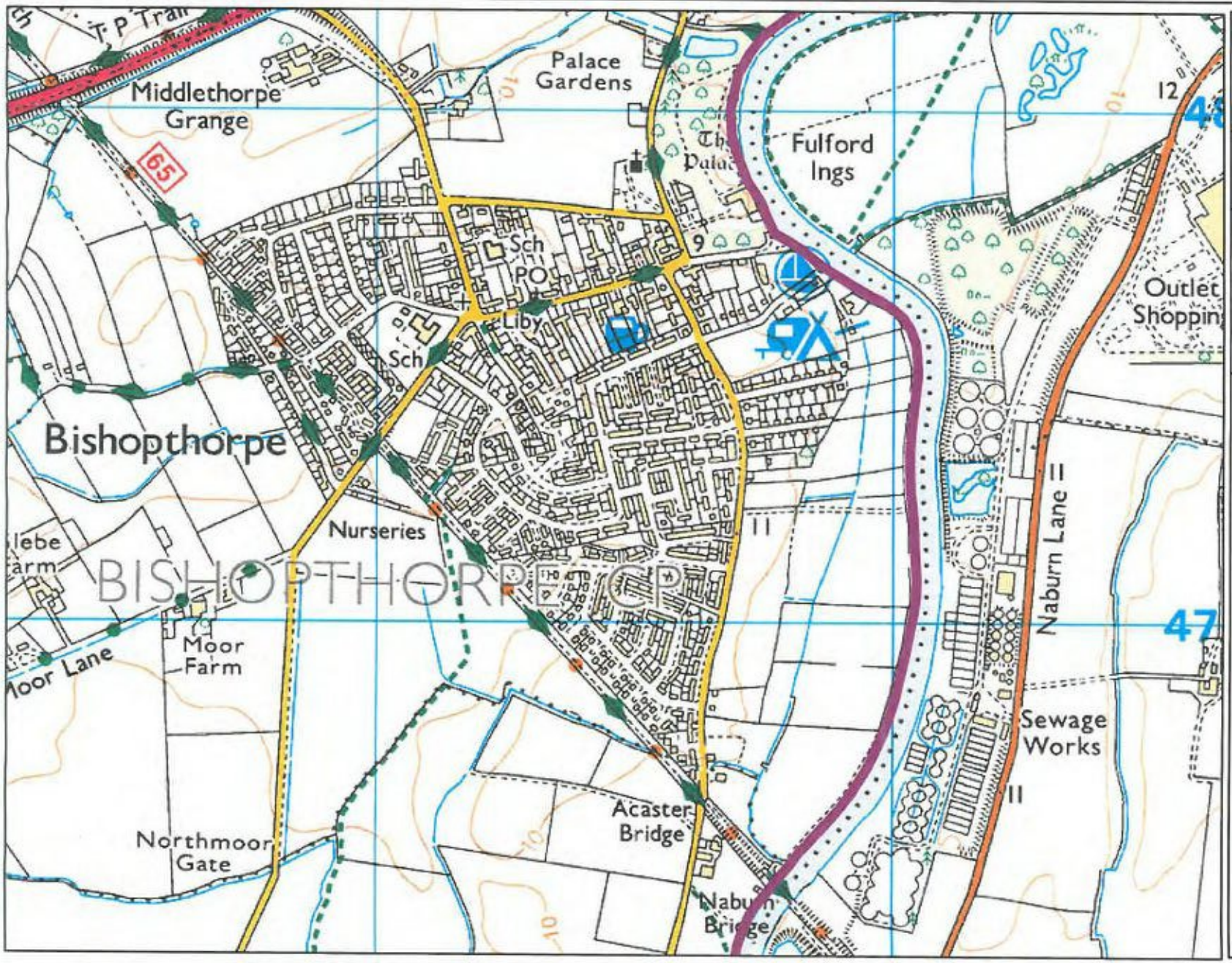
Figure 13d: Flooded Domestic Properties in 2000
BISHOPTHORPE

Drainage | A3

Feasibility | DRowntree | A

Drawing No. 9659-13d

Flood Defence Asset Location Map centred on Chantry Lane, Bishopthorpe, York. [RFI/2016/1689]



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Legend

GEOM_002

<all other values>

ASSET_ID

128487

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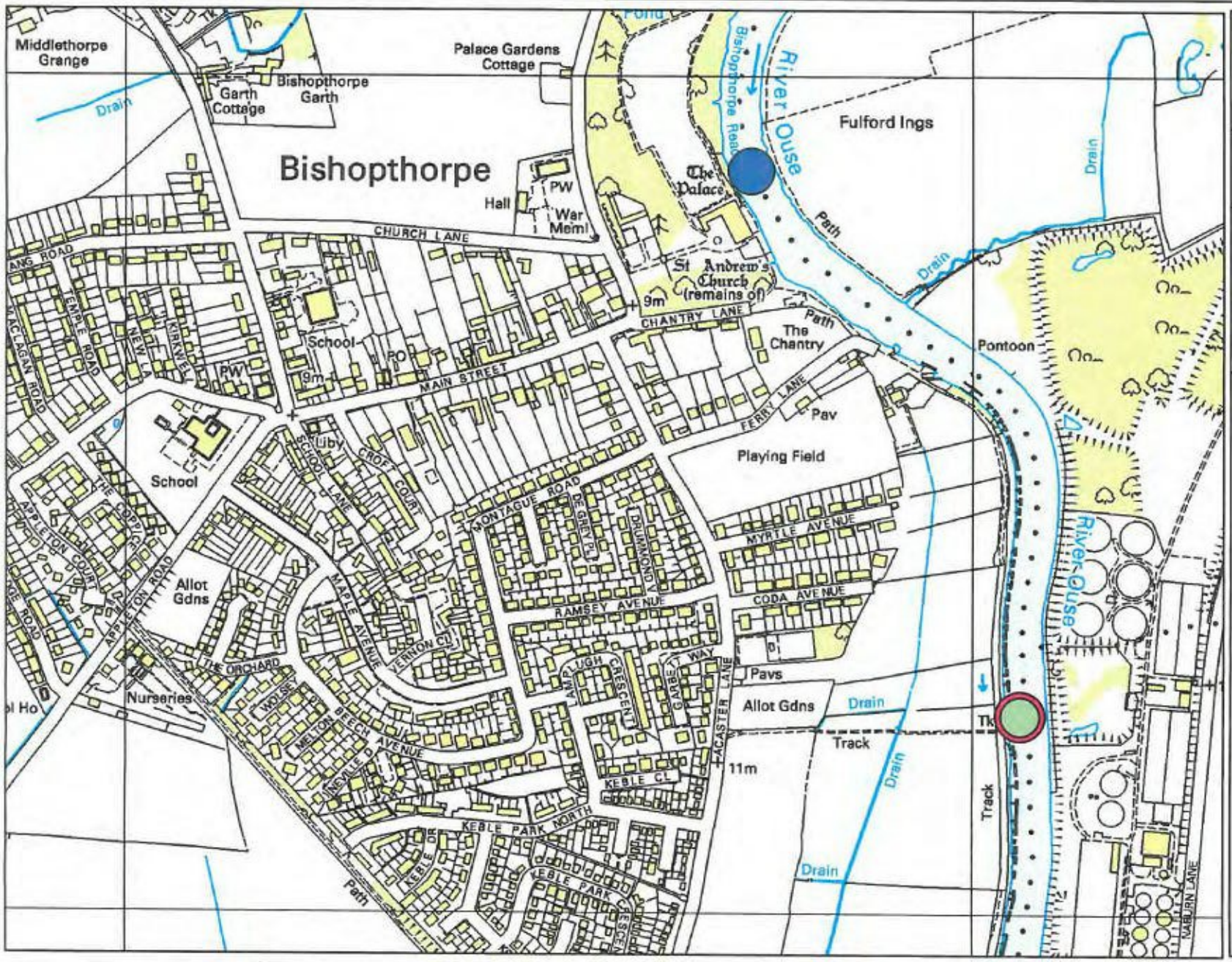
Modelled Flood Level Node Point Location Map centred on Chantry Lane, Bishopthorpe, York. [RFI/2016/1689]



Environment Agency

Scale 1:10,000

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Legend

NodePoint

<all other values>

NODEPOINTN

- 12213_MODEL_Ouse094
- 12213_MODEL_Ouse097
- 12213_MODEL_Ouse098

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MAX WATER LEVELS MAOD (WITHOUT DEFENCES)

SCENARIO

Node label	x	y	level 5	flow 5	level 10	flow 10	level 25	flow 25	level 50	flow 50	level 75	flow 75	level 100	flow 100	level 101	flow 101	level 200	flow 200	level 1000	flow 1000
12213_MODEL_Ouse094	459738.72	447885.78	8.58	386.47	8.74	379.64	8.94	385.85	9.11	389.71	9.20	391.35	9.28	396.73	9.65	400.21	9.41	395.55	10.08	457.78
12213_MODEL_Ouse097	460056.28	447235.75	8.47	370.96	8.60	388.91	8.79	424.26	8.94	453.57	9.03	468.38	9.10	487.36	9.50	511.95	9.23	494.72	9.97	519.95
12213_MODEL_Ouse098	460056.28	447235.75	8.47	371.20	8.60	389.14	8.79	424.52	8.94	453.86	9.03	468.68	9.10	487.60	9.50	512.31	9.23	495.06	9.97	520.33

MAX WATER LEVELS MAOD (WITH DEFENCES) SCENARIO

Node label	x	y	level 5	flow 5	level 10	flow 10	level 25	flow 25	level 50	flow 50	level 75	flow 75	level 100	flow 100	level 101	flow 101	level 200	flow 200	level 1000	flow 1000
12213_MODEL_Ouse094	459738.72	447885.78	8.72	344.9	8.91	349.0	9.16	351.1	9.35	355.3	9.43	357.7	9.48	359.0	9.73	374.2	9.57	361.2	10.22	461.1
12213_MODEL_Ouse097	460056.28	447235.75	8.62	344.6	8.80	375.0	9.03	415.5	9.22	444.5	9.29	444.5	9.35	450.2	9.61	472.1	9.44	454.4	10.12	511.5
12213_MODEL_Ouse098	460056.28	447235.75	8.62	344.8	8.80	375.2	9.03	415.7	9.22	444.8	9.29	444.8	9.35	450.5	9.61	472.5	9.44	454.7	10.12	511.9

SELBY

SCENARIO

Node label	x	y	level 5	flow 5	level 10	flow 10	level 25	flow 25	level 50	flow 50	level 75	flow 75	level 100	flow 100	level 101	flow 101	level 200	flow 200	level 1000	flow 1000
12213_MODEL_Ouse094	459738.72	447885.78	8.72	345.11	8.90	348.68	9.16	351.33	9.36	355.59	9.43	357.89	9.48	359.74	9.79	371.66	9.57	361.40	10.23	461.91
12213_MODEL_Ouse097	460056.28	447235.75	8.62	344.77	8.78	373.95	9.03	416.11	9.21	439.52	9.29	456.47	9.35	452.40	9.68	464.42	9.44	460.24	10.13	512.38
12213_MODEL_Ouse098	460056.28	447235.75	8.62	344.98	8.78	374.18	9.03	416.38	9.21	439.82	9.29	456.78	9.35	452.71	9.68	464.73	9.44	460.54	10.13	512.77

			CAWOOD SCENARIO															
			level	flow	level	flow	level	flow	level	flow	level	flow	level	flow	level	flow	level	flow
Node label	x	y	5	5	10	10	25	25	50	50	75	75	100	100	101	101	200	200	1000	1000
12213_MODEL_Ouse094	459738.72	447885.78	8.71	345.21	8.89	346.54	9.15	351.38	9.35	355.72	9.43	361.13	9.46	359.27	9.77	372.24	9.55	361.47	10.21	460.59
12213_MODEL_Ouse097	460056.28	447235.75	8.61	345.26	8.77	375.46	9.02	415.78	9.20	450.36	9.28	466.98	9.32	461.46	9.66	462.68	9.42	463.67	10.11	513.09
12213_MODEL_Ouse098	460056.28	447235.75	8.61	345.47	8.77	375.70	9.02	416.05	9.20	450.65	9.28	467.29	9.32	461.76	9.66	463.03	9.42	463.99	10.11	513.48

Taking climate change into account

11. Global sea level will continue to rise, depending on greenhouse gas emissions and the sensitivity of the climate system. The relative sea level rise in England also depends on the local vertical movement of the land, which is generally falling in the south-east and rising in the north and west. In preparing a Strategic Flood Risk Assessment or a site-specific flood risk assessment, the allowances for the rates of relative sea level rise shown in table 4 should be used as a starting point for considering flooding from the sea, along with the sensitivity ranges for wave height and wind speed in table 5.

Table 4: Recommended contingency allowances for net sea level rises

	Net sea level rise (mm per year) relative to 1990			
	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Notes to table 4:

a. For deriving sea levels up to 2025, the 4mm per year, 3mm per year and 2.5mm per year rates (covering the three geographical groups respectively), should be applied back to the 1990 base sea level year. From 2026 to 2055, the increase in sea level in this period is derived by adding the number of years on from 2025 (to 2055), multiplied by the respective rate shown in the table. Subsequent time periods 2056 to 2085 and 2086 to 2115 are treated similarly.

b. Refer to Department for Environment, Food and Rural Affairs *FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts*, October 2006, for details of the derivation of this table. In particular, Annex A1 of this Note shows examples of how to calculate sea level rise.

c. Vertical movement of the land is incorporated in the table and does not need to be calculated separately.

12. The rise in sea level will change the frequency of occurrence of high water levels relative to today's sea levels, assuming no change in storminess. There may also be secondary impacts such as changes in wave heights due to increased water depths, as well as possible changes in the frequency, duration and severity of storm events. A 10 per cent sensitivity allowance should be added to offshore wind speeds and wave heights by the 2080s.

13. In making an assessment of the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment, the sensitivity ranges in table 5 may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities, river flow, wave height and wind speed.

Table 5: Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	*+5%*	*+10%*	*+20%*	*+30%*
Peak river flow	*+10%*	*+20%*		
Offshore wind speed	*+5%*		*+10%*	
Extreme wave height	*+5%*		*+10%*	

Notes to table 5:

a. Refer to Department for Environment, Food and Rural Affairs *FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts*, October 2006, for details of the derivation of this table.

b. For deriving peak rainfall, for example, between 2025 and 2055 multiply the rainfall measurement (in mm per hour) by 10 per cent and between 2055 and 2085 multiply the rainfall measurement by 20 per cent. So, if there is a 10mm per hour event, for the 2025 to 2055 period this would equate to 11mm per hour; and for the 2055 to 2085 period, this would equate to 12mm per hour. Other parameters in table 5 are treated similarly.

14. Sensitivity testing of the flood map produced by the Environment Agency, using the 20 per cent from 2025 to 2115 allowance for peak flows, suggests that changes in the extent of inundation are negligible in well-defined floodplains, but can be dramatic in very flat areas. However, changes in the depth of flooding under the same allowance will reduce the return period of a given flood. This

means that a site currently located within a lower risk zone (e.g. Zone 2 in table 1) could in future be re-classified as lying within a higher risk zone (e.g. Zone 3a in table 1). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding (see table 2). It will therefore be important that developers, their advisors and local authorities refer to the current flood map and the Strategic Flood Risk Assessment when preparing and considering proposals.

15. Flooding in estuaries may result from the combined effects of high river flows and high sea surges. When taking account of impacts of climate change in flood risk assessments covering tidal estuaries, it will be necessary for the allowances for sea level rise in table 4 and the allowances for peak flow, wave height and wind speed in table 5 to be combined.[11]

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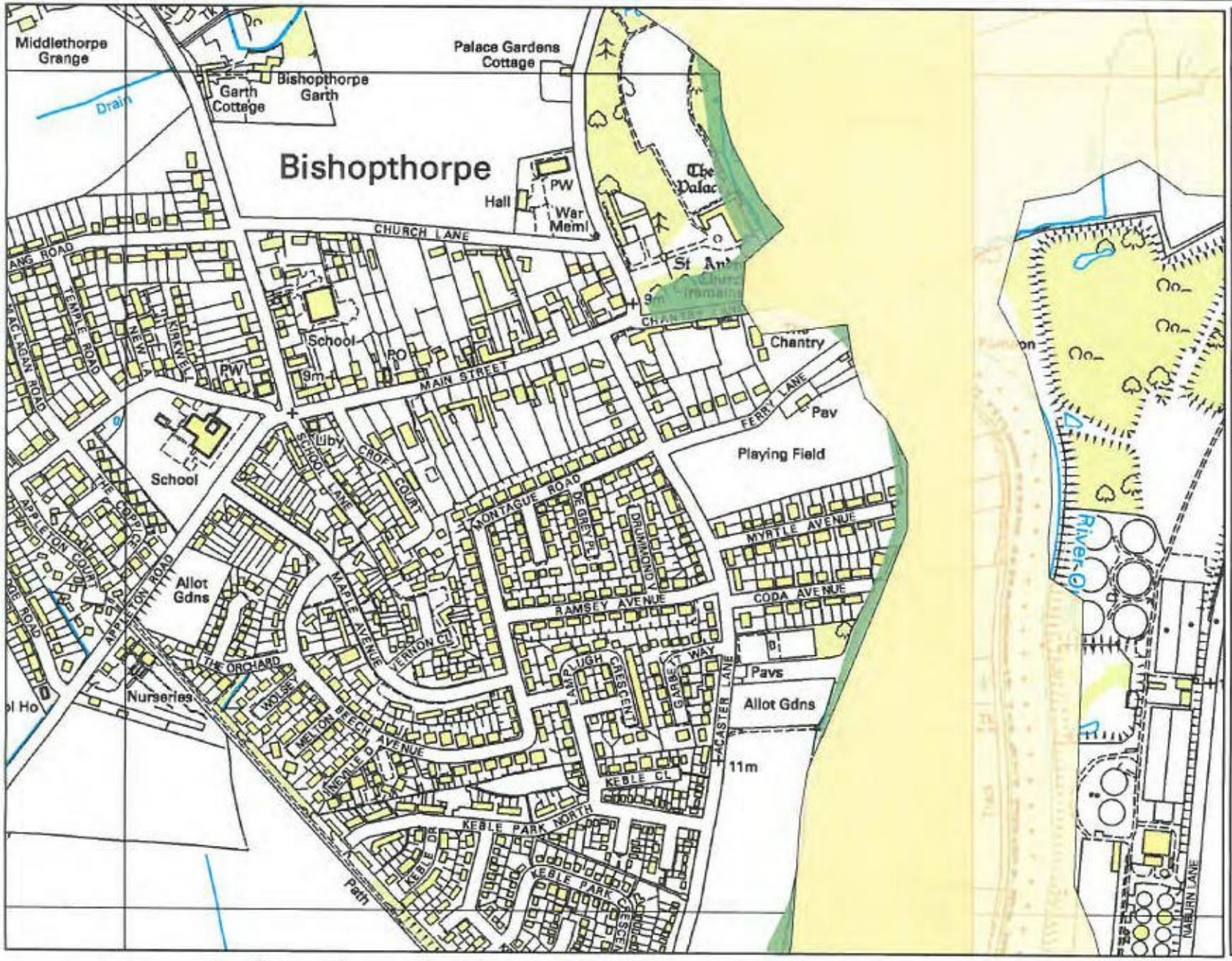
[11] Refer to Defra *FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts*, October 2006. Annex A2 gives details of joint probability analysis. www.defra.gov.uk/environ/fcd/pubs/pagn/climatechangeupdate.pdf

February 1991 and December 1978 Flood Event Outline Map centred on Chantry Lane, Bishopthorpe, York. [RFI/2016/1689]



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Scale 1:10,000

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Please note that the supplied map is not considered by the Environment Agency to constitute a flood risk assessment on its own and may not be accepted by local planning authorities for that purpose. Using an inappropriate scale can in some instances result in a different indication of whether a particular point is within a flood zone.

Legend

- FEO_122DEC1978
- FEO_122FEB1991

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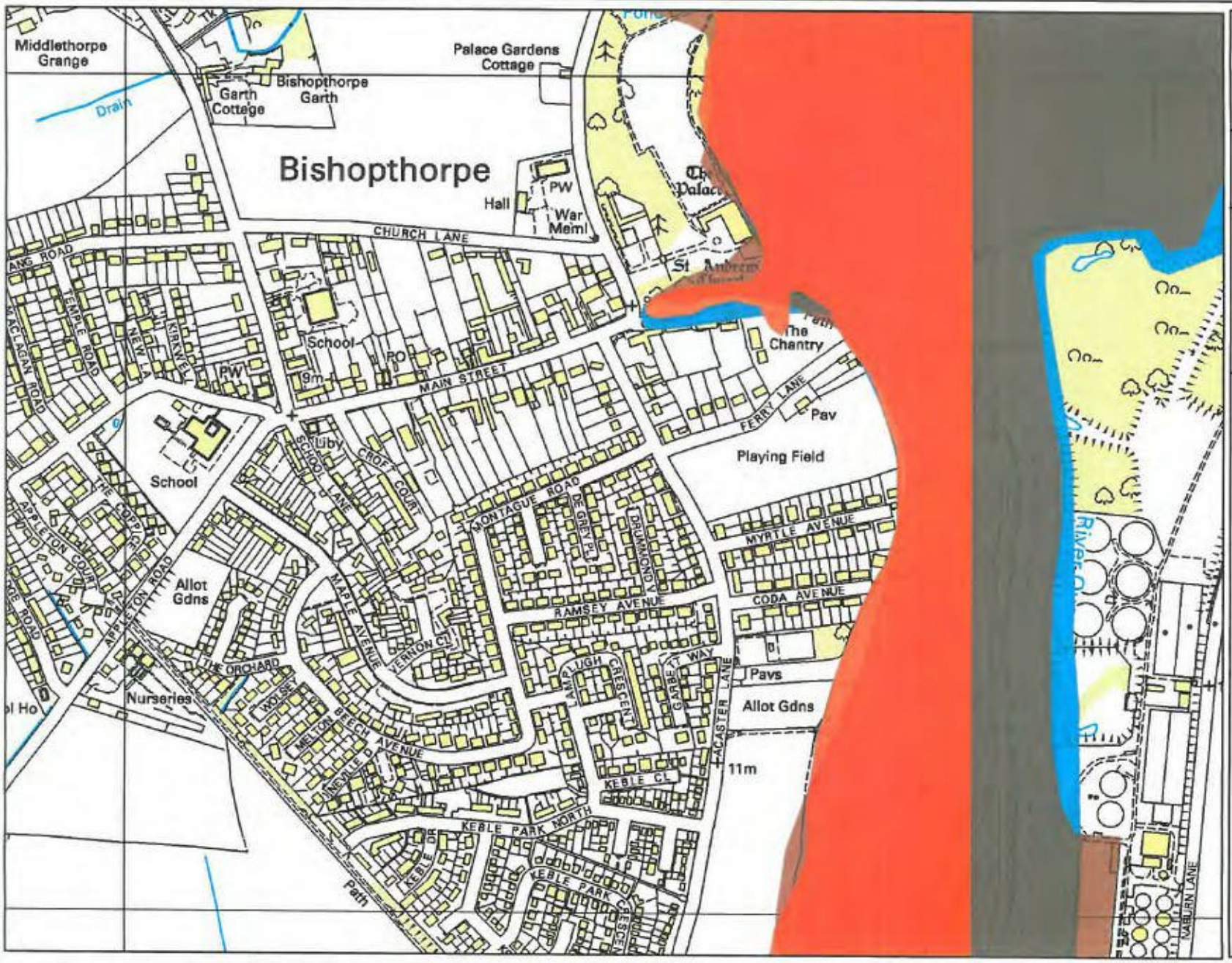
January 1982, January 1995, March 1968 Flood Event Outline Map centred on Chantry Lane, Bishopthorpe, York. [RFI/2016/1689]



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Legend

- FEO_122JAN1982
- FEO_122JAN1995
- FEO_122MAR1968

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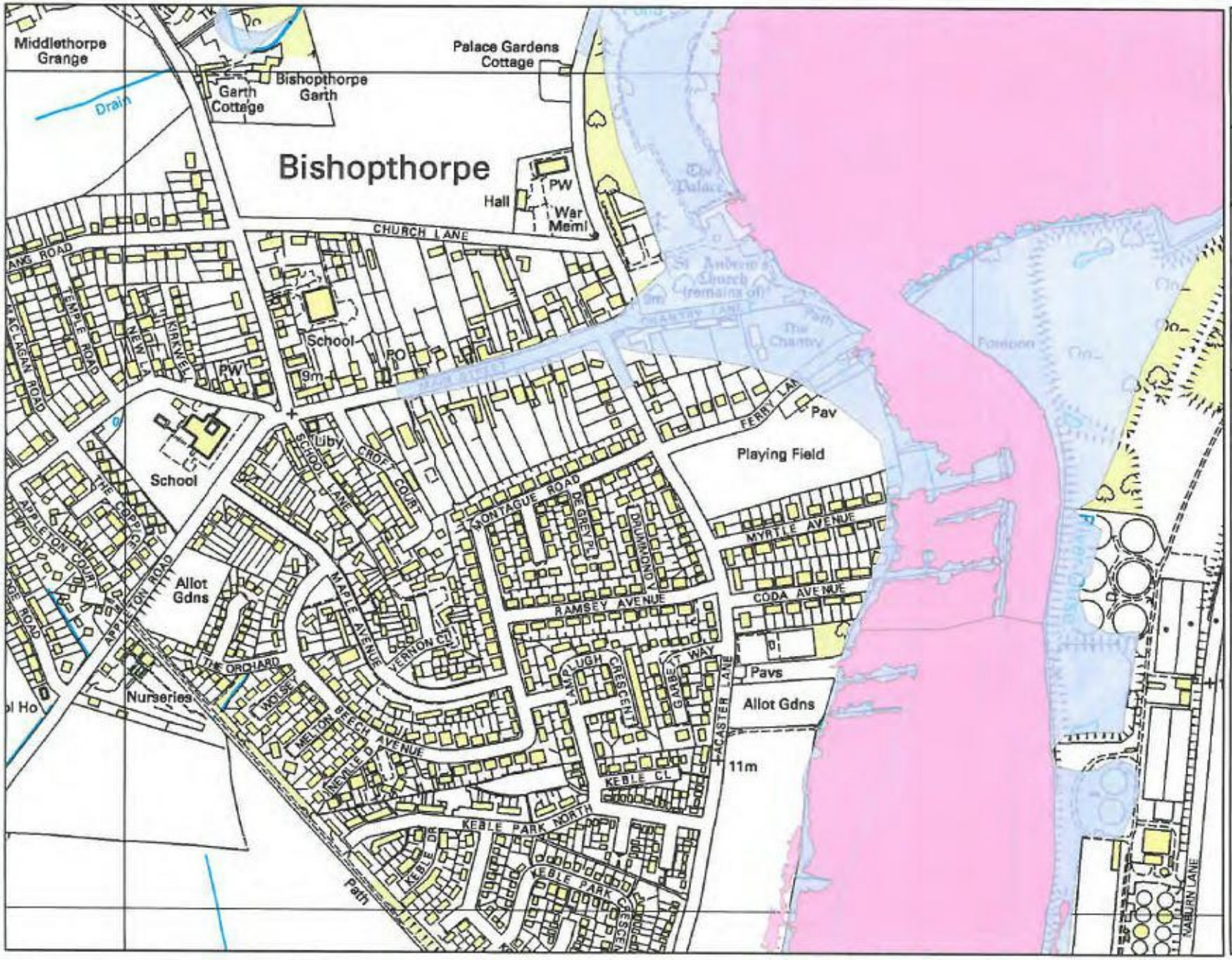
Autumn 2000 and September 2012 Flood Event Outline Map centred on Chantry Lane, Bishopthorpe, York. [RFI/2016/1689]



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Legend

- FEO_122SEPT2012
- FEO_122AUTM2000

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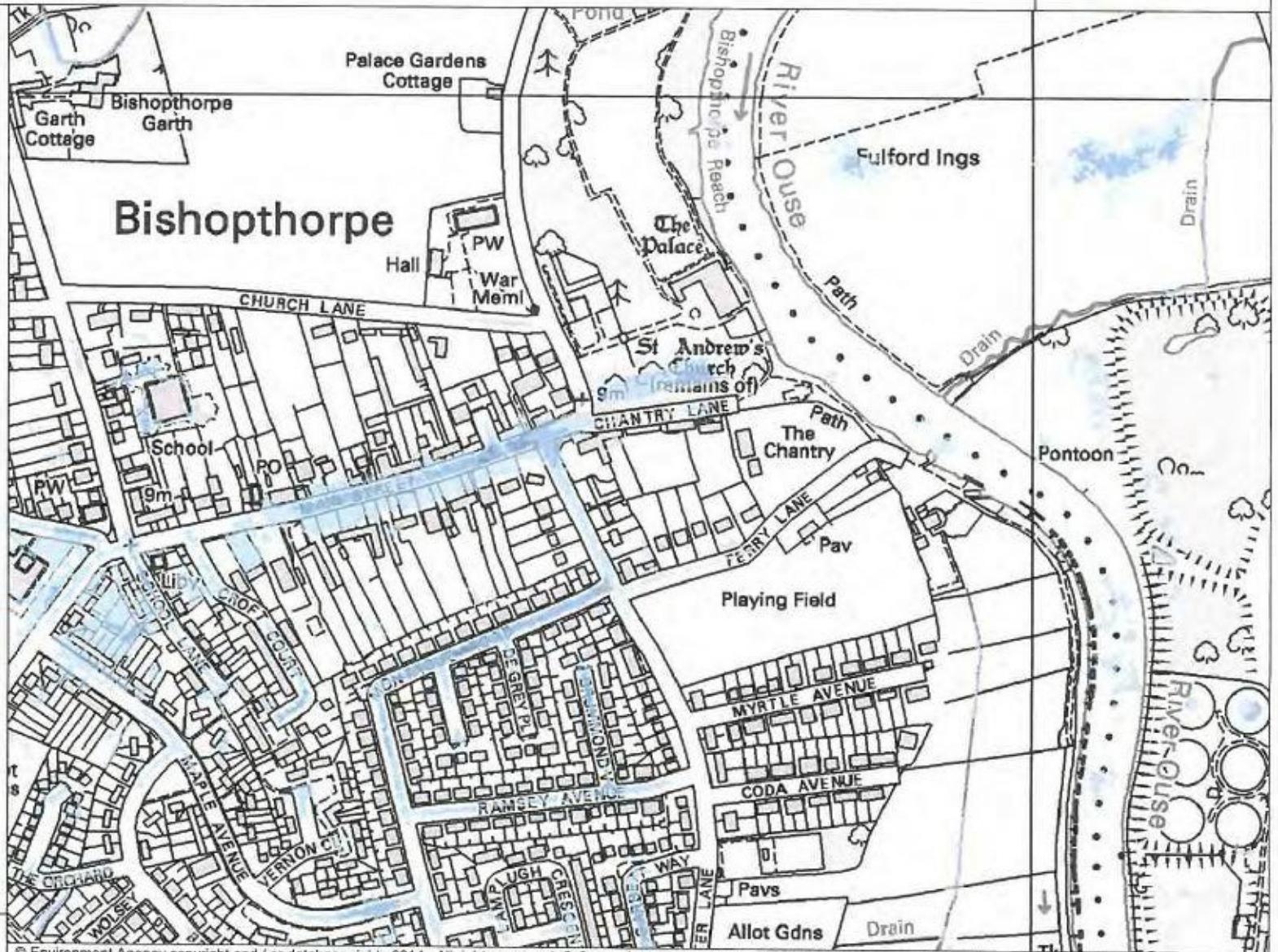
Easimap

Environment Agency

Legend

- uFMfSW (2013) – 1 in 30 chance rain
- uFMfSW (2013) – 1 in 100 chance rain
- uFMfSW (2013) – 1 in 1000 chance rain



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N W E S

Alan Wood & Partners

Hull Office
(Registered Office)
341 Beverley Road
Hull
HU5 1LD
Telephone
01482.442138

Leeds Office
Suite 73
Brabazon House
Turnberry Park
Leeds LS27 7LE
Telephone
0113 531.1098

Lincoln Office
Unit E
The Quays
Burton Waters
Lincoln LN1 2XG
Telephone
01522.300210

London Office
Henry Wood House
2 Riding House Street
London
W1W 7FA
Telephone
020.71860761

Scarborough Office
Kingsley House
7 Pickering Road
West Ayton
Scarborough YO13 9JE
Telephone
01723.865484

Sheffield Office
Hallamshire House
Meadow Court
Hayland Street
Sheffield S9 1BY
Telephone
01142.440077

York Office
Omega 2
Monks Cross Drive
York
YO32 9GZ
Telephone
01904 611594

Email
eng@alanwood.co.uk

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Land Remediation Advice
Land Surveying
Marine Works
Mining Investigations
Modular Design
Parametric Modelling
Party Wall Surveyors
Planning Applications
Project Managers
Renewable Energy
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Road & Drainage Design
Site Investigations
Site Supervision
Structural Engineering
Sulphate Attack Specialists
Temporary Works
Topographic & Measured Surveys
Traffic Assessments

Quality Assurance Accreditation
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Certificate no. GB.02/07

Environmental Accreditation
ISO 14001Registered firm
Certificate no. GB.09/277b


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