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ENVIRONMENTAL CONSULTING , SOFTWARE & TRAINING

FLOOD RISK ASSESSMENT

Site Address

4 Princess Louise Road

Blyth

NE24 2EH

Client

H. Bhaker

Renovate Homes & Property Management Ltd.

Date

16/08/2023

1 Document Control

FLOOD RISK ASSESSMENT	
Site Address:	4 Princess Louise Road Blyth NE24 2EH
National Grid Reference:	431538, 581200
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Version No:	1.0
Prepared for:	H. Bhaker Renovate Homes & Property Management Ltd.
Date:	16/08/2023
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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
LPA	Northumberland 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	4 Princess Louise Road, Blyth, NE24 2EH Grid Reference: 431538, 581200
Area	184m^2
Proposed Development	The conversion of residential accommodation containing seven bedsits into No.5 one and two bed flats.
Flood Zone	The site is located in Flood Zone 2.
Topography	The ground level at the site ranges from 3.26mAOD (west) to 3.59mAOD (east).
Main Sources of Flooding	The main sources of flooding are considered to be from the River Blyth and the North Sea, located 0.64km and 1km east of the site respectively.
Flood Defences	The site benefits from High Ground situated on the banks of the River Blyth.
Records of Historic Flooding	The EA Historic Flood Map identifies 2 incidents in 1964 and 2008. The sources were not specified but they did not impact the site.
Fluvial (River) and Tidal (Sea) Flood Risk	Medium – During the 0.5% AEP (2125) higher central allowance, the tidal flood depth reaches 0.81m to a level of 4.55mAOD. Given the upper end allowance this flood depth reaches 0.83m to a level of 4.57mAOD.
Pluvial (Surface Water) Flood Risk	Low – the site is unaffected during both the 1 in 30-year and 1 in 100-year pluvial events. During the 1 in 1000-year event the courtyard and small area of the residential dwelling are impacted to between 300-600mm.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Very Low – No artificial sources have been identified.
Groundwater Flood Risk	Low – according to the BGS, the site has limited potential for groundwater flooding; the groundwater table depth is approximately less than 3mbgl for at least part of the year.
Development Impacts on Local Flood Risk	The development is internal and therefore will not increase the site impermeable area. As such it will have no adverse impact on local flood risk.
Proposed Flood Risk Mitigation Measures	• Finished floor levels will remain as existing at 3.74mAOD; • Raising finished floor levels higher is not possible due to ceiling heights; • A combination of the water entry and water exit strategy will be used; • 1.2m Aqua stop flood barriers will be introduced and stored nearby each ground floor entrance, which provide a protection against a flood level of up to 4.94mAOD;

SECTION	SUMMARY
	• The structural integrity of the ground floor will be reviewed and improved as required; • Occupants will sign up for EA Emergency Flood Warning Direct Service; • Detailed Flood Emergency Plans will be provided too all residents; • Safe egress to Flood Zone 1 is easily accessible by exiting the front door onto Princess Louise Road; • Safe refuge is available on 1st floor for flats 1, 2 and 3 which can be accessed by the internal stair cases; • Emergency access onto the roof will be provided;
Surface Water Management (SuDS)	SuDS would reduce current surface water runoff rates however given the small size of the site (184m^2), there is limited potential for implementation. Consideration should be given to rainwater harvesting and permeable paving where possible.
Conclusions	Based on the information reviewed it is considered that overall flood risk to the proposed development is medium. However, the proposal would provide a significant betterment in terms of flood risk by improving the resistance and resilience measures of the building as part of the development scheme. As such we believe the application should be view in a positive manner.

5 Introduction

STM Environmental Consultants Limited (STM) were appointed by H. Bhaker of Renovate Homes & Property Management Ltd. (Client) to provide a Flood Risk Assessment (FRA) at a site located at 4 Princess Louise Road, Blyth, NE24 2EH.

6 Development Proposal

The FRA is required to support a planning application for the conversion of residential accommodation containing seven bedsits into No. 5 (1 and 2 bedroom) flats.

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 – Northumberland County Council

Policy WAT 3 Flooding

1. In assessing development proposals the potential for both on and off-site flood risk from all potential sources will be measured, taking into account the policy approach contained within: the relevant Catchment Flood Management Plan; the Northumberland Local Flood Risk Management Strategy; the Northumberland Outline Water Cycle Study; and the findings of Drainage Area Studies.

2. Development proposals will be required to demonstrate how they will minimise flood risk to people, property and infrastructure from all potential sources by:

a. Avoiding inappropriate development in areas at risk of flooding and directing the development away from areas at highest risk. Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere. The Sequential Test and, if necessary, the Exceptions Test, will be applied (subject to minor development and change of use exemptions) in accordance with national policy and the Northumberland Strategic Flood Risk Assessment. Site Specific Flood Risk Assessments will be required for:

i. All development in Flood Zones 2 and 3;

ii. In Flood Zone 1, for 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;
- land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

b. For developments where (2a) above applies, it will be ensured that:

i. The impact of the development proposal on existing sewerage infrastructure and flood risk management infrastructure is assessed, including whether there is a need to reinforce such infrastructure or provide new infrastructure in consultation with the relevant water authority;

ii. The development takes into account climate change and the vulnerability of its users;

iii. The site is configured so that the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

iv. The development is made resistant and resilient, in terms of its layout, mix and/or building design, in accordance with national policy and the findings and recommendations of the Northumberland Strategic Flood Risk Assessment; 11. Water Environment The Local Plan should be read as a whole. Proposals will be judged against all relevant policies. 225 Northumberland Local Plan (Adopted March 2022)

v. Sustainable drainage systems are incorporated as appropriate, in accordance with Policy WAT 4;

vi. Any residual flood risk can be safely managed;

vii. Safe access and escape routes are incorporated, where appropriate, as part of an agreed emergency plan.

c. Pursuing the full separation of foul and surface water flows as follows:

i. a requirement that all development provides such separation within the development; and

ii. where combined sewers remain, the Council will work with statutory sewerage providers to progress the separation of surface water from foul;

d. Ensuring that built development proposals, including new roads, separate, minimise and control surface water run-off, using Sustainable Drainage Systems, modified as necessary where minewater is present; in relation to this:

i. surface water should be managed at source wherever possible, so that there is no net increase in surface water run-off for the lifetime of the development;

ii. surface water should be disposed of in accordance with the following hierarchy for surface water run-off:

- to a soakaway system, unless it can be demonstrated that this is not feasible due to poor infiltration with the underlying ground conditions and/or high groundwater levels;
- to a watercourse, unless there is no alternative or suitable receiving watercourse available;

- to a surface water sewer;
- as a last resort, once all other methods have been explored, disposal to combined sewers;

iii. where greenfield sites are to be developed, the surface water run-off rates should not exceed, and where possible should reduce, the existing run-off rates;

iv. Where previously developed sites are to be developed:

- the peak surface run-off rate from the development to any drain, sewer or surface water body for any given rainfall event should be as close as reasonably practicable to the greenfield run-off rate for the same event, so long as this does not exceed the previous rate of discharge on the site for that same event; or
- where it is demonstrated that the greenfield run-off rate cannot be achieved, then surface run-off rate should be reduced wherever possible by a minimum of 50% of the existing site run-off rate;

e. Full consideration should be given to solutions within the wider catchment area, including blue-green infrastructure based solutions and those providing ecosystem services, with wider solutions especially applied if local solutions could be harmful to biodiversity, landscape or built heritage; 11. Water Environment 226 The Local Plan should be read as a whole. Proposals will be judged against all relevant policies. Northumberland Local Plan (Adopted March 2022)

3. In relation to flood alleviation schemes:

a. the early implementation of approved schemes will be supported through development decisions;

b. any proposal for additional schemes should demonstrate that they represent the most sustainable solution and that their social, economic and environmental benefits outweigh any adverse environmental impacts caused by new structure(s), including increasing the risk of flooding elsewhere.

4. Any works relating to the above, which impact on natural water systems, should consider the wider ecological implications, applying the ecosystem approach, and link into green infrastructure initiatives wherever practicable.

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 4 Princess Louise Road, Blyth, NE24 2EH and is centred at national grid reference 431538, 581200. The site has an area of 184m^2.

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

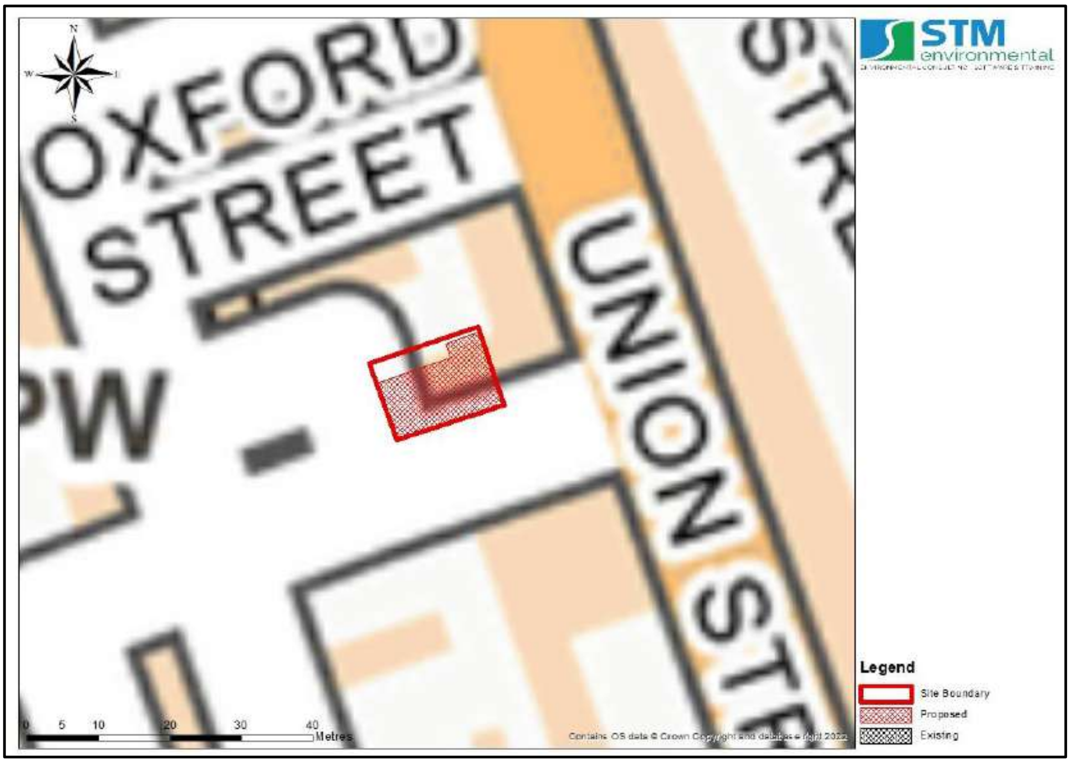

Figure 1: Site Location Map

Figure 2: Site Aerial Map

10.2 Site Access

The site is accessed via Princess Louise Road.

10.3 Local Planning Authority

The site falls within the jurisdiction of Northumberland County Council in terms of the planning process.

10.4 Lead Local Flood Authority

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

10.5 Flood Zone

For planning purposes, the site is located in Flood Zone 2 as defined by the EA and LLFA.

10.6 Site and Surrounding Land Uses

10.6.1 Site Current Land Use

The site is currently used as a shared bedsit, with seven individual bedrooms.

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 Dwellings	Residential Dwellings, Public Roads and Industrial Units
Eastern	Residential Dwellings	Residential Dwellings and Public Roads
Southern	Residential Dwellings and Public Road (Princess Louise Road)	Residential Dwellings, Public Roads and Industrial Units
Western	Residential Dwellings	Residential Dwellings and Public Roads

10.7 Hydrology

The nearest main watercourse is the River Blyth, which is located 0.64km east of the site.

10.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as tidal river or creek deposits. The underlying bedrock geology is characterized as the Pennine Middle coal measures formation.

10.9 Hydrogeology

The site lies upon both a Secondary A superficial and 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 elevation is gradually sloped, ranging from 3.26mAOD (west) to 3.59mAOD (east).

11 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.

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

11.1.1 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.

11.1.2 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.

11.1.3 Main Potential Sources of Local Fluvial Flooding

The site is not in an area which is at risk of fluvial flooding.

11.1.4 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.

11.1.5 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.

11.1.6 Potential Sources of Tidal Flooding

The nearest potential source of tidal flooding to the site is considered to be the River Blythe.

11.1.7 Records of Historic Tidal Flooding Incidents

Examination of the LLFA's Level 1 SFRA revealed notable flood events recorded in 1876, 1890, 1921, 1953, 1954 and 1999 when large parts of the east coast suffered significant flooding following tidal surges that breached the local defences.

It is not known if the development was affected during these flood events.

11.1.8 Designated Tidal Flood Risk Zone for the Site

The site is considered to be located within Flood Zone 2 as defined by the Environment Agency and the LLFA indicating that it has between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of tidal flooding.

11.1.9 Flood Defences

The EA's flood defence map which is available in Appendix 7 shows that the site benefits from high ground located to the east, on the banks of the River Blyth.

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

The EA Product 6 dataset which is presented in Appendix 11 provides modelled flood levels and flows for model node points close to the site. The data has been summarised in the description below:

Figure 3: Mapping of the flood extents during the 2019 (0.5% and 0.1% AEP) and 2120 (0.5% AEP) fluvial and tidal flooding events.

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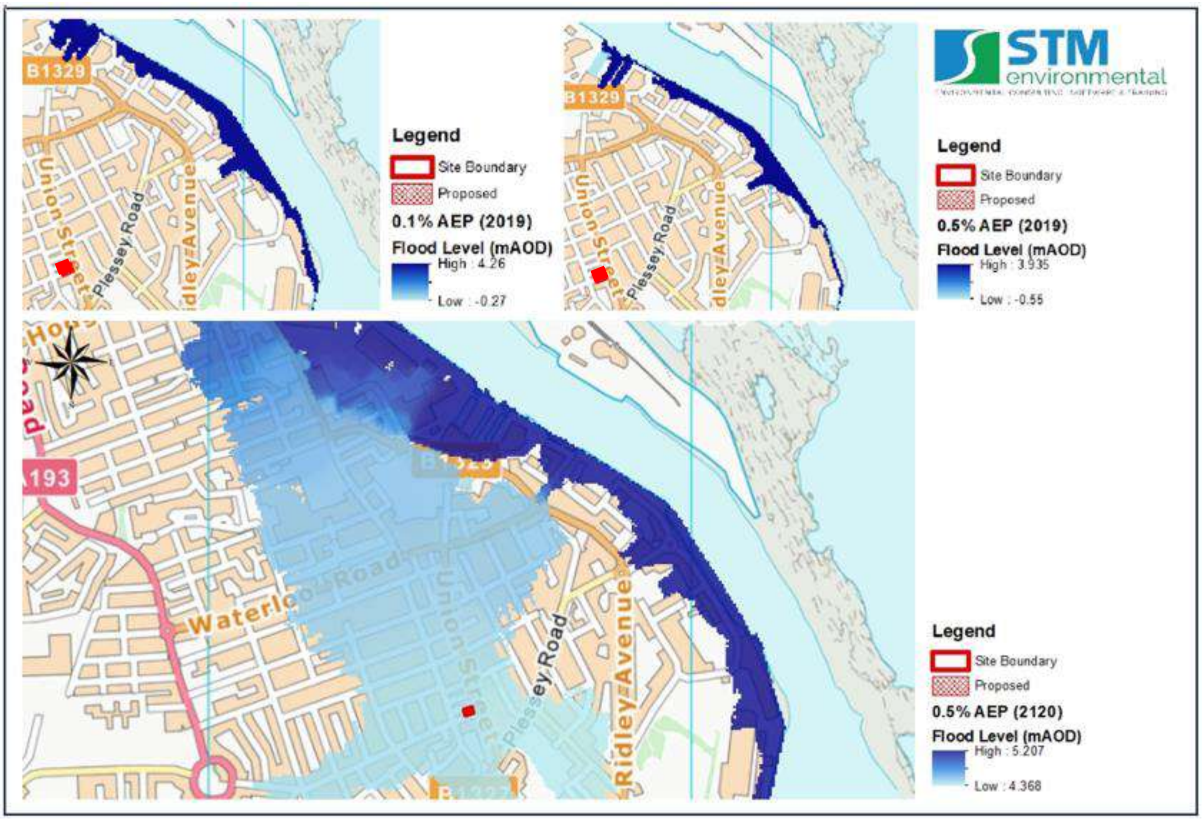


Figure 3 shows the flood extent from the River Blythe for during 0.5% and 0.1% AEP (2019) and 0.5% AEP (2120) event.

During the 0.5% AEP (2019) and 0.1% AEP (2019) modelled flood events, the site remains unaffected and flooding largely occurs around the banks over the River Blyth.

During the 0.5% AEP (2120), the site is impacted to an average flood level of 4.49mAOD. This equates to the development potentially witnessing a flood depth of 0.75m during this extreme flood event.

During the 0.5% AEP (2125) higher central allowance, this flood depth reaches 0.81m to a level of 4.55mAOD. Given the upper end allowance this flood depth reaches 0.83m to a level of 4.57mAOD.

11.1.11 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.

11.2 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.

11.2.1 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.

11.2.2 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.

11.2.3 Records of Historic Pluvial Flooding Incidents

The Historic Flood Map which is available as part of the Northumberland Preliminary Flood Risk Assessment indicates that the borough suffered two significant flooding events in 1964 and 2008, but does not specify the source. The flood extent outline did not impact the site.

Copies of these maps are available in Appendix 4.

11.2.4 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.

11.2.5 Sewer Flooding

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

Copies of these maps are available in Appendix 4.

11.2.6 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 30-year, 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 30-year and 1 in 100-year pluvial event the development remains unaffected.

During the 1 in 1000-year event the rear garden to the site is affected at depths of up to 300-600mm, however the residential dwelling remains dry.

11.2.7 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 medium.

11.3 Risk of Flooding from Multiple Sources (ROFMS)

The Environment Agency provides a map which gives an indication of the overall flood risk to a site from fluvial, tidal and surface water sources after considering the presence of flood defences. This map indicates that there is greater than 3.3% chance of flooding at the site in any year. A copy of the map is presented in Appendix 8.

11.4 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.

11.4.1 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.

11.4.2 Susceptibility to Groundwater Flooding

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

11.5 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 not located within a Critical Drainage Area.

12 Potential Impacts of the Development on Local Flood Risk

12.1 Changes to Impermeable Area and Building Footprint

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

Table 2: Existing and proposed site ground cover.

	Impermeable Area (m^2)	Permeable Area (m^2)	Total Area (m^2)
Existing	184	0	184
Proposed	184	0	184

Table 3: Break down of existing and proposed site uses

Use	Existing (m^2)	Proposed (m^2)	Difference (m^2)
Building	148	148	0
Impermeable Paving	36	36	0
Permeable Paving	0	0	0
Garden	0	0	0
Total	184	184	-

As the development will have no change to permeable area, it is considered unlikely that it will impact upon flood flow and surface water runoff rates.

12.2 Impacts on Flood Storage and Flood Flow Routes

The development will not change the site's built-up area and as will have no impact on local flood storage and flood flow pathways.

13 Flood Risk Mitigation Measures

13.1 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 4: 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.

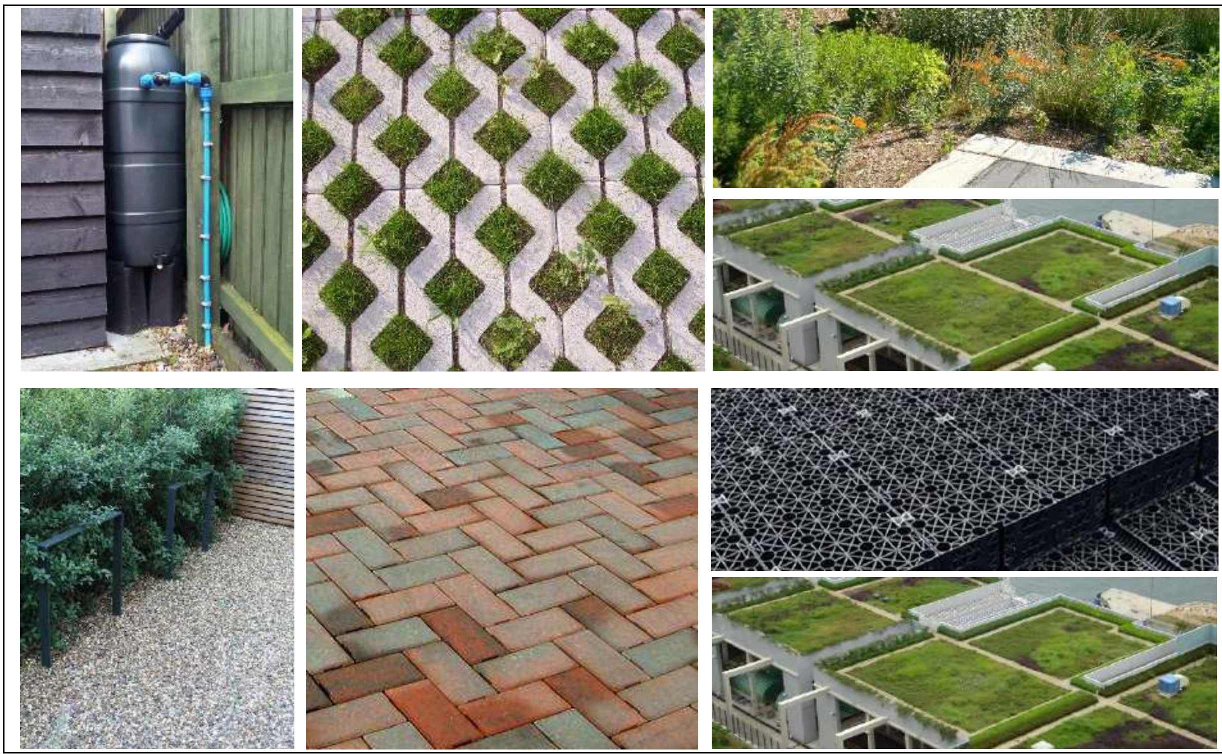


Figure 3: Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

Given the nature of the development, it is considered that there are limited opportunities for implementing SuDS. Measures such as rainwater harvesting and permeable paving should be considered. A full SuDS strategy is outside the scope of works of this FRA.

13.2 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.

13.2.1 Finished Floor Levels

The average ground level of the existing site is 3.44mAOD. The finished floor levels are raised by 300mm above this to 3.74mAOD.

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; Or
- Estimated flood level 1% AEP plus CC; Or
- The Adjacent roadway;

During the 0.5% AEP (2125) tidal event, the proposed development is impacted to a flood depth of 0.81m to a level of 4.55mAOD. EA standing advice states that the development should be raised 300m above this to 4.85mAOD.

However, as the development is for a change of use and given restrictions in ceiling and floor height, finished floor levels will remain as existing at 3.74mAOD.

13.2.2 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 that flood depths of more than 0.3m are predicted in extreme scenarios, the water entry strategy is generally considered the most applicable for this site.

The proposal will provide a combined strategy, thereby improving the resilience and resistance measures to the property and protecting life and infrastructure.

The foremost strategy would prevent water entry, this can be implemented by undertaking the following:

Water Exclusion Strategy:

- Using materials and construction with low permeability;
- Landscaping e.g. creation of low wall to protect the rear bedrooms (subject to this not increasing flood risk elsewhere);
- 1.2m Aqua Stop Flood barriers will be stored near by the front doors to the ground floor.
- Flood gates with waterproof seals within the building upon the entrances of the ground floor flats;
- Structural integrity of the ground floor will be investigated and improved as required to withstand the potential differences;

As the above method relies on barriers being installed in a timely manner, the developer may undertake a combined approach by implementing parts of the water entry strategy.

Water Entry Strategy:

There are a range of options for implementing the Water Entry Strategy including:

- Use materials with either good drying and cleaning properties, or, sacrificial materials that can easily be replaced;
- Designing for water to drain away;
- Designing access to all spaces to permit drying and cleaning;
- Raising the level of electric wiring, appliances and utility metres (0.1m above flood level);
- Ground supported floors with concrete slabs coated with impermeable membrane;
- Plastic water resistant internal doors.

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.

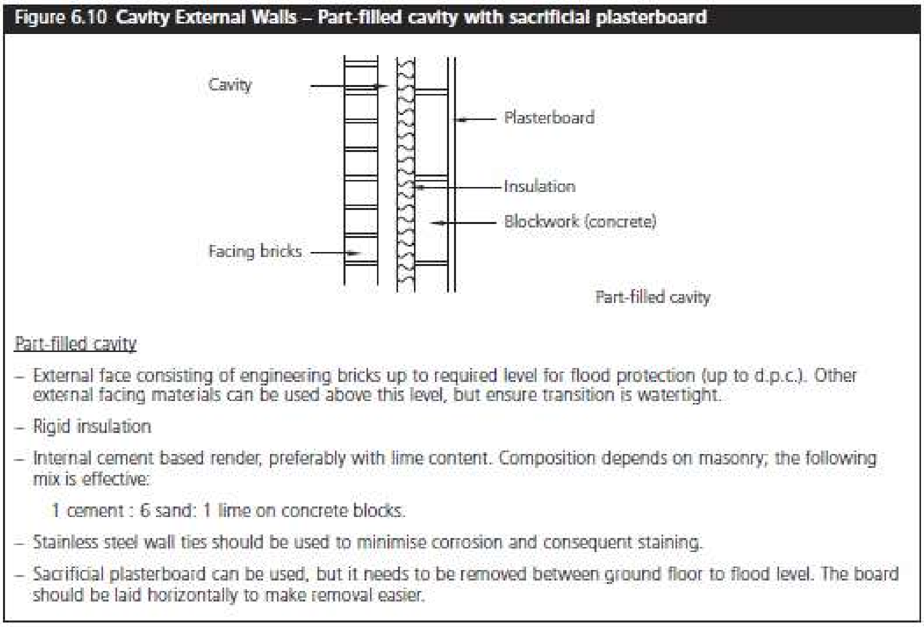
Doors:

- 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



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.

13.3 Emergency Plan

13.3.1 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.

As the Product 4 and Product 6 Dataset did not provide velocities, a Hazard Rating could not be determined for the development.

13.3.2 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.

13.3.3 Access and Safe Egress

Safe egress to Flood Zone 1 is available by exiting the door of the dwelling, onto Princess Louise Road. Directions of this route are presented in Appendix 12 .

13.3.4 Safe Refuge

The proposed development will have internal connections to upper floors in the property which will act to provide safe refuge and a means of escape above the flood level for flats 1, 2 and 3.

Detailed Flood Emergency plans will be provide for all residents.

14 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 main sources of potential flooding to the site are considered to be associated flooding from the River Blyth and the North Sea;
- The EA define the site as being within Flood Zone 2;
- The finished floor level will be set to match existing at a minimum of 3.74mAOD;
- Aqua stop barriers will provide protection (to 4.94mAOD) above the most extreme flood levels;
- The proposal will utilise both the water exclusion and exit strategies;
- EA mapping indicates that the site does benefit from flood defences. These defences include high ground at the River Blyth;
- The site is not within a CDA.
- The development will result in no change of impermeable area of the site and therefore unlikely to increase local flood risk;
- There is limited opportunity for implementing SuDS mitigation measures. Consideration should be given to use of rainwater harvesting and permeable paving;
- Flood resilient materials and construction methods will be used so as to ensure that the impacts of any potential flooding are minimised as much as possible;
- Occupants will subscribe to the EA Flood Warnings Direct Service;
- Safe egress routes to Flood Zone 1 is easily accessible;
- In the event that evacuation is not possible, safe refuge is available in the upper floors of the building which are accessible via an internal staircase;

The proposed development should be considered to be in general compliance with local planning policy and the NPPF when taking into account the proposed mitigation measures which will be introduced alongside the change of use. The proposal, although it increases the venerability classification, it will provide an overall benefit by protecting the property and inhabitants for the longevity of the development far greater than the current scenario.

15 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, Northumberland County Council Level 2 SFRA, October 2015
4. Local Plan, Northumberland County Council, March 2022

16 Appendices

16.1 Appendix 1 – Site Photographs

16.2 Appendix 2 – Development Plans

See next page.

Princess Louise Road

0 20
Metres

N

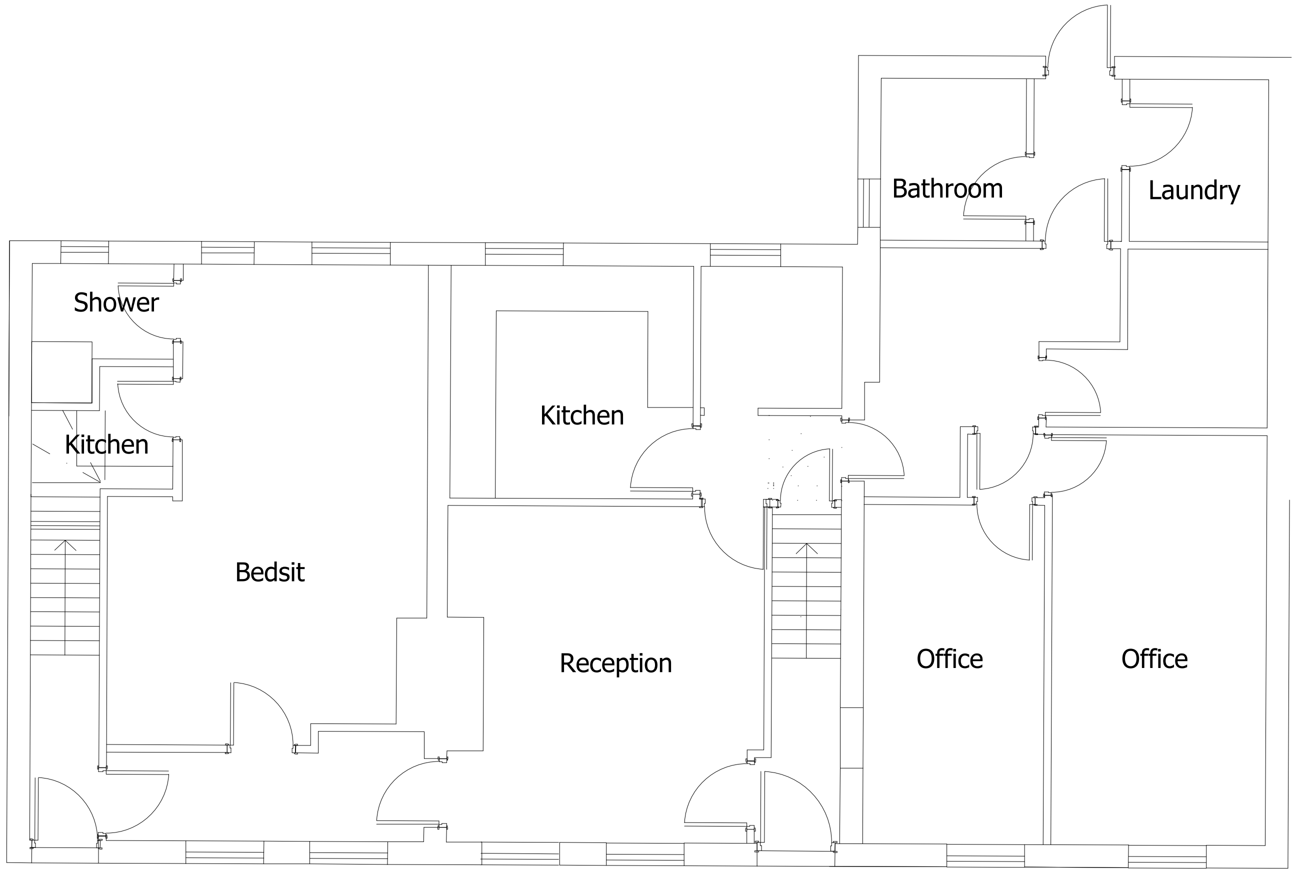
ReQuestaPlan

Plan Produced for: Renovat8 Homes & Property

Date Produced: 20 Jun 2023

Plan Reference Number: TQRQM23171231418045

Scale: 1:500 @ A4



Ground Floor Plan

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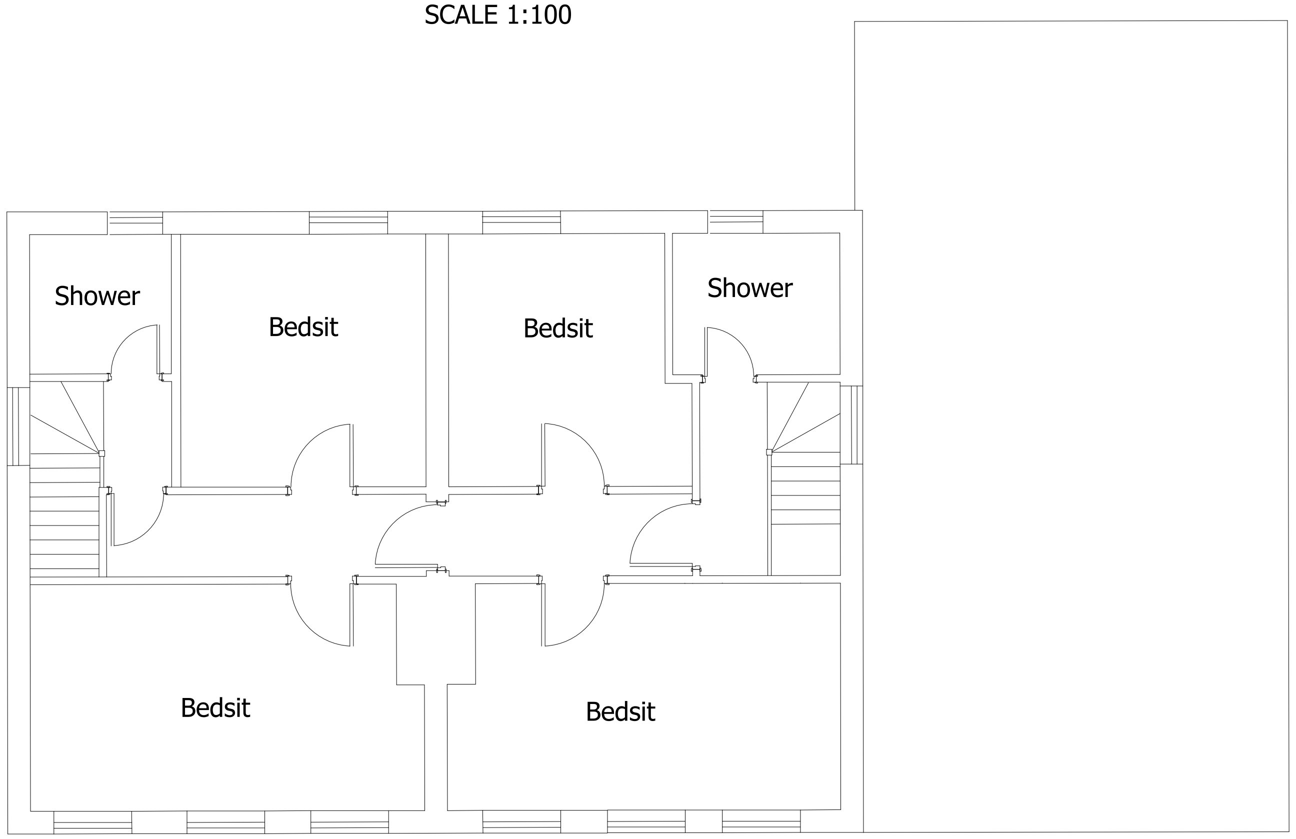

First Floor Plan

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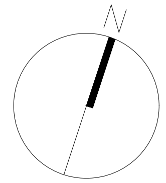
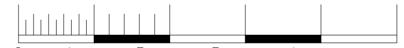




PLANNING 1:100

Revision	Description	Date

Project

Residential Conversion
4 Princess Louise Road
Blyth

Intersect Architects Limited

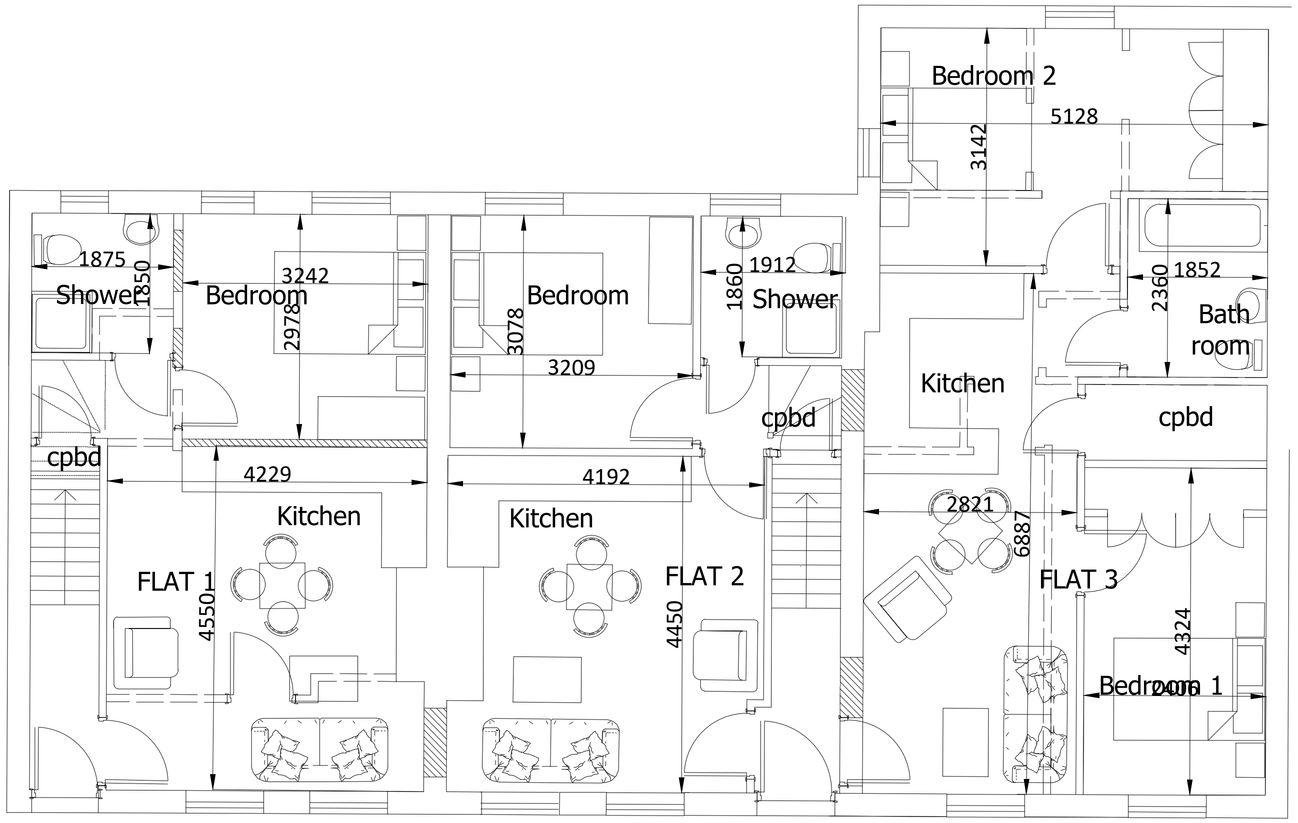
YBN 7-8 Delta Bank Road
Metro Riverside Park
Gateshead NE11 9DJ. T. 0191 303 6283

Title

Plans as existing

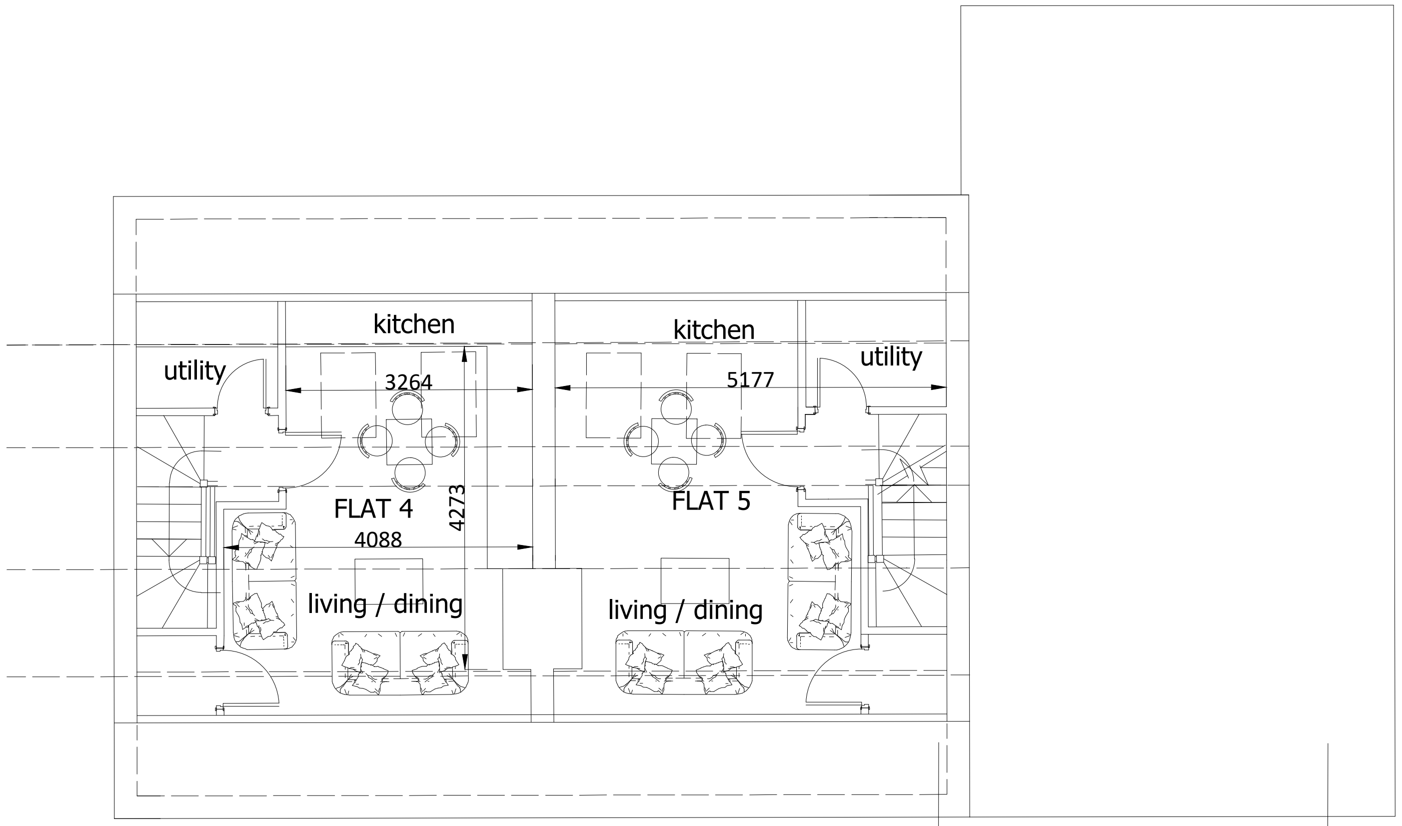
Scale	Date	Drawn by	Chckd by
1:100@A3	June 2023	jkb	ajs

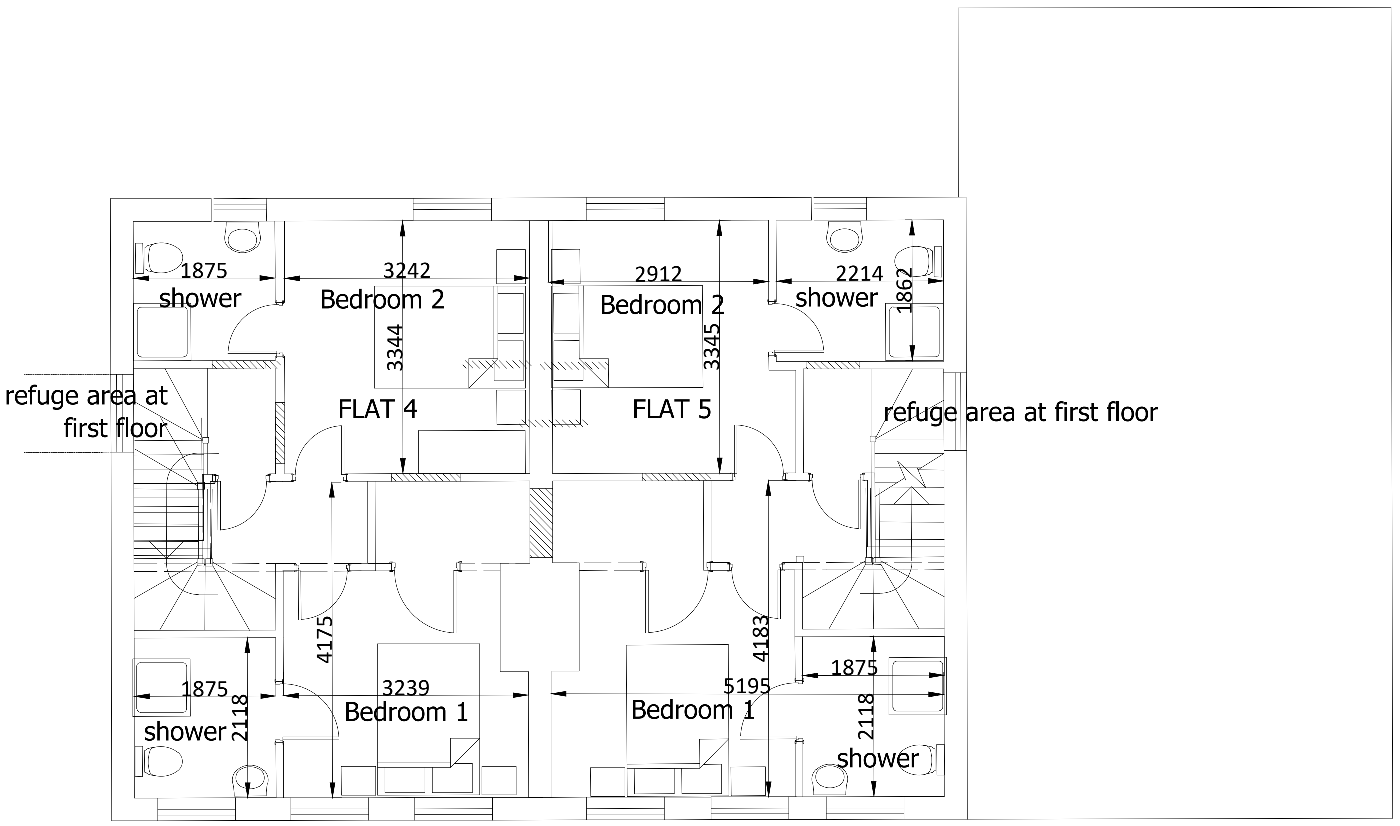
Dwg. No. SP-363-A-PL-04/ -



Ground Floor Plan

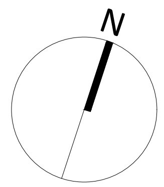
SCALE 1:100





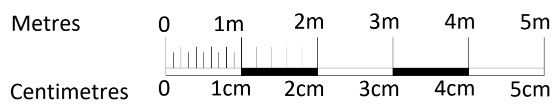
First Floor Plan

SCALE 1:100



AREA SCHEDULE

Flat 1 -35.7m2
Flat 2 -35.7m2
Flat 3 -53.1m2
Flat 4 -55.4m2
Flat 5 -55.4m2



PLANNING 1:100

Revision	Description	Date
B	Stairs altered, areas updated	15.08.2023
A	Dimensions added	02.08.2023

Project: Residential Conversion
4 Princess Louise Road
Blyth

Intersect
Architects Limited
YBN 7-8 Delta Bank Road
Metro Riverside Park
Gateshead NE11 9DJ. T. 0191 303 6283

Title: Plans as proposed

Scale	Date	Drawn by	Chckd by
1:100@A3	June 2023	jkb	ajs

Dwg. No. SP-363-A-PL-10/ B

Elevation to Princess Louise Road

SCALE 1:100

Rear elevation

SCALE 1:100

Metres 0 1m 2m 3m 4m 5m

Centimetres 0 1cm 2cm 3cm 4cm 5cm

PLANNING 1:100

Revision	Description	Date
A	Ground floor windows updated	11.07.2023

Project
Residential Conversion
4 Princess Louise Road
Blyth

Intersect
Architects Limited
YBN 7-8 Delta Bank Road
Metro Riverside Park
Gateshead NE11 9DJ. T. 0191 303 6283

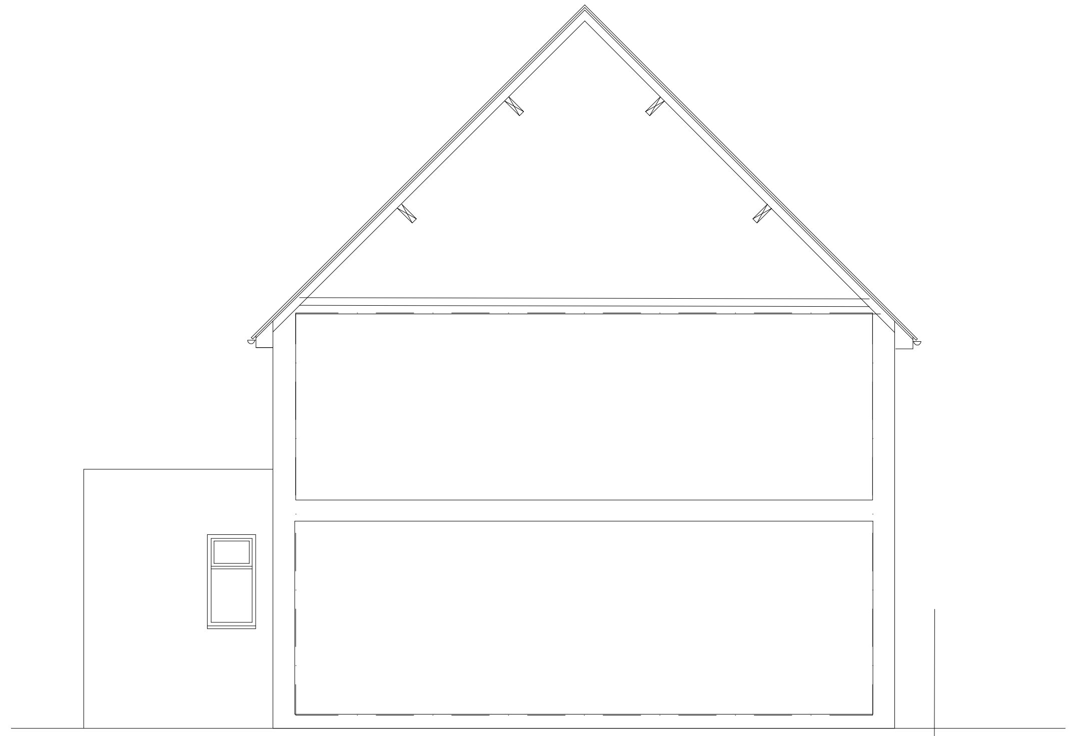
Title
Elevations as existing

Scale	Date	Drawn by	Chckd by
1:100@A3	June 2023	jkb	ajs

Dwg. No. SP-363-A-PL-05/ A

West elevation

SCALE 1:100

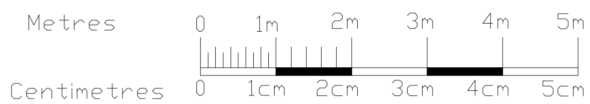


Section

SCALE 1:100

East elevation

SCALE 1:100



PLANNING 1:100

Revision	Description	Date

Project

Residential Conversion
4 Princess Louise Road
Blyth

Intersect

Architects Limited

YBN 7-8 Delta Bank Road
Metro Riverside Park
Gateshead NE11 9DJ. T. 0191 303 6283

Title Elevations as existing

Scale	Date	Drawn by	Chckd by
1:100@A3	June 2023	jkb	ajs

Dwg. No. SP-363-A-PL-06/ -

Elevation to Princess Louise Road

SCALE 1:100

Rear elevation

SCALE 1:100

Metres 0 1m 2m 3m 4m 5m

Centimetres 0 1cm 2cm 3cm 4cm 5cm

PLANNING 1:100

Revision	Description	Date
A	**Ground floor windows updated**	**11.7.2023**

Project Residential Conversion
4 Princess Louise Road
Blyth

Intersect Architects Limited
YBN 7-8 Delta Bank Road
Metro Riverside Park
Gateshead NE11 9DJ. T. 0191 303 6283

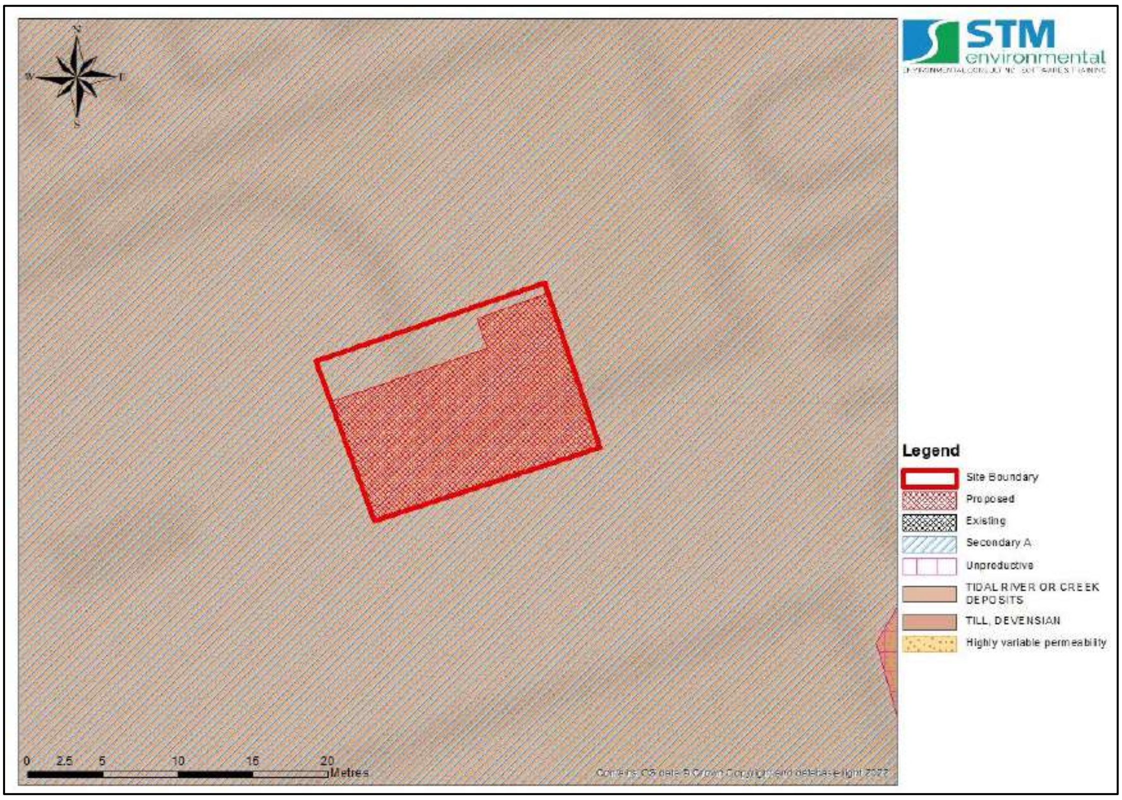
Title Elevations as proposed

Scale	Date	Drawn by	Chckd by
1:100@A3	June 2023	jkb	ajs

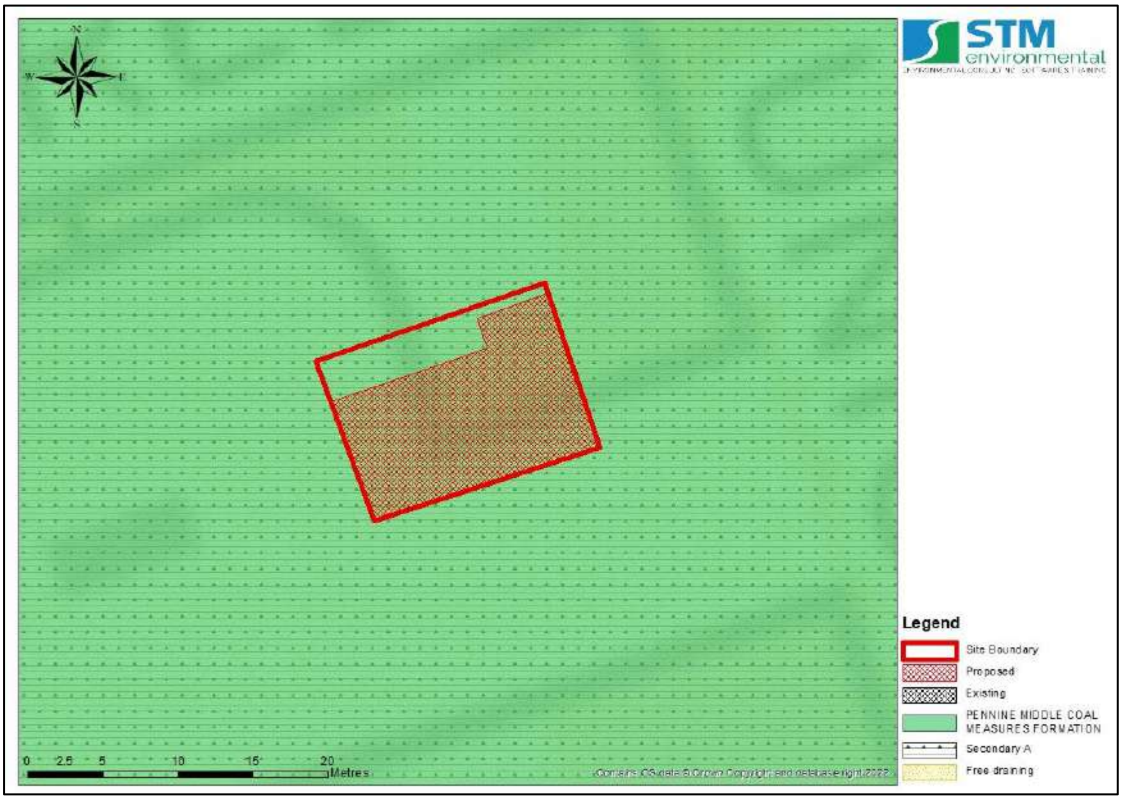
Dwg. No. SP-363-A-PL-11/ A

16.3 Appendix 3 – Environmental Characteristics

16.3.1 Superficial Hydrogeology Map



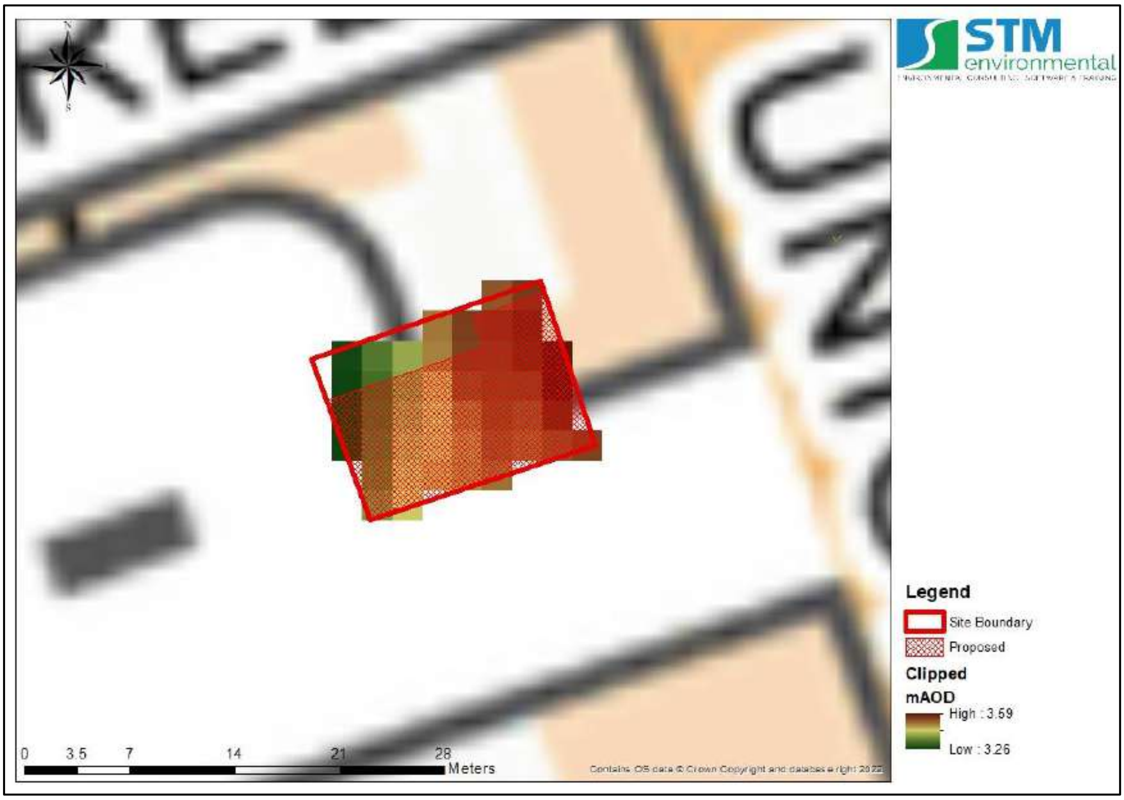
16.3.2 Bedrock Hydrogeology Map



16.3.3 Topography Map

16.3.4 Topographic Node Map

16.3.5 Topographic Clipped Map

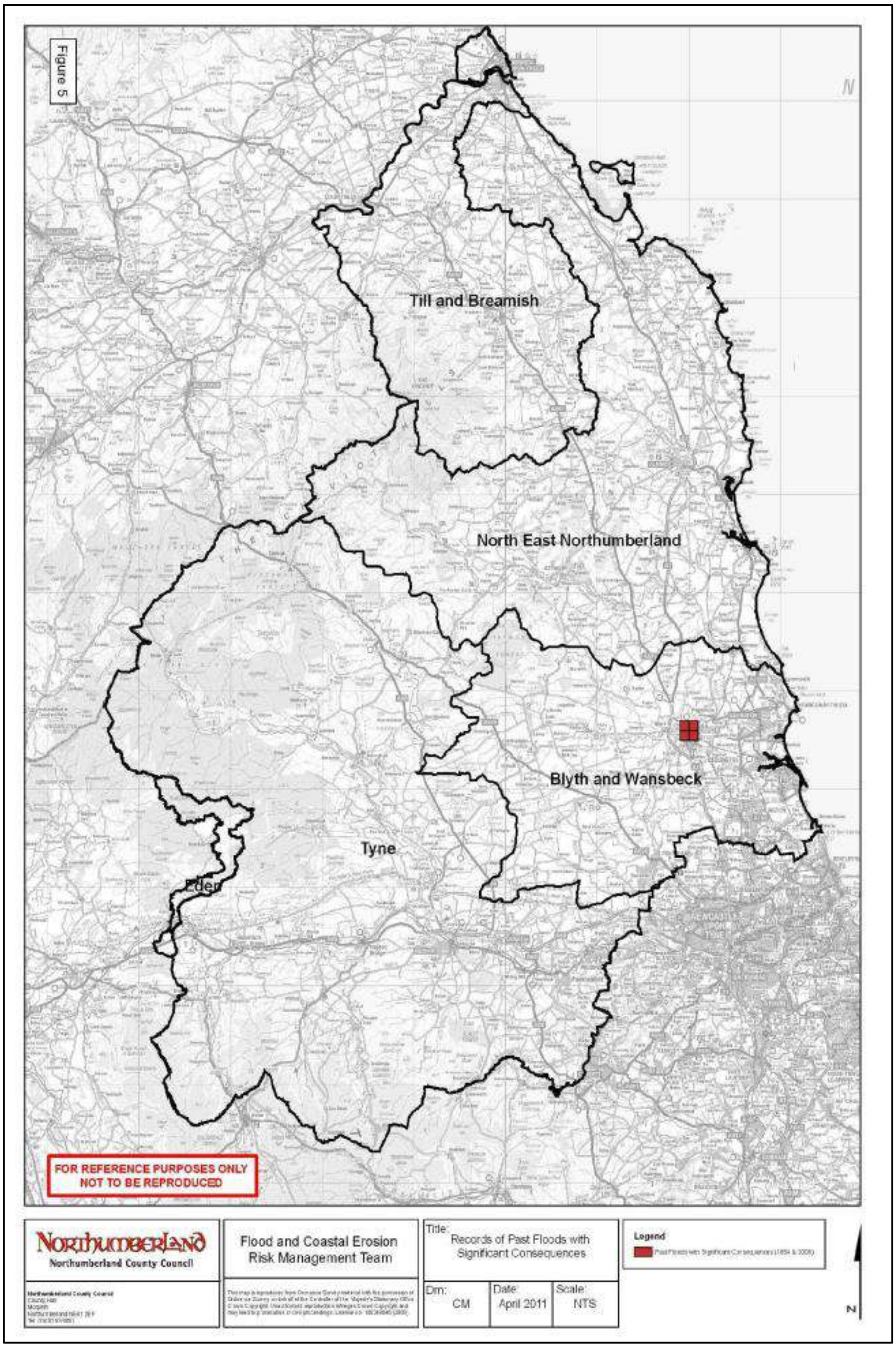


16.4 Appendix 4 – Historical Flood Incident Maps

16.4.1 EA Historic and Recorded Flood Outlines

N.A. – No identifiable EA Historic and Recorded Flood Outlines.

16.4.2 LLFA Level 1 SFRA Historic Flood Map



16.4.3 LLFA Level 1 SFRA Fluvial and Tidal Flood Table

See next page.

Appendix A: Historical Flood Events

Table A-1: Historical flooding (Including extracts from EA CFMPs)

River Tyne Catchment		
Date	**Source of flooding**	**Areas affected by flooding**
July 1722	River	Flooding from the South Tyne causing widespread damage to bridges, including the Allensford bridge over the River Derwent.
August 1752	River	Flooding from the Rivers Rede and Coquet resulting in the flooding of agricultural land.
November 1753	River	Flooding from the South Tyne at Greenhead causing the bridge over Tipalt Burn to be washed away as well as the bridge at Ridley Hall.
November 1761	River	Flooding from the South Tyne resulting in the bridges on Tipalt Burn, Greenhead and Ridley Hall all being destroyed.
November 1771	River	Flooding from the South Tyne causing damage to bridges at Alston, Eals, Featherstone, Ridley Hall, Haydon Bridge, Greenhead and Allendale.
November 1771	River	Flooding from the North Tyne damaging bridges.
November 1771	River	Severe damage to property and bridges caused by flooding from the River Tyne. Numerous locations affected such as Hexham, Bywell, Ovingham, Wylam and Newcastle with a total of 25 deaths.
March 1782	River	Flooding from the River Tyne causing damage at Hexham and Newcastle with the bridge at Hexham collapsing.
March 1782	River	Flooding from the South Tyne destroying bridges at Whitfield and Ridley Hall.
September 1807	River	Flooding from the River Tyne and North Tyne damaging mainly agricultural land.
December 1814	River	Severe flooding causing by heavy rain and snowmelt. Highest levels since 1771.
December 1815	River	Bridges at Knarsdale, Haydon Bridge, Greenhead were damaged or washed away by flooding from the South Tyne.
December 1828	River	Flooding from both the River Tyne and North Tyne flooding both houses and the paper mill at Scotswood.
October 1829	River	Flooding from the River Tyne at Hexham, Corbridge, Scotswood and Newcastle.
November 1833	River	Flooding from the South Tyne causes bridge damaged at Alston.
September 1856	River	Flood mark Bellingham Bridge caused by flooding from the River Tyne. New rail bridge damaged and agricultural losses caused through flooding from the River Tyne from Hexham to the estuary
January 1878	River	Flooding of property at Hexham caused by flooding from the River Tyne
December 1878	River	Flooding at Hexham (Tyne Green) caused by flooding from the River Tyne. One school also flooding in Ovingham.
March 1881	River	Flooding from the River Tyne causes Flooding of property at Hexham and flooding of school and George Stephenson's Cottage in Ovingham and Wylam
March 1881	River	Damage to the paper mill at Fourstones through flooding of the South Tyne
January 1883	River	Flooding at Hexham and Corbridge caused by flooding from the River Tyne
November 1886	River	Flooding at Hexham caused by flooding from the North, South and main River Tyne
December 1828	River	Flooding from both the River Tyne and North Tyne flooding both houses and the paper mill at Scotswood.

River Tyne Catchment		
Date	**Source of flooding**	**Areas affected by flooding**
October 1829	River	Flooding from the River Tyne at Hexham, Corbridge, Scotswood and Newcastle.
November 1833	River	Flooding from the South Tyne causes bridge damaged at Alston.
January 1837	River	Snowmelt flood affecting the River Tyne causing flooding at Hexham, Corbridge, Scotswood (14 houses), Dunston, Quayside.
September 1856	River	Flood mark Bellingham Bridge caused by flooding from the River Tyne. New rail bridge damaged and agricultural losses caused through flooding from the River Tyne from Hexham to the estuary
September 1856	River	Agricultural losses through flooding from the River Team
January 1878	River	Flooding of property at Hexham caused by flooding from the River Tyne
December 1878	River	Flooding at Hexham (Tyne Green) caused by flooding from the River Tyne. One school also flooding in Ovingham.
March 1881	River	Flooding from the River Tyne causes Flooding of property at Hexham and flooding of school and George Stephenson's Cottage in Ovingham and Wylam
March 1881	River	Damage to the paper mill at Fourstones through flooding of the South Tyne
January 1883	River	Flooding at Hexham and Corbridge caused by flooding from the River Tyne
November 1886	River	Flooding at Hexham caused by flooding from the North, South and main River Tyne
November 1923	River	Water from the River Tyne causes flooding in Hexham.
June 1924	River	Bridge destroyed at Winlaton Mill; houses flooded on Derwent and Team as flooding from the River Derwent, Team and Ouseburn occurs.
January 1925	River	Roads impassable at Falstone, Hesleyside and Charlton due to flooding from the North Tyne. Road flooded at Warden due to flooding from the South Tyne
September 1926	River	Property flooding at Haltwhistle, Hexham and Corbridge by water from the River Tyne and South Tyne.
September 1927	River	Agricultural and road flooding caused by flooding from the South Tyne
November 1929	River	Agricultural and road flooding from the South Tyne
February 1933	River	Agricultural and road flooding from the North Tyne. Flooding from the River Tyne also causes flooding in Prudhoe to the rail embankment
April 1934	River	Ovingham to Wylam road flooded due to flooding from the River Tyne
October 1938	River	Ovingham to Wylam road and Low Prudhoe to rail due to flooding from the River Tyne.
January 1939	River	Flooding at Hexham and Corbridge caused by the River Tyne.
February 1941	River	Flooding around the school at Ovingham caused by the River Tyne.
April 1947	River	Flooding of houses at Warden, Hexham and Corbridge caused by flooding from the River Tyne. General flooding at Haydon Bridge from the South Tyne.
January 1955	River	Flooding from the River Tyne causes flooding of ICI works in Prudhoe and school in Ovingham. Major flooding occurred in Corbridge where flood banks were breached resulting in properties being flooded
	River	Flooding occurred from the River Rede at West Woodburn and Hindhaugh resulting in properties being flooded. Homes also flooding in Warden by water from the South Tyne.
October 1967	River	Flooding from the south Tyne at Greenhead causes flooding to school and homes

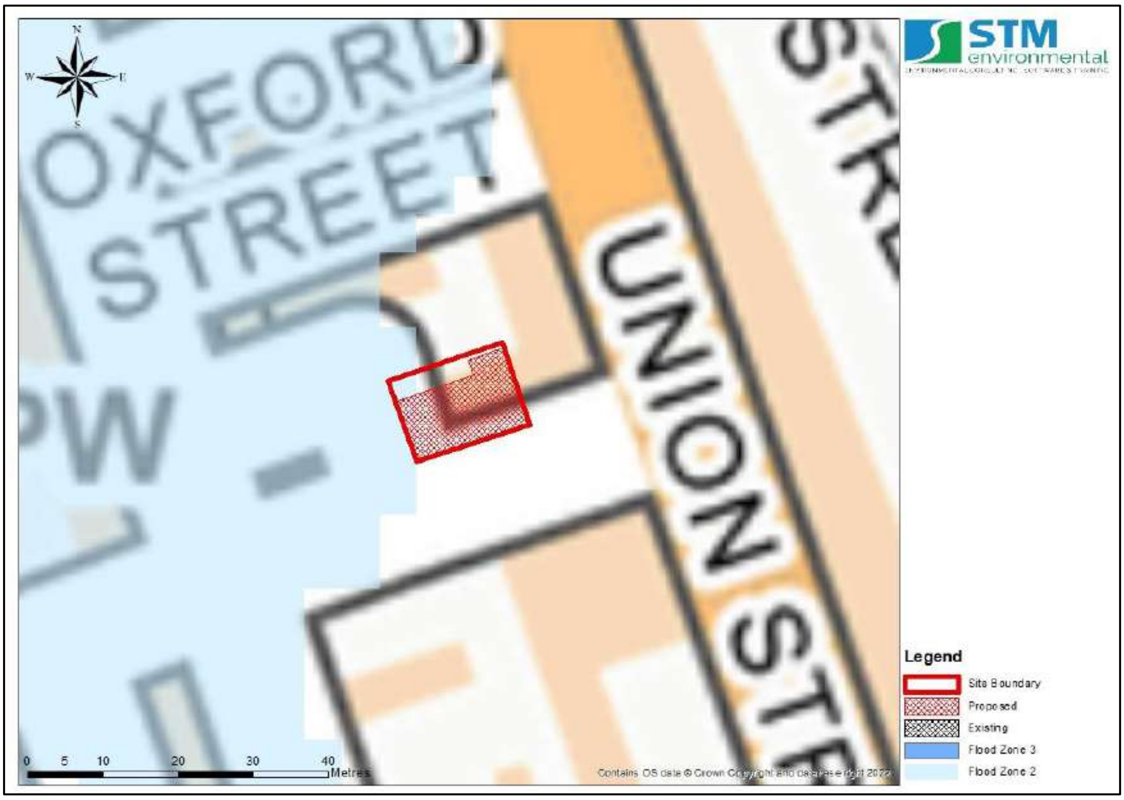
River Tyne Catchment		
Date	**Source of flooding**	**Areas affected by flooding**
		(Tipalt burn).
January 2005	River	100 properties were affected throughout the catchment as flooding occurred from the South Tyne at Haydon Bridge, Hardhaugh near Warden. Flooding from the River Tyne also causes flooding at Corbridge.
September 2008	River	Land and properties flooded throughout Tyne catchment
North East Northumberland Rivers		
1744	River Coquet	The Weldon Bridge on the River Coquet was swept away due to flooding. This impacted the main road between Morpeth and Wooler. Four people drowned.
1752	River Coquet	The Weldon Bridge on the River Coquet was swept away due to flooding. This impacted the main road between Morpeth and Wooler.
October 1770	River Aln	The Great North road at Alnwick was flooded and the ancient bridge below the castle was destroyed.
November 1770	River Aln	A flood resulted in the collapse of the south arch of the Lion Bridge next the town of Alnwick.
May 1782	River Aln	A wooden bridge was swept away by a flood at Alnwick on the River Aln.
September 1839	River Coquet	A notable flood on the River Coquet.
October 1872	Heavy rainfall	2.04 inches of rain fell at Brenckburn Priory, and the River Coquet was higher than at any time since September 1839.
1877, 1879, 1963, 1966, 1997, 2008	Belford Burn	Multiple events of flooding of Belford village from Belford Burn. At most 34 properties and a caravan park were flooded in Belford.
July 1893	Heavy thunderstorm	A heavy thunderstorm occurred in the Upper Coquet dale, near Alwinton. The resulting flood was very catastrophic, sudden and large in size, drowning sheep and people. The flood bore onto Harbottle, spreading out by Holystone and Hepple, and going on down the Coquet 'like a moving wall'.
October 1895	Very heavy rainfall	Very heavy rainfall resulted in flooding at Biddleston, near Rothbury on the River Coquet.
October 1900	Severe storm	A very severe storm of snow, sleet and rain, bringing an exceptionally high maximum rainfall caused a flood at Alnwick Castle on the River Aln, flooding agricultural land, swept away bridges and flooded the road into Alnwick.
July 1912	Heavy rainfall	Heavy rainfall produced floods in the street in Bamburgh.
August 1946	Heavy rainfall	Heavy rainfall fell over the Cheviot Hills extending to the coast between Alnmouth and Berwick-on-Tweed. Thousands of pounds of damage were reported at Rothbury. Trees were uprooted and water was reported to have been running down from the hills in torrents cutting 3 ft deep channels in several roads.
1992	Rapid snowmelt	Low lying areas in Warkworth flooded due to rapid snowmelt and channel overtopping.
May 1996	River Coquet	Rothbury Riverside and Rothbury Golf course flooded. 64 properties flooded in Rothbury.
January 2005	Tidal	Warkworth, land flooded
September 2008	River Coquet, River Aln	Extensive flooding in Rothbury. 72 Properties flooded, Extensive flooding in Warkworth, Lesbury, Powburn and Thropton

River Tyne Catchment		
Date	**Source of flooding**	**Areas affected by flooding**
July 2009	River Coquet	Flooding in Rothbury
Till and Breamish Catchments		
1792	Wooler Water	Two arches of the bridge were swept away at Wooler
February 1831	River Tweed	Exceptional flooding of the River Tweed and all tributaries following a snowstorm and thaw. Flooding of Norham has only occurred once since.
September 1839	River Tweed	Considerable damage between Kirknewton and the River Till confluence.
	Wooler Water	North of Wooler – hundreds of acres flooded and embankments swept away.
September 1856	River Till	Milfield Floodplain - Till floodplain completely inundated. Doddington and Fenton – embankment breached in several places and crops flooded. Water one foot deep in a house at Fenton.
1898	River Breamish	Powburn - River Breamish in flood. Peggy Bell bridge was washed away.
1906	River Till	Milfield Plain - bridge swept away.
1946	River Breamish	Powburn - Eleven houses flooded at Powburn and South Hedgeley.
August 1948	Wooler Water River Breamish River Glen College Burn River Tweed River Tweed	Wooler -Properties suffered severely. Wooler Iron bridge collapsed. Powburn - village flooded. Kirknewton - Confluence of the Till and the Glen: 6000 acres under several feet of water forming a lake which extended up the Glen Valley. College Burn - There was flooding of properties due to backwater at the Glen and College Burn confluence. Bridge End - local flooding to two properties. Norham - debris piled up against bridge supports. Main East Coast railway cut in several places. Berwick -Tweedmouth - homes along main street flooded, tourists stranded, roads flooded. Whiteadder Bridge - three bungalows, bridge collapsed
October 1949	Wooler Water	Wooler - Consequence of flood was trebling of the channel width and the creation of a new channel (upstream of Wooler Bridge) and the tearing down of bankside trees.
1st October 1981	Wooler Water River Breamish River Breamish River Glen	Wooler - Extensive erosion in channel. Weirs outflanked and some damaged. Sediment deposition. Floodbanks overtopped causing flooding of arable land along the Wooler-Berwick road. Powburn - property flooded Bridge over River Till at Ford - road blocked by water. College Burn changed course at Hethpool. Land flooded and bridge damaged. West Newton - Burn overflowed on right floodbank, flooding one property. Akeld - Floodbank failed in two places, agricultural land and Akeld Steads road flooded
Spring 1983	River Till River Breamish	Coupland - flooding of agricultural land. Ford Bridge - road flooding. Linthaugh - left bank breached, two fields flooded. Redscar Bridge, Fenton and Chatton Bridge - road flooded.
2nd November 1984	Wooler Water River Breamish	Wooler - weir collapsed. Ingram/Headgeley - Severe damage to fencing, public road bridges, footbridges and farmland.

River Tyne Catchment		
Date	**Source of flooding**	**Areas affected by flooding**
	River Tweed / Glen	Milfield Plain, Kirknewton and Bridge End - flooding of agricultural land.
31st March 1992	Wooler Water River Till River Till River Tweed	Wooler - considerable sediment movement. Milfield Plain - bridge blocked, some property flooded. Etal - Heatherslow Mill flooded. Norham - road flooded.
6th February 2001	River Breamish	Chatton - road at bridge flooded.
13th August 2004	Wooler Water	Wooler Water - four caravans flooded.
September 2008	Wooler Water River Breamish River Tweed / Glen	Agricultural land and properties flooded throughout and Alnwick District
Wansbeck and Blyth Catchments		
< 1839	Fluvial	Flooding in 1609, 1739, 1761, 1782, 1828 and 1831 but no further information is available.
Sep 1839	Fluvial	Flood of similar severity to 1963, which would have caused extensive flooding in Morpeth.
Jun 1863	Fluvial	Roads & gardens in Low Stanners and Bennett's Walk, Morpeth.
Nov 1863	Fluvial	Houses in High and Low Stanners, Morpeth.
Dec 1876	Tidal	Houses in Low Stanners and Bennett's Walk, Morpeth (fluvial). Waves flowing into streets of Blyth.
Aug 1877	Fluvial	Houses in High and Low Stanners, Morpeth.
Jan 1878	Fluvial	Houses in High and Low Stanners, Morpeth.
Dec 1878	Fluvial	Houses in High Stanners, Morpeth.
Mar 1881	Fluvial	Houses in High and Low Stanners, Bennett's Walk, Morpeth.
Nov 1886	Fluvial	Houses in High and Low Stanners, Bennett's Walk, Morpeth.
Sep 1890	Tidal	Extraordinary high tide in Blyth, highest in 30 years, affected Cowpen Square, Havelock Street, Croft Road, Waterloo Hotel, and houses close to Cambois Ferry, Grey Street and Turner Street (1 in 167 yr return period).
Sep 1898	Fluvial	Houses in Low Stanners and Bennett's Walk, Morpeth.
Oct 1898	Fluvial	Houses in Low Stanners and Bennett's Walk, Morpeth.
Oct 1900	Fluvial	Extensive flooding caused by Cotting Burn in Morpeth. Also flooding of houses by Wansbeck in Low Stanners and Bennett's Walk, Morpeth. Submergence of Old Ponteland Bridge, Ponteland.
Oct 1903	Fluvial	Houses in Low Stanners, Morpeth. Agricultural land in Pont Valley.

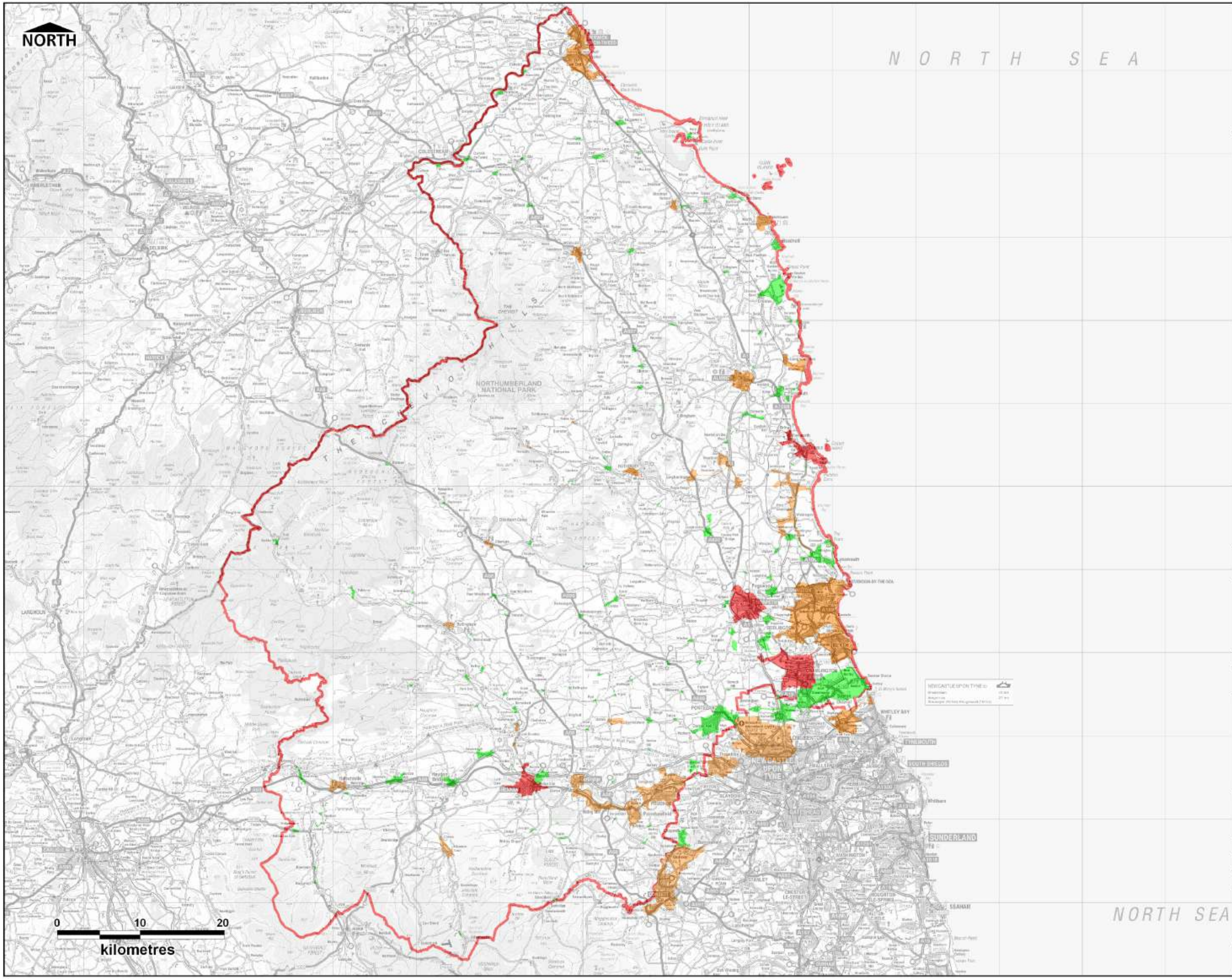
River Tyne Catchment		
Date	**Source of flooding**	**Areas affected by flooding**
Dec 1921	Tidal	In Blyth flood water flowing through the gratings covering the sewers, affected Park Road, Havelock Street, Croft Road, Regent Street, Turner Street, Cowpen Street and Cowpen Square (1 in 63 yr return period).
Feb 1924	Tidal	Flooding in Blyth with overflow down Regent Street almost as far as Travellers Rest Hotel also affected business premises east of the Arcade and Turner Street (1 in 28 yr return period).
Jun 1924	Fluvial	Flooding from Wansbeck and Cotting Burn including High and Low Stanners, Morpeth.
1941	Fluvial	Properties in Ponteland.
Jan 1953	Tidal	Floods up to 1m (3 feet) deep caused by high tides land gales up to 82mph. Affected Golden Fleece, Regent Street, Waterloo Road, Havelock Street and Bondicar Terrace in Blyth.
Nov 1954	Tidal	Serious flooding in Blyth at High Ferry (1 in 38 yr return period).
Mar 1963	Fluvial	482 houses, shops, factories and garages flooded in Morpeth caused by snowmelt. Main road (A696), Callerton Lane. Some properties in Ponteland. Estimated return period 1:160 years.
Oct 1967	Fluvial	Third largest recorded event at Mitford gauging station on Wansbeck.
Sep 1968	Fluvial	Thunderstorm causes flooding of properties and commercial premises along Cotting Burn, Morpeth.
Jan 1978	Fluvial	Eland Haugh, Fairney Edge and Riverside, Ponteland.
Mar 1979	Fluvial	South Ponteland and Ponteland Bridge, also a construction site for houses in Darras Hall.
Jan 1982	Fluvial	9 houses and the social club at High Stanners, Morpeth. Second largest recorded flood event at Mitford gauging station on Wansbeck. Return period estimated at about 1:25 years.
Aug 1986	Fluvial	Flooding in Ponteland as a result of Fairney Burn.
Apr 1992	Fluvial	4 houses at High Stanners, Morpeth. 13 properties in Riverside and houses in Darras Hall. Estimated return period 1:35 years at Hartford Bridge gauging station on the Blyth.
Aug 1999	Tidal	Localised flooding in coastal areas.
Sept 2008	Fluvial	Largest recorded at Mitford, extensive flooding in Morpeth with approx 1000 properties effected from the River Wansbeck

16.5 Appendix 5 - EA Flood Zone Map



16.5.1 Sewer Flood Map

Please see next page.



NORTHUMBERLAND COUNTY COUNCIL

Northumberland Boundary

Reported Incidents of Sewer Flooding

- Medium Incidence
- Low Incidence
- High Incidence

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title:

Northumberland County Council Level 1 Strategic Flood Risk Assessment

Drawing Title:

Sewer Flooding Risk

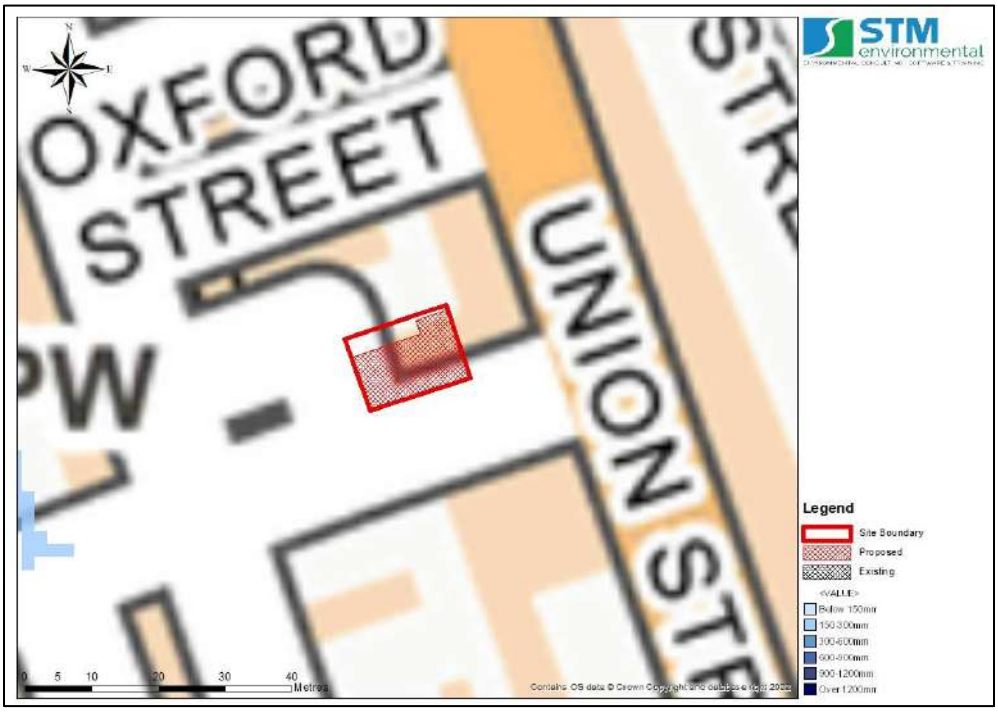
Scale at A3: AS SHOWN			
Drawn: CAB		Approved: LNO	
Stage 1 Check: SA	Stage 2 Check: SJA	Originated: CAB	Date: 09-04-10

Scott Wilson
Royal Court
Basil Close, Chesterfield
Derbyshire, S41 7SL
Telephone (01246) 209221
Fax (01246) 209229
www.scottwilson.com

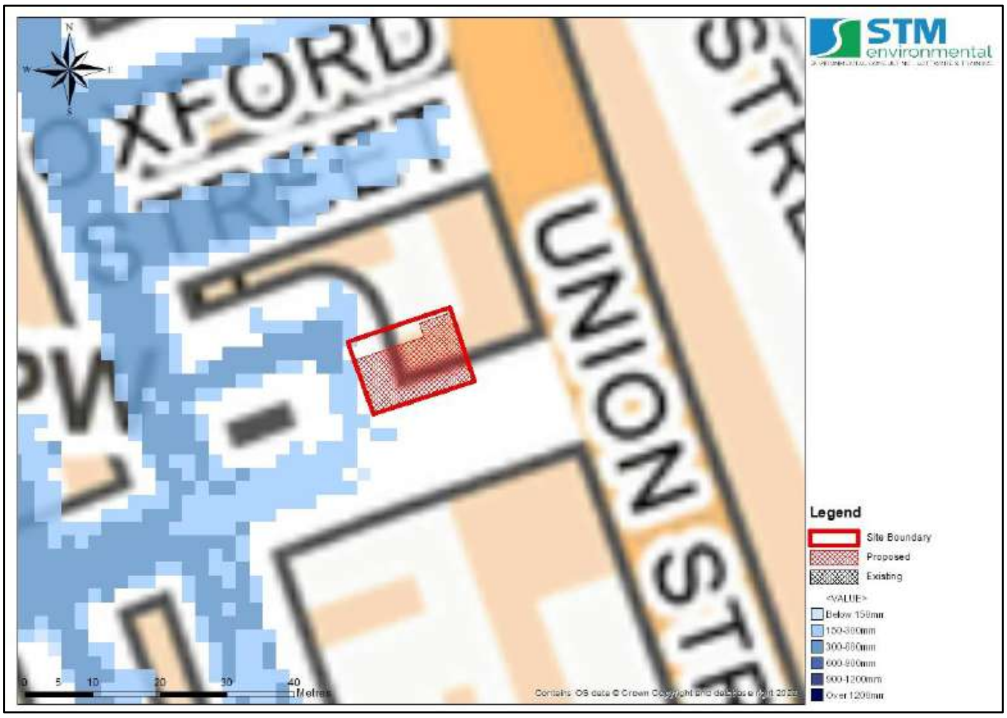
Drawing Number: S106308-B4

16.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

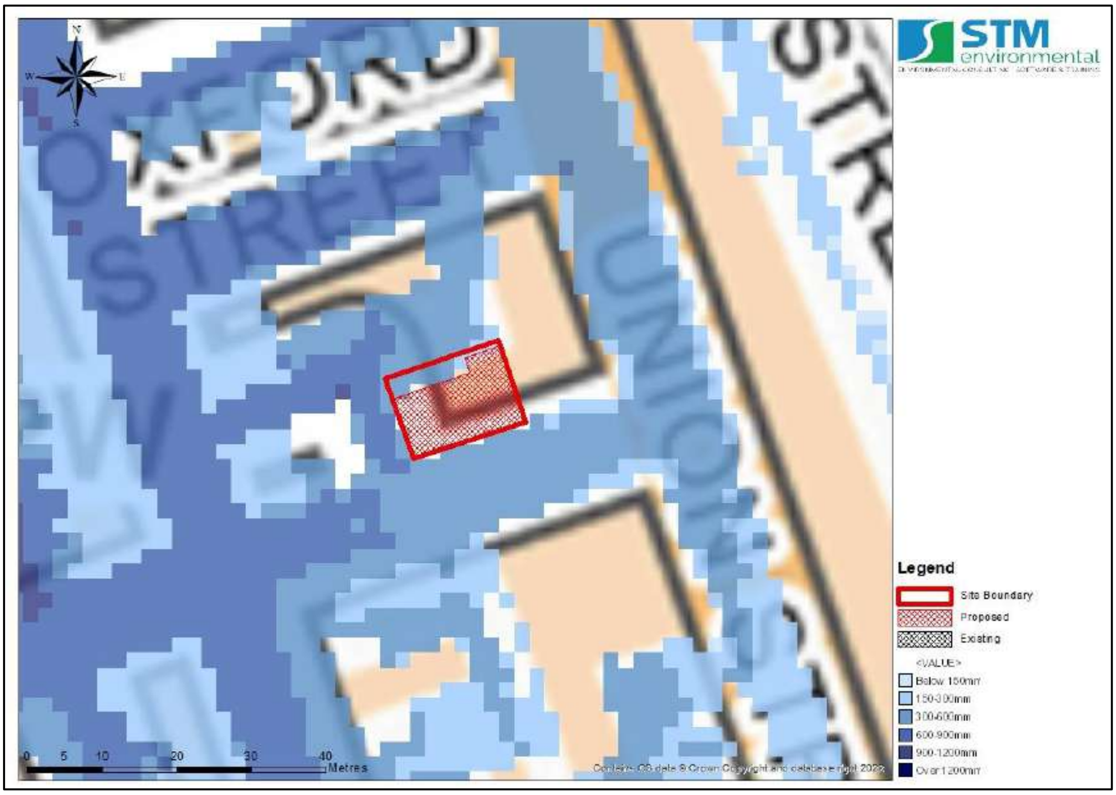
16.6.1 Predicted surface water flood depth for the 1 in 30-year return period (Source: EA, 2016).



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

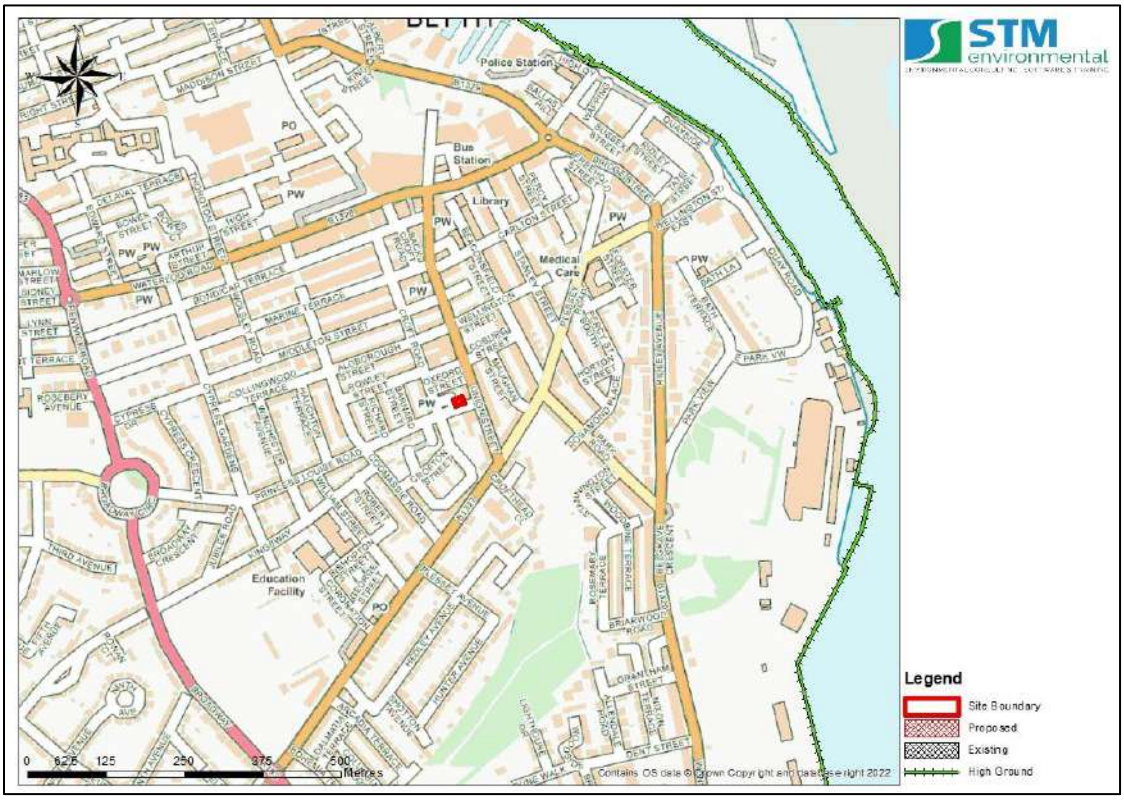


16.6.3 Predicted surface water flood depth for the 1 in 1000-year return period (Source: EA, 2016).

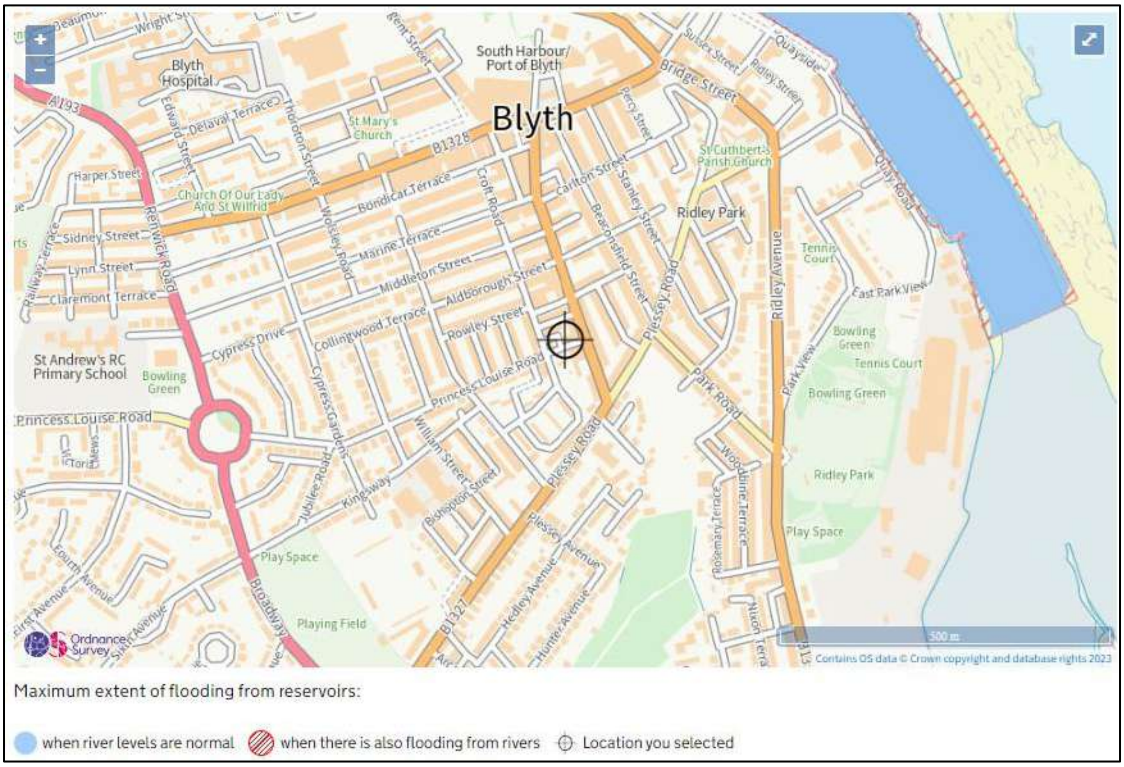


16.7 Appendix 7 –Flood Defence and Reservoir Flood Risk Maps

16.7.1 EA flood defence map



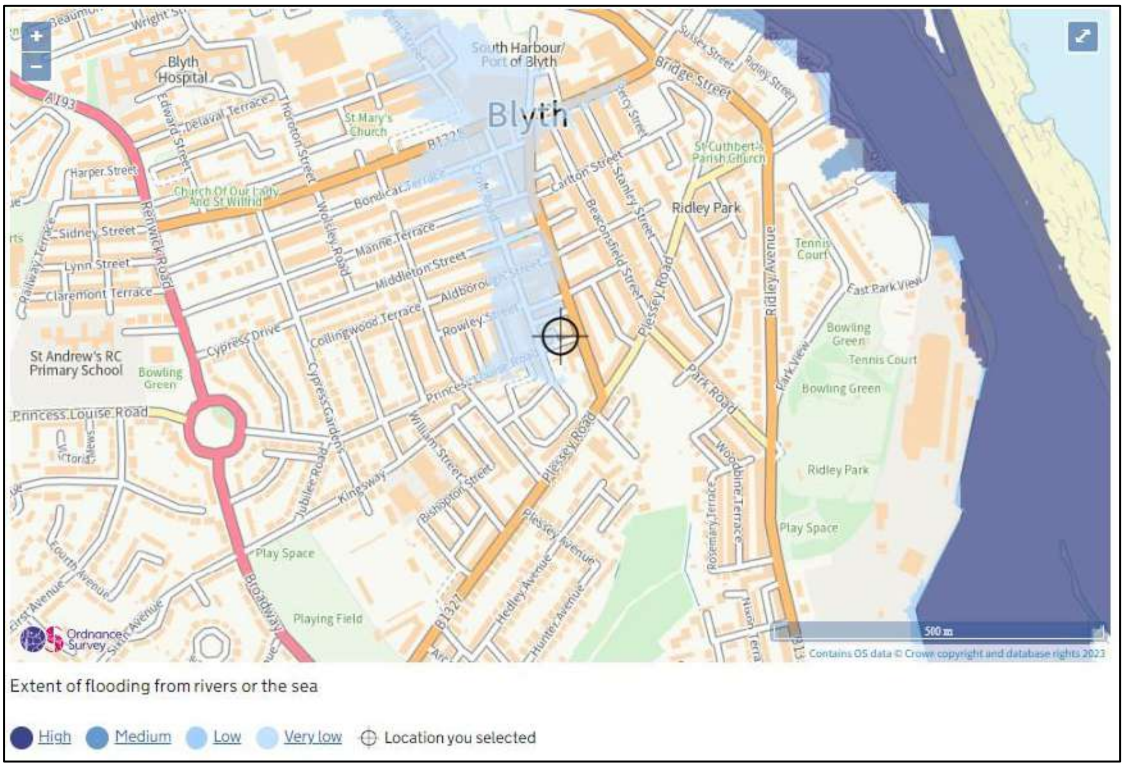
16.7.2 Reservoir Flood Risk Map



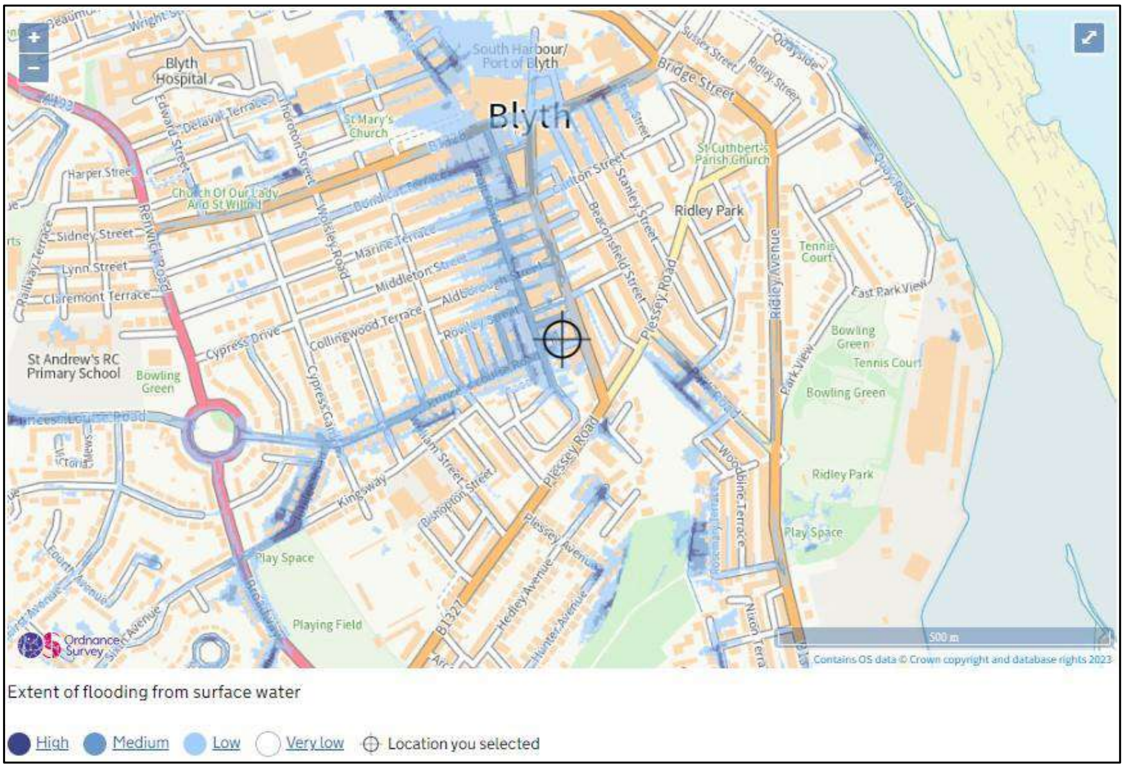
16.8 Appendix 8 – Risk of Flooding from Multiple Sources Map

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

16.9.1 Long Term Fluvial and Tidal Flood Risk

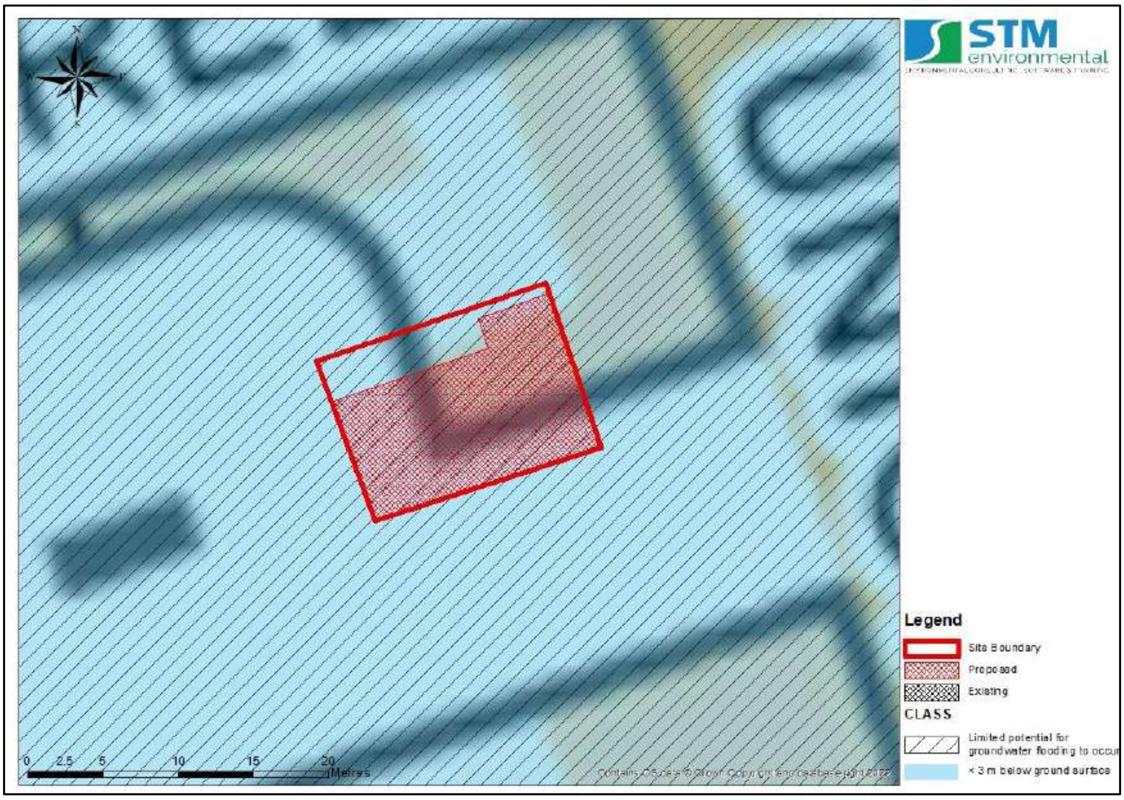


16.9.2 Long Term Pluvial Flood Risk



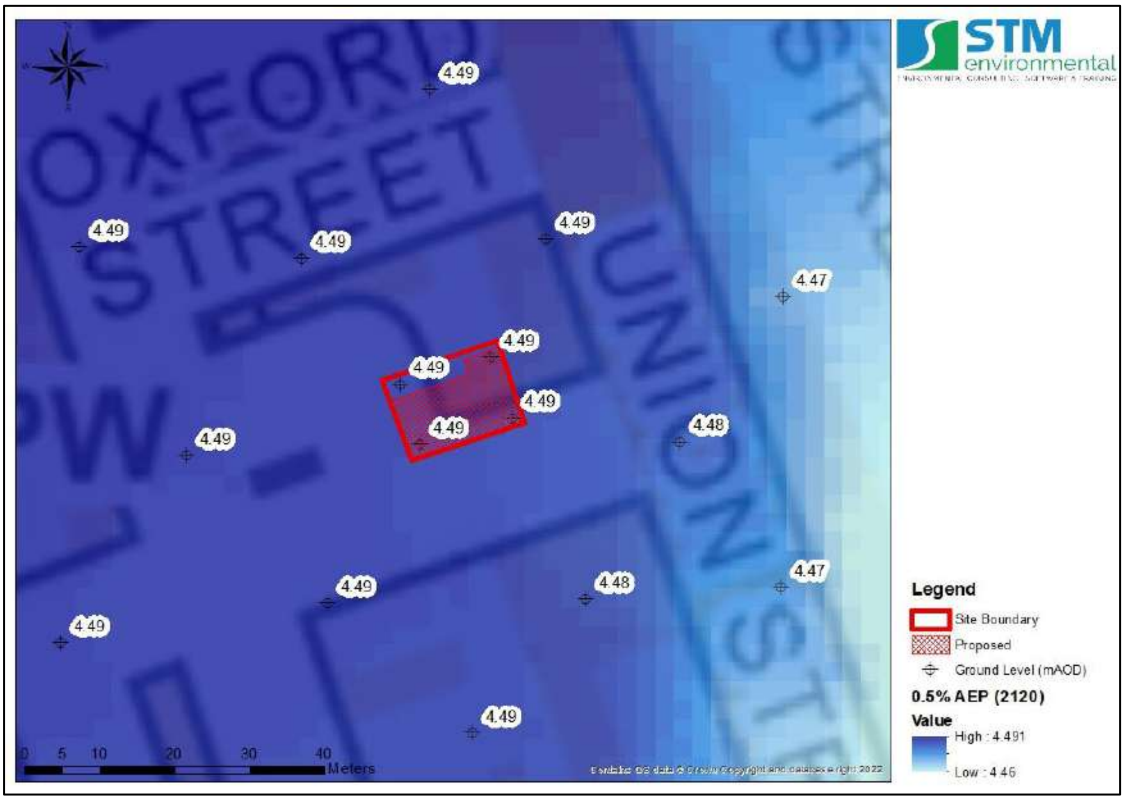
16.10 Appendix 10 – Groundwater Flood Maps

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



16.11 Appendix 11 - EA Product 4/6 (Detailed Flood Risk) Data

16.11.1 Flood Node Map



16.11.2 Product 4 Data

Please see next page.

Tidal Node Point Table
Blyth

Chainage		3612	3614	3616	3618
Easting		432,630.05	433,690.89	434,367.90	434,378.05
Northing		584,237.77	582,543.25	580,683.91	578,813.10
Level at Return Period (1:x)*	*1*	3.22	3.22	3.23	3.22
	2	3.29	3.3	3.3	3.29
	5	3.4	3.4	3.41	3.4
	10	3.48	3.49	3.49	3.48
	20	3.58	3.58	3.58	3.58
	25	3.61	3.61	3.61	3.61
	50	3.7	3.7	3.7	3.7
	75	3.76	3.76	3.76	3.76
	100	3.79	3.79	3.8	3.79
	150	3.86	3.86	3.86	3.86
	200	3.9	3.9	3.9	3.9
	250	3.94	3.94	3.94	3.93
	300	3.96	3.96	3.96	3.96
	500	4.05	4.05	4.05	4.04
	1000	4.16	4.16	4.16	4.15

*Levels are in mAOD

Environment Agency

Legend

Node Points with Modelled Tidal Flood Levels ★

Node Point Location Plan Blyth

Date: Aug 2023 Scale: N.T.S. Status: Final

MapEdit data quality flag: Adequate

Data Source: MapEdit 03-08-2023

Approved by: James Carradice 03-08-2023

Flood Map for Planning

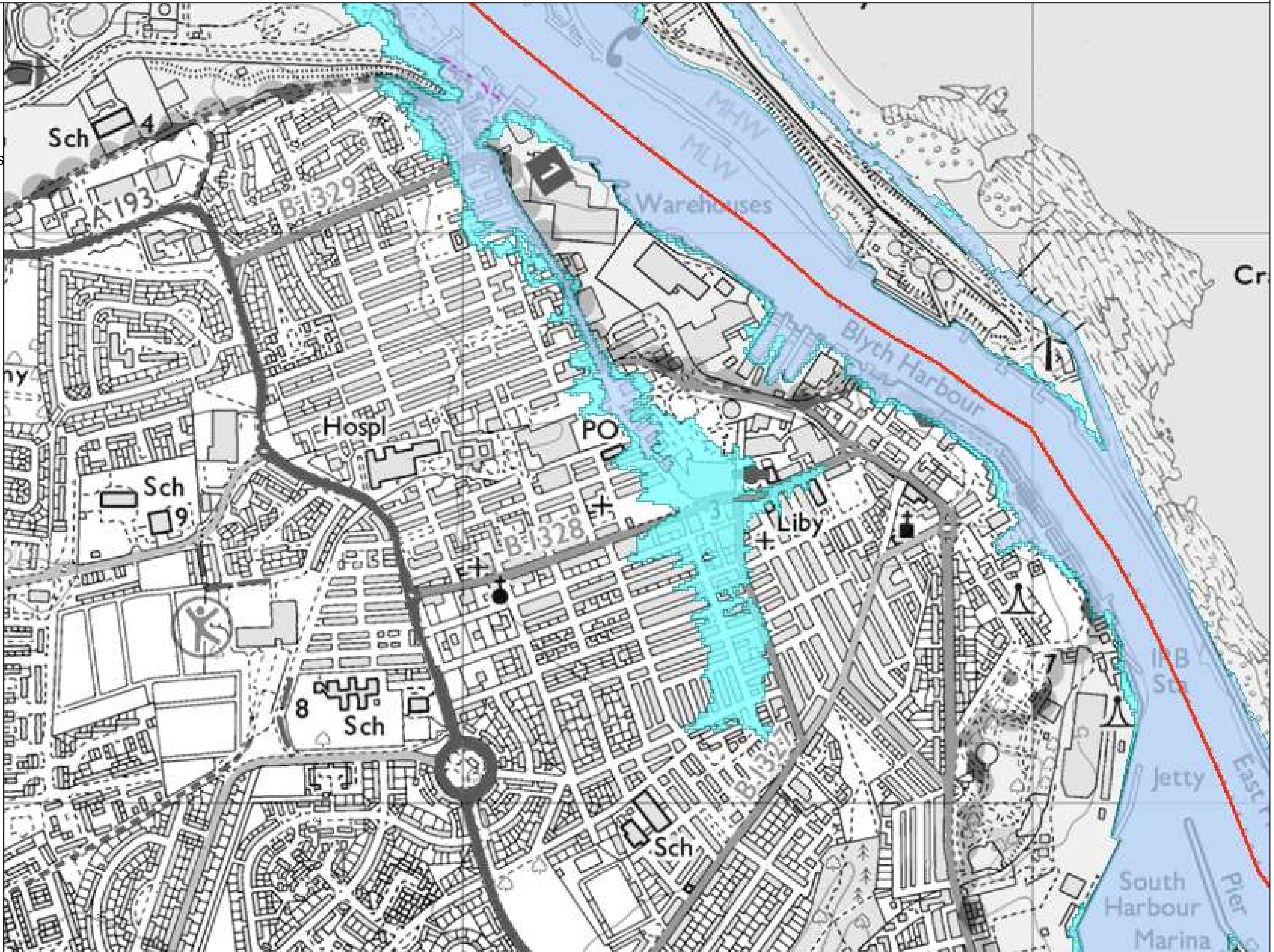
Legend

- Statutory Main Rivers
- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

1: 10,000

0 250

Metres



Surface Water Flood Risk

Environment Agency

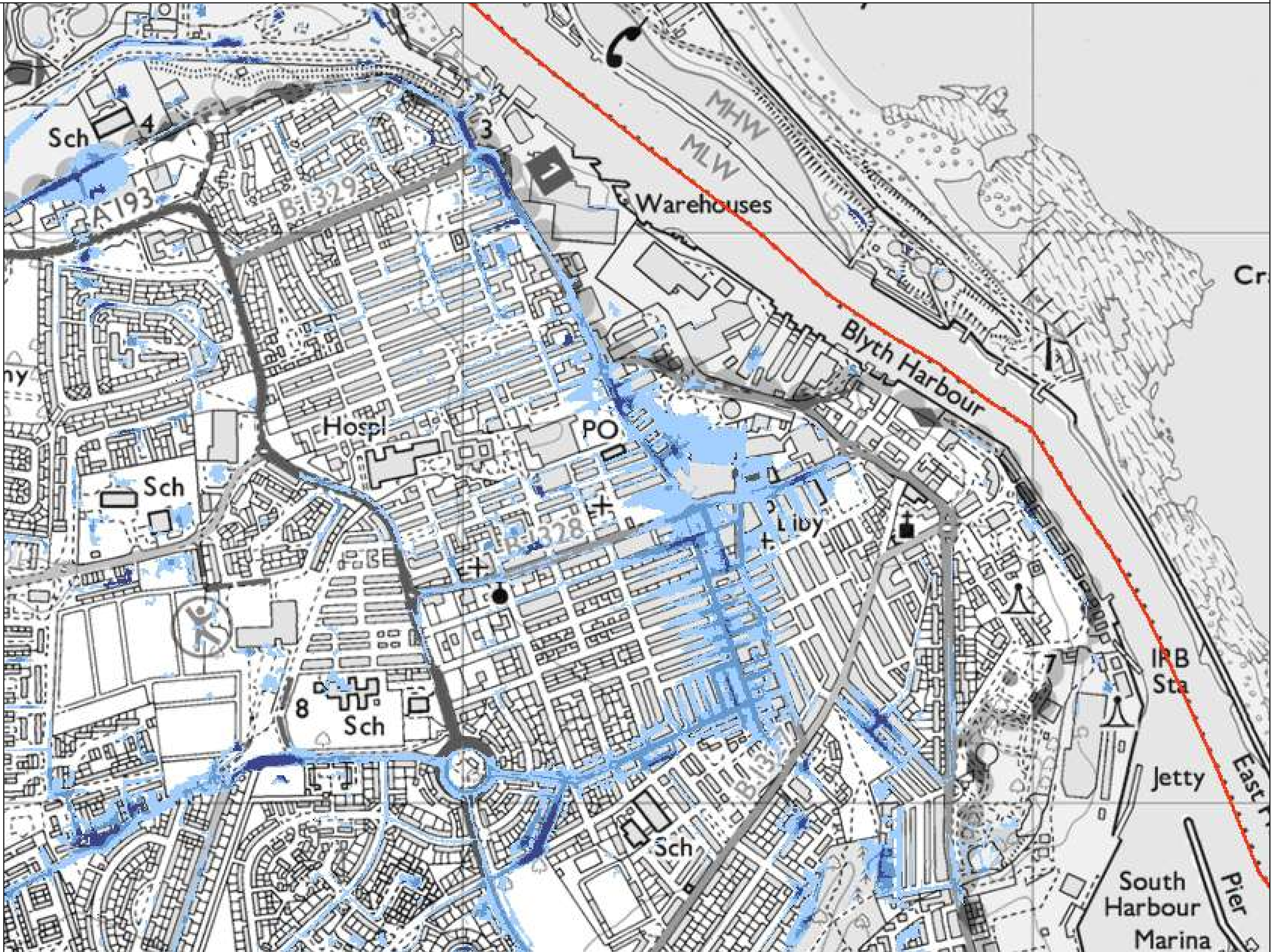
Legend

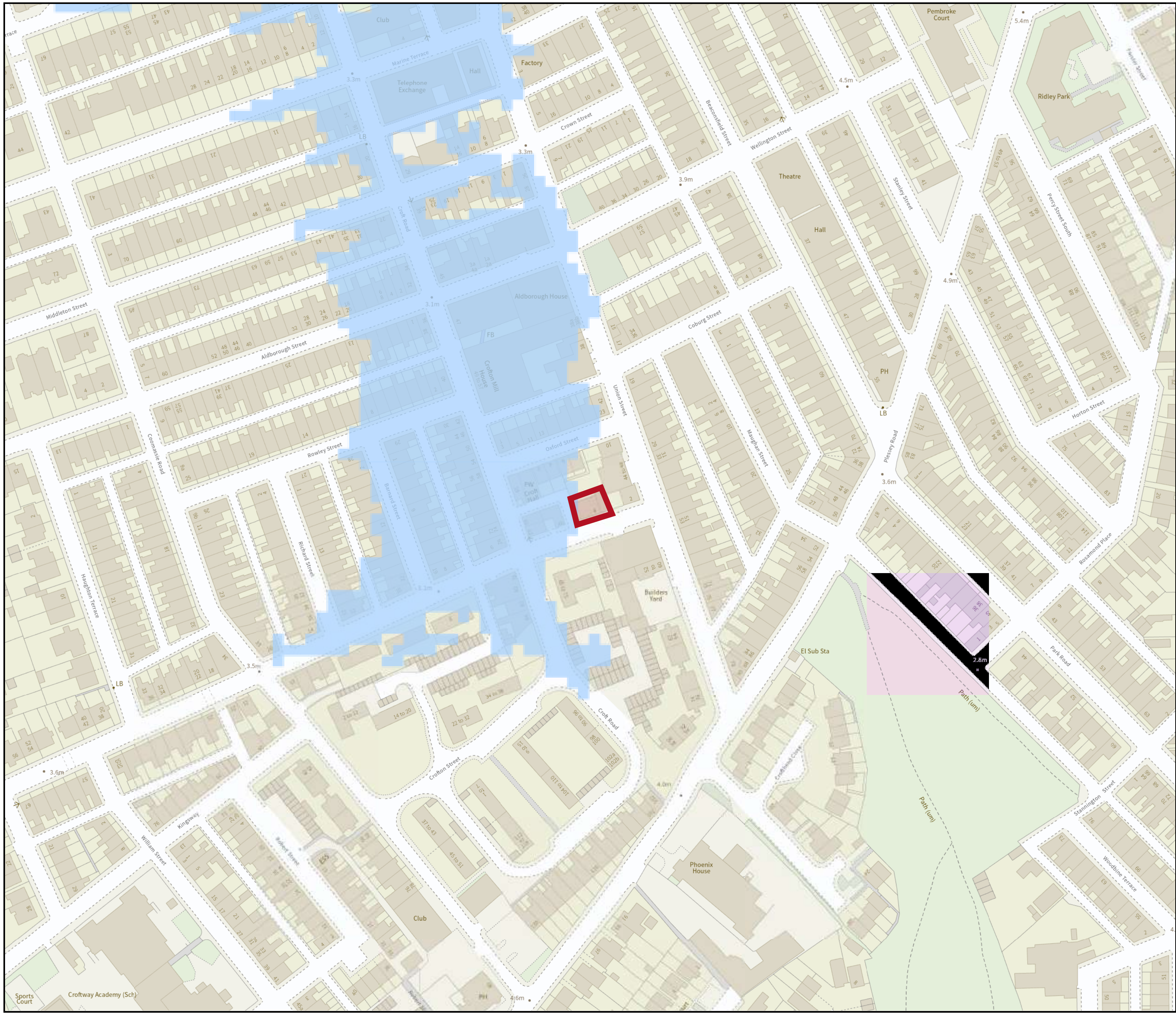
- Statutory Main Rivers
- High (>= 3.3%)
- Medium (3.3% - 1%)
- Low (1% - 0.1%)

1: 10,000

0 250

Metres





Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
431538/581198

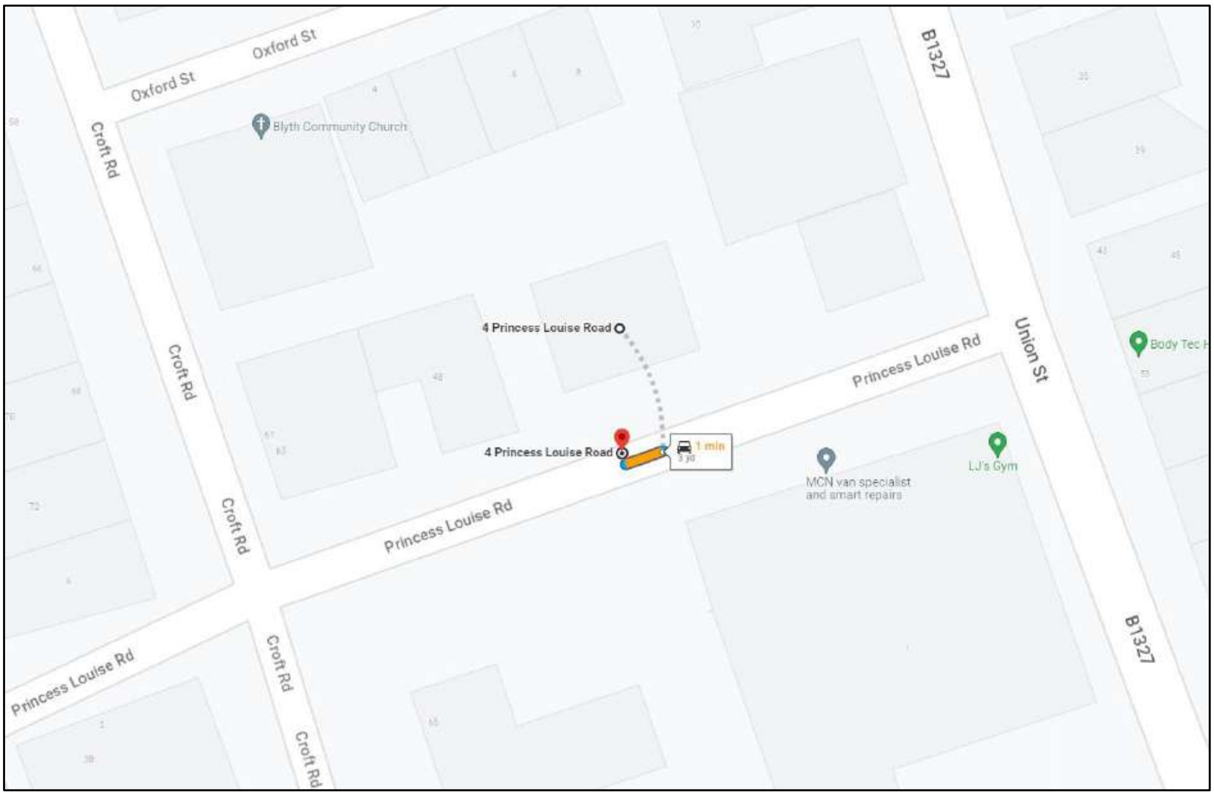
Scale
1:2500

Created
14 Jun 2023 10:58

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

16.12 Appendix 12 – Safe Egress to Flood Zone 1 Map



16.13 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".