FLOODPLAN LIMITED

Project Title: 00126 13 Olney Avenue, Manchester

Product: Level 3 Flood Risk Assessment

Date: 26 July 2021

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Report Revision Log

Report Reference	Date Issued	Issued To	Notes
00126 13 Olney Avenue	27/07/2021	Client	

1. INTRODUCTION

1.1. PURPOSE OF THE REPORT

FloodPlan have been commissioned on behalf of Mr N. Sharif to produce a Flood Risk Assessment for a site at 13 Olney Avenue, Benchill, Manchester, M22 8AB. This assessment has been conducted with the understanding that the document will be used as part of a planning permission proposal by Mr N. Sharif.

1.2. LOCATION OF SUBJECT SITE

The site is located a site at 13 Olney Avenue, Benchill, Manchester, M22 8AB. (382789, 388542). Access to the site is gained via Olney Avenue. LiDAR shows the site level to be circa 41.0mAoD.

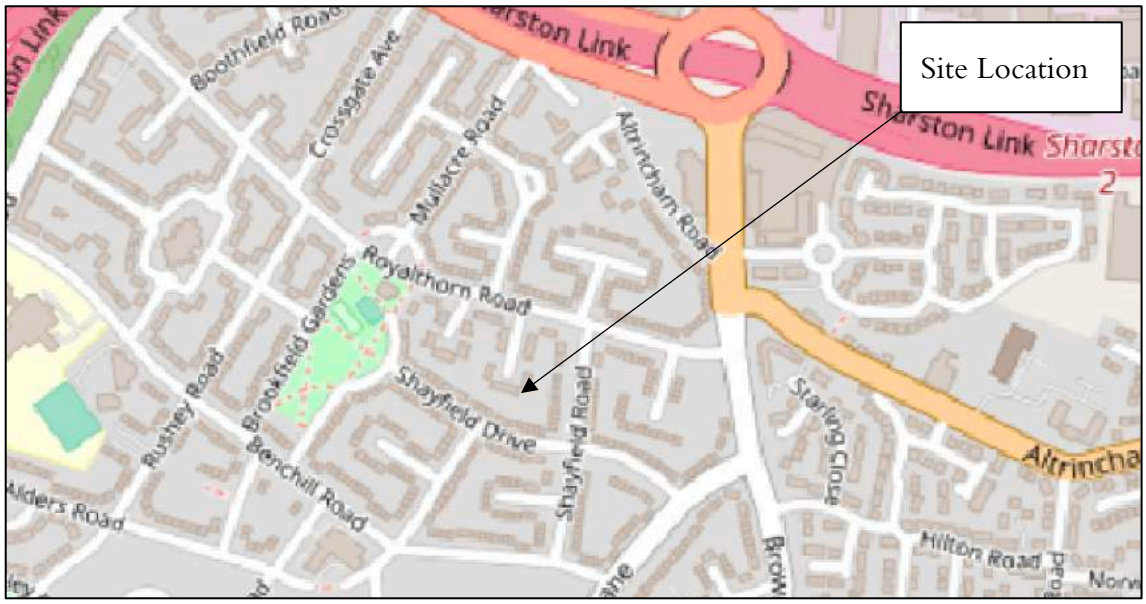


Figure 1: Site Location

1.3. SITE PROPOSALS

The existing site is used as an amenity area and is therefore designated as 'less vulnerable'. The proposed extension is to be used as part of a residential dwelling and is therefore designated as 'more vulnerable'. The development therefore increases the vulnerability classification of the site. The development is likely to increase the impermeable area on site. Proposals can be seen in Appendix A: Development Plan.

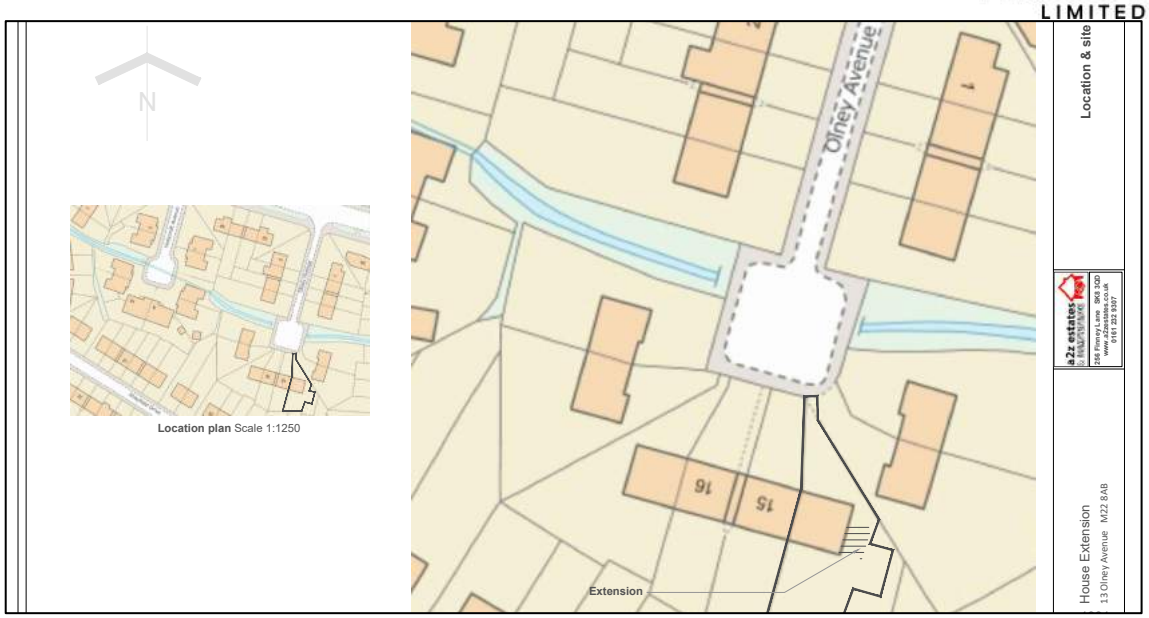


Figure 2: Development Location Plan

2. ASSESSMENT OF NPPF

2.1. INTRODUCTION TO NPPF

The National Planning Policy Framework (NPPF) document provides guidance to local planning authorities to ensure the effective implementation of the planning policy. The policy seeks to direct development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. For these purposes:

- "areas at risk of flooding" means land within Flood Zones 2 and 3; or land within Flood Zone 1 which has critical drainage problems, and which has been notified to the local planning authority by the Environment Agency.
- "flood risk" means risk from all sources of flooding - including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers, and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

Flood risk (from river and sea) are categorised inro one of the below:

2.2. FLOOD RISK CLASSIFICATIONS

Flood Zone	Probability of flooding
Zone 1	Low probability
Zone 2	Medium probability
Zone 3a	High probability
Zone 3b	Functional Floodplain

2.3. FLOOD RISK VULNERABILITY CLASSIFICATION

NPPF categorises land by vulnerability. A summary of categories can be seen below:

Vulnerability Class	Infrastructure
Essential Infrastructure	Power stations, water treatment works, wind turbines etc.

Highly vulnerable	Police stations, basement dwellings, caravans, mobile homes etc
More vulnerable	Hospitals, residential buildings, landfill sites, drinking establishments etc
Less Vulnerable	Emergency services stations, shops and building that offer professional services etc
Water compatible development	Pumping stations, docks, marinas etc

2.4. SUITABLE DEVELOPMENT MATRIX

The below table outlines the suitable development type for the flood zone classification assigned by the Environment Agency flood maps.

Flood risk vulnerability classification	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Zone 1					
Zone 2			Exception Test Required		
Zone 3a	Exception Test Required			Exception Test Required	
Zone 3b Functional floodplain	Exception Test Required				

Figure 3: Suitable Development Matrix

Key: Blue Development is appropriate; Red Development should not be permitted; Green Development is appropriate with the passing of an Exception Test.

3. NPPF SITE ASSESSMENT

3.1. FLOOD ZONE CLASSIFICATION

As per Figure 4, the site is wholly within flood zone 2 with the access being in flood zone 3. The site does not benefit from flood defences. Importantly, the site is not designated a flood storage area.

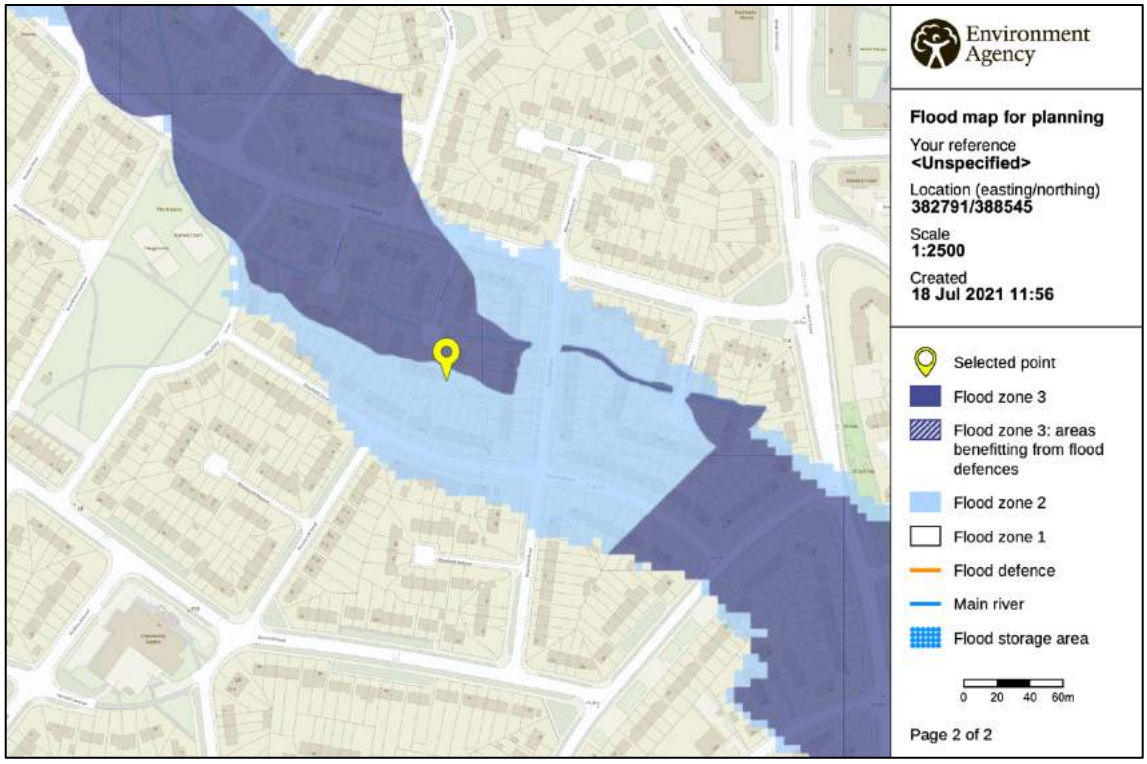


Figure 4: Flood Zone

3.2. LAND VULNERABILITY CLASSIFICATION

The existing site is used as an amenity area and is therefore designated as 'less vulnerable' by NPPF. The proposed development being an addition to a residential dwelling, will be designated 'more vulnerable'. The development therefore increases the vulnerability classification of the site.

3.3. SITE SUITABILITY (NPPF)

'More vulnerable' development is suitable for flood zone 2, as per Figure 3.

4. SITE FLOOD RISK

4.1. THIRD PARTY FLOOD RISK DATA SUMMERY

A 'Groundsure' flood report has been acquired for advising this assessment. The full report can be found in Appendix B. The main findings are summarised below:

Type of Risk	Assessment of Risk
Overall Flood Risk	High
Rivers and the Sea	Medium
Surface Water	Significant
Groundwater	Low
Historic Flood	Not Identified
Flood Defences	No
FloodScoreTM – insurance rating	High

4.2. SURFACE WATER FLOODING

The Environment Agency surface water flood map Figure 5, shows the site is at a medium risk from surface water flooding. It should be noted that the proposed access route via Olney Avenue experiences a high risk of surface water flooding. Users of the site should be made aware.

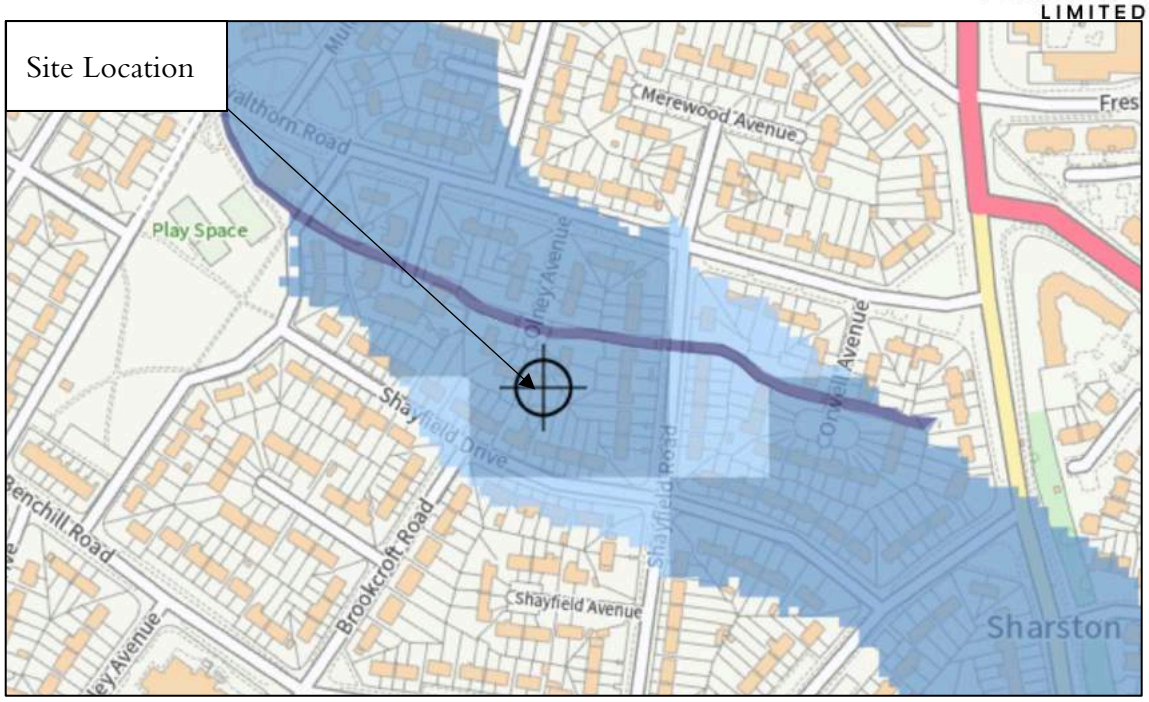


Figure 5: EA Surface Water Flood Map

Where the dark blue shaded area denotes high risk of surface water flooding; the light blue denotes low risk with white areas having very low risk of surface water flooding. The risk classification is comparable to the 'Groundsure' flood report.

4.3.4.3 TIDAL AND FLUVIAL FLOODING

The site is classified as having a medium risk of flooding from tidal or river sources by the EA mapping and Groundsure flood report.

Figure 6: EA Tidal and Fluvial Flood Map

Where the dark blue shaded area denotes high risk of tidal and pluvial flooding; the light blue denotes low risk with the lightest blue areas having a very low risk of surface water flooding.

The Environment Agency provided hydraulic model outputs (Appendix C: Hydraulic Modelling Output) on the 8th of July 2021. The models rearrest node is 'BROW01_0869u' directly northwest of the subject site. The node shows a maximum flood level of 41.15mAoD for the present day 1% fluvial event + 70%CC. It would be reasonable to suggest that the subject site will experience the same maximum flood level. The subject site has a ground level of circa 41.0mAoD. Circa 150mm of flooding is expected during the extreme flood event. This report recommends a flood free FFL (+300mm) and/or flood resistant/resilient materials be considered.

4.4. GROUNDWATER FLOODING

The 'Groundsure' flood report indicates that the site has a low risk of groundwater flooding.

4.5. RESERVOIR FLOODING

The site is at not believed to be at risk of flooding from reservoir sources.

4.6. CANAL AND ARTIFICIAL WATER FLOODING

The site is at not believed to be at risk of flooding from artificial water sources.

4.1. HISTORIC FLOODING

The 'Groundsure' flood report failed to identify any historic flooding.

5. FURTHER SITE ASSESSMENT

5.1. SITE ACCESS AND EGRESS ROUTES

Access to the site is proposed via Olney Avenue. The access road experiences some fluvial and surface water flood risk.

5.2. FLOOD COMPENSATION

The development is proposing an increase in impermeable area. The development should have a suitable SuDS design to ensure water quality and acceptable run off. The design should also ensure no third-party impacts.

5.3. FLOOD WARNING AREAS

The below Figure 7, highlights the areas that are considered to benefit from Environment Agency flood warnings. The site is outside of the warning area.

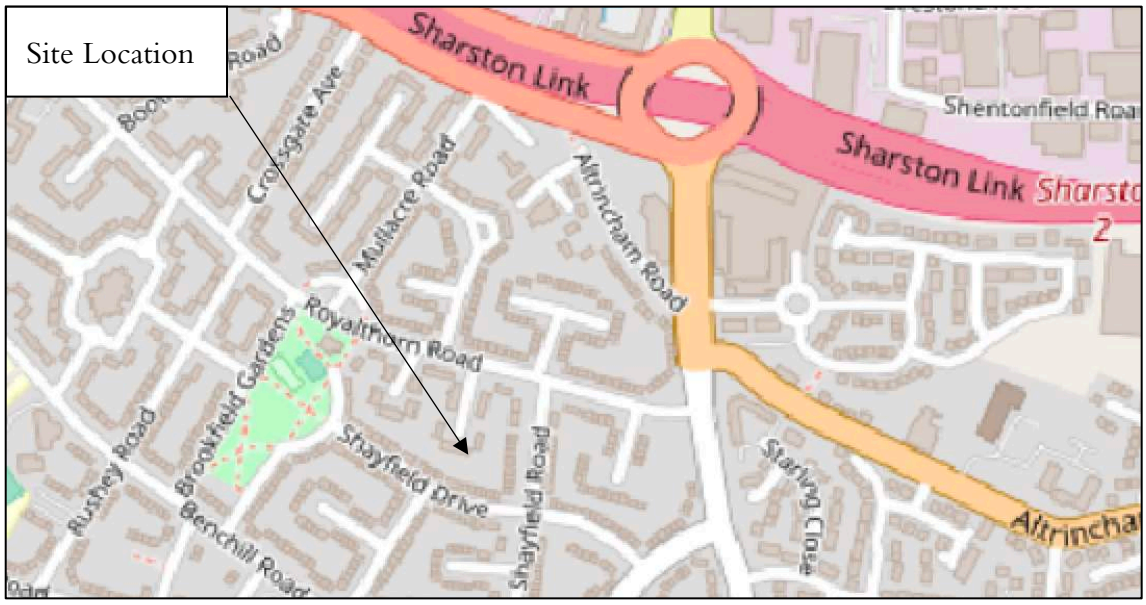


Figure 7: EA Flood Warning Areas

5.4. AWARENESS OF FLOOD RISK

The developer should be aware that the site is not immune from flooding. It is recommended that all residents take the opportunity to develop emergency and non-emergency plans.

5.5. SEQUENTIAL TEST

Not Applicable

5.6. EXCEPTION TEST

Not Applicable

6. FINDINGS AND RECOMMENDATIONS

6.1. FINDINGS

The development plans propose the change of use from amenity to a residential use extension. More vulnerable developments are suitable for flood zone 2. The site is subject to fluvial and tidal and surface water flooding. The risk of flooding is not negligible but should be found acceptable for the development vulnerability classification.

6.2. RECOMMENDATIONS

This report recommends the following be considered to lower the risk and/or consequences that flooding may cause to the proposed development:

- Property level flood protection and resilience should be considered
- Any impermeable areas created should be subject to SuDS treatment and attenuation with a controlled discharge.
- A bespoke evacuation plan should be considered.

List of Appendices

Appendix A: Development Plan

Appendix B: Groundsure Flood Report

Appendix C: Hydraulic Modelling Output

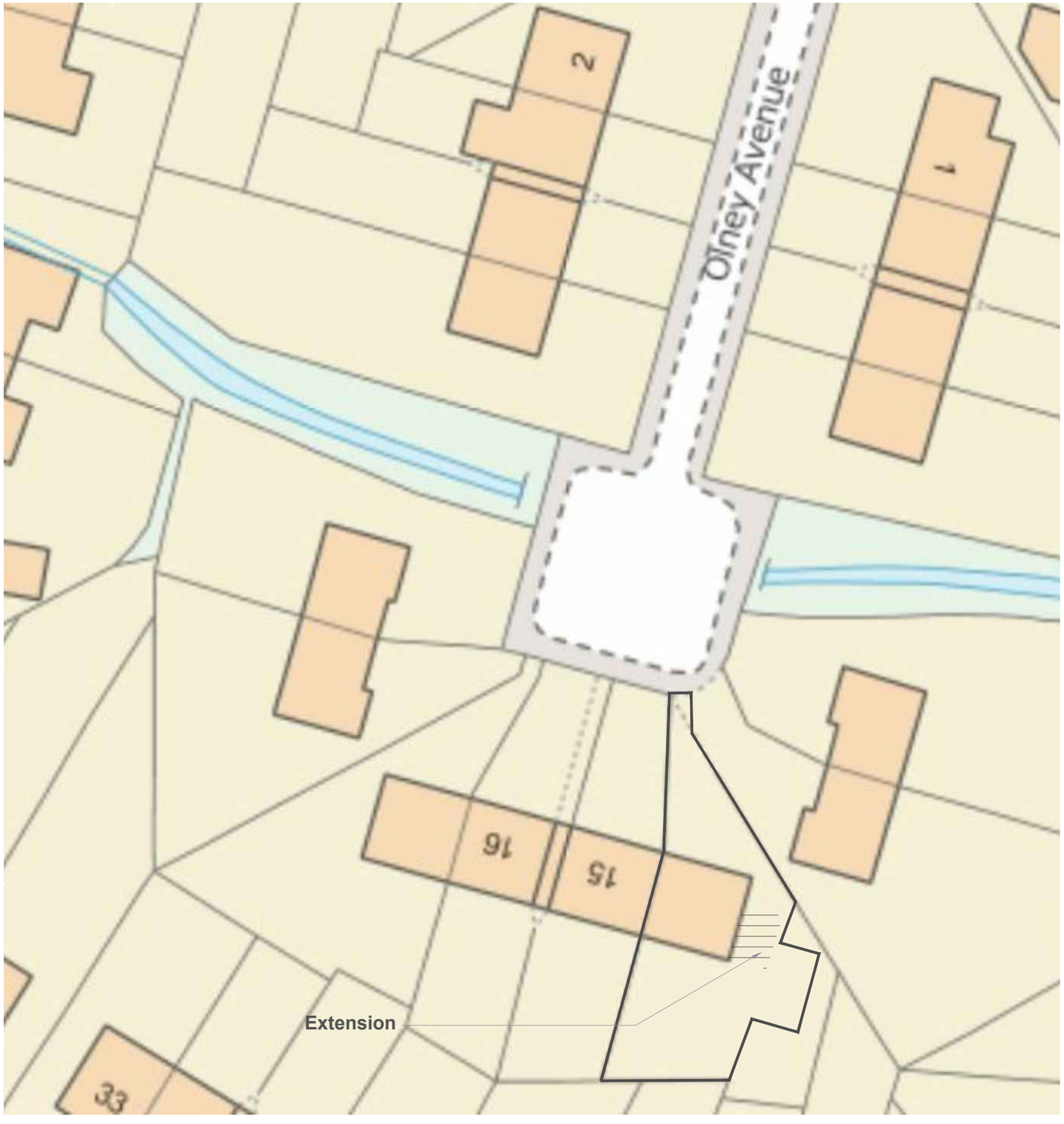
<u>List of Appendices</u>

Appendix A: Development

All These drawings are for the purpose of achieving local authority planning and building regulations plans approval only and should not be used as a working drawings for building construction. These design drawings must be read in conjunction with structural engineers design, drawings and calculations.

N

Location plan Scale 1:1250



Site Plan Scale 1:500

Location & site plan @A3

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www.a2zestates.co.uk
0161 232 9307

House Extension
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1931

01c

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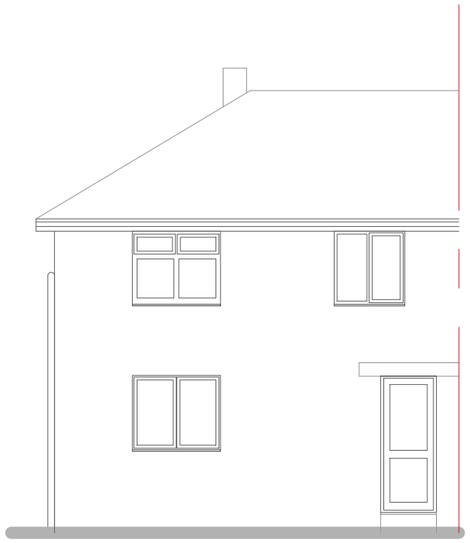
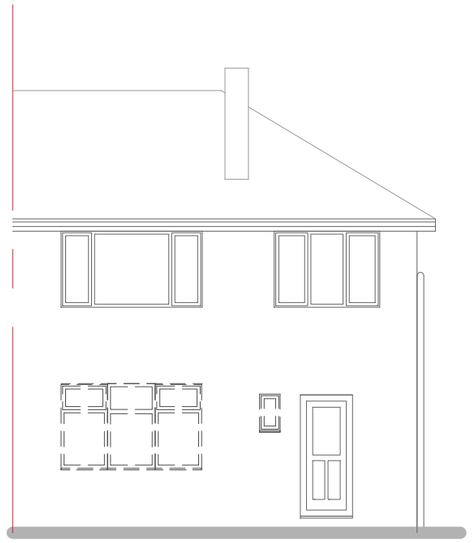
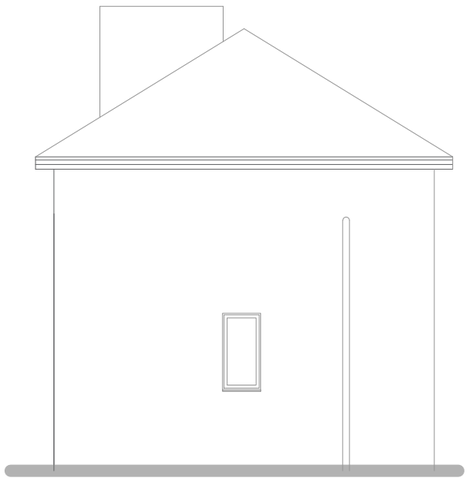


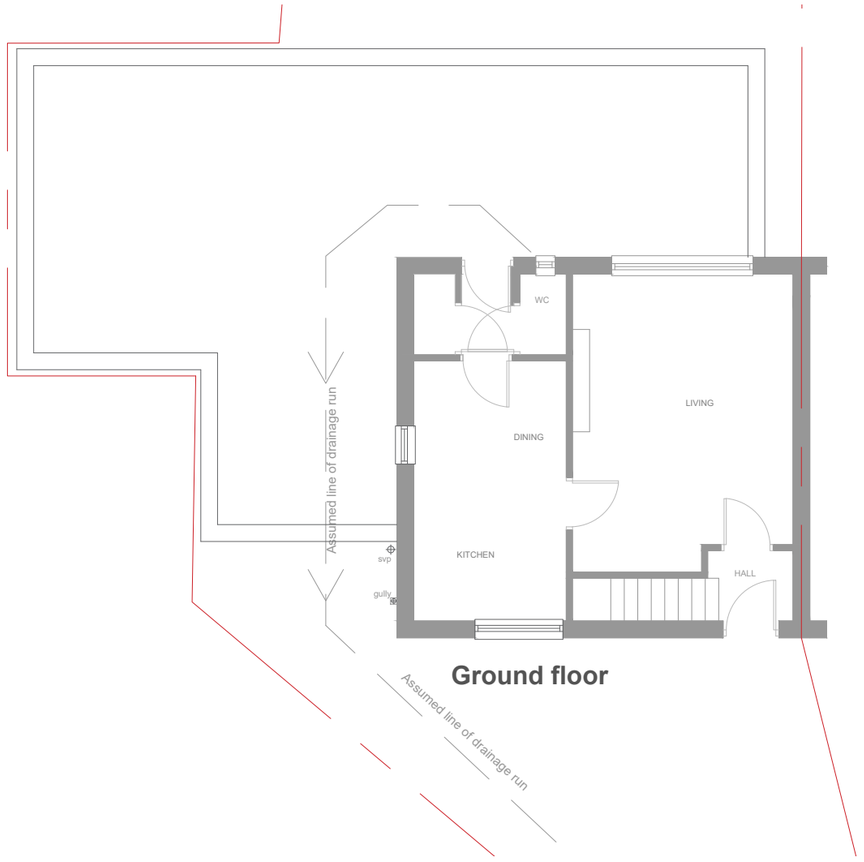
Front Elevation



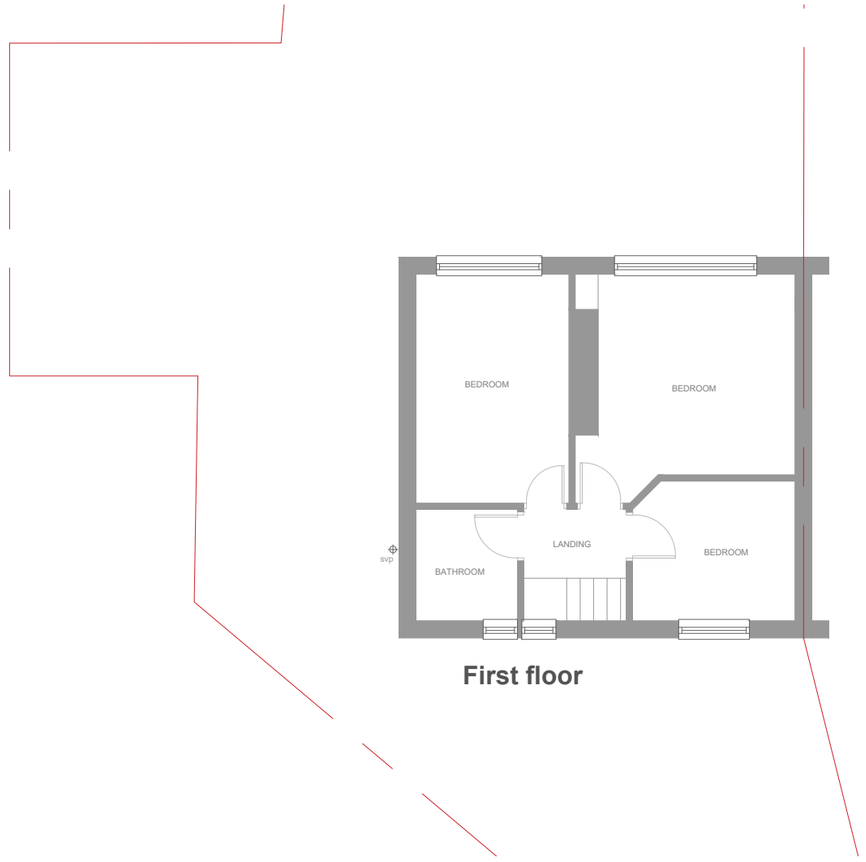
Rear Elevation



Side Elevation



Ground floor



First floor

Floor Plans and Elevations

1:100 @A3

Existing

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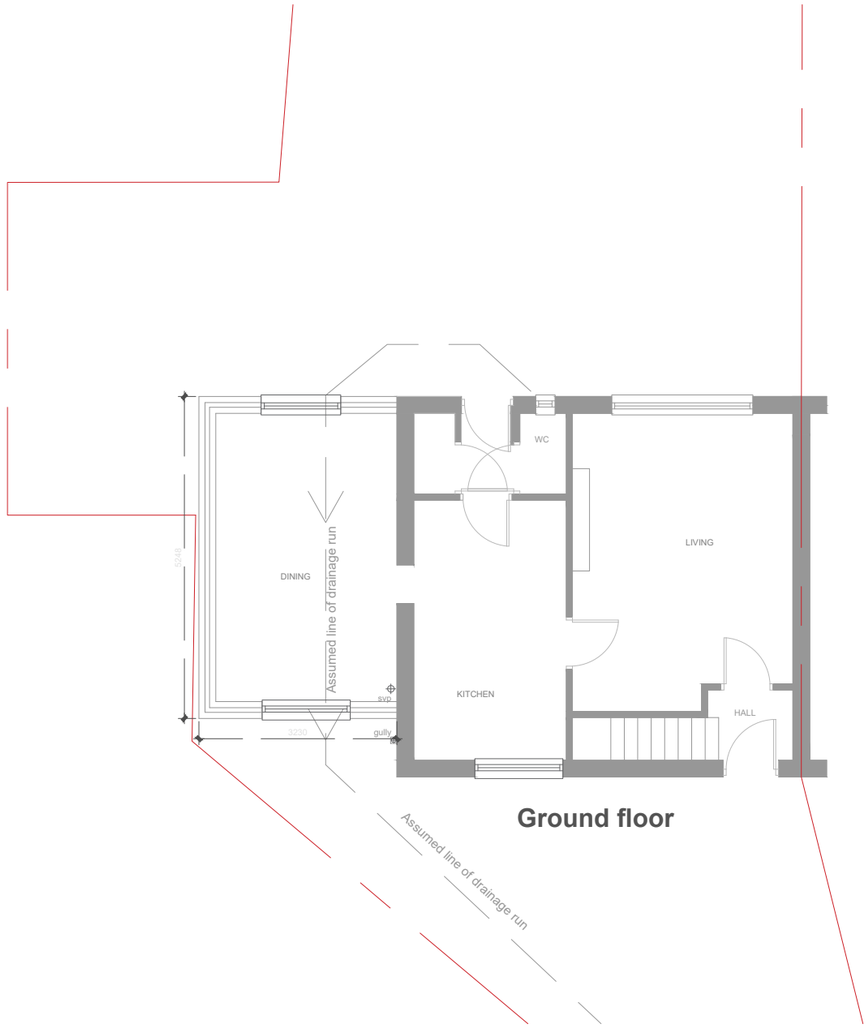
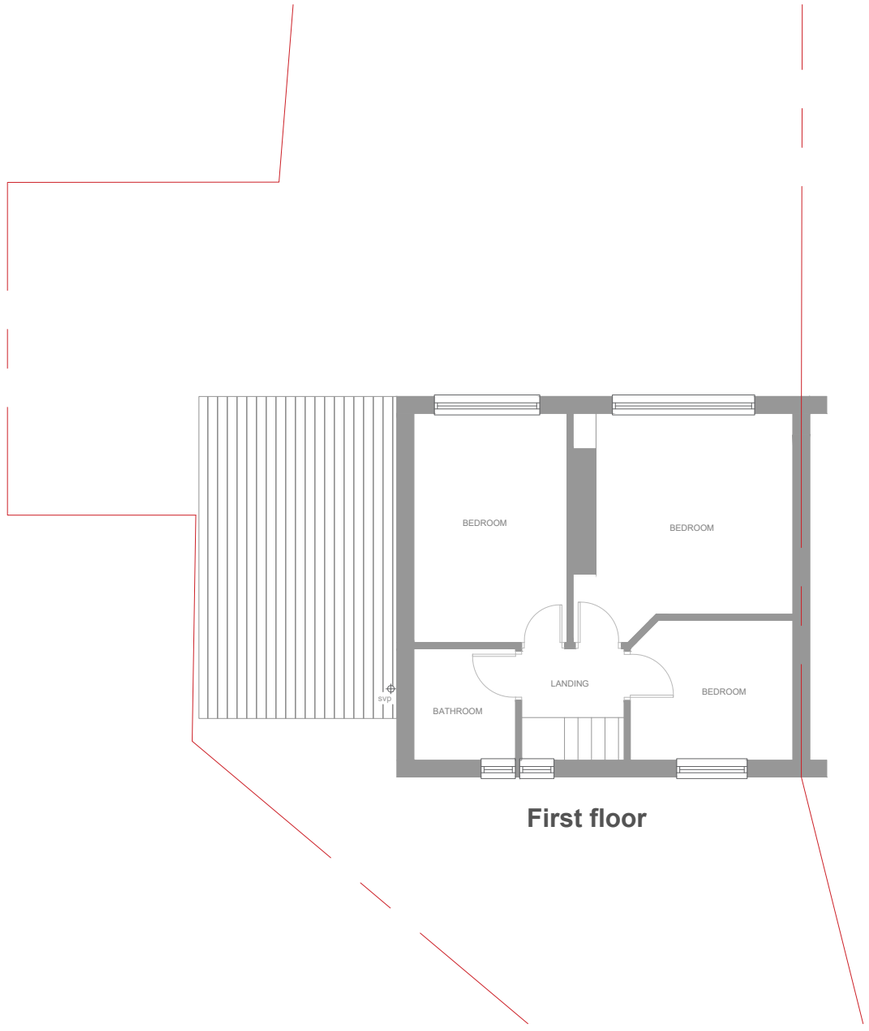


Ground floor



First floor

1:100@A3

Proposed

Floor Plans

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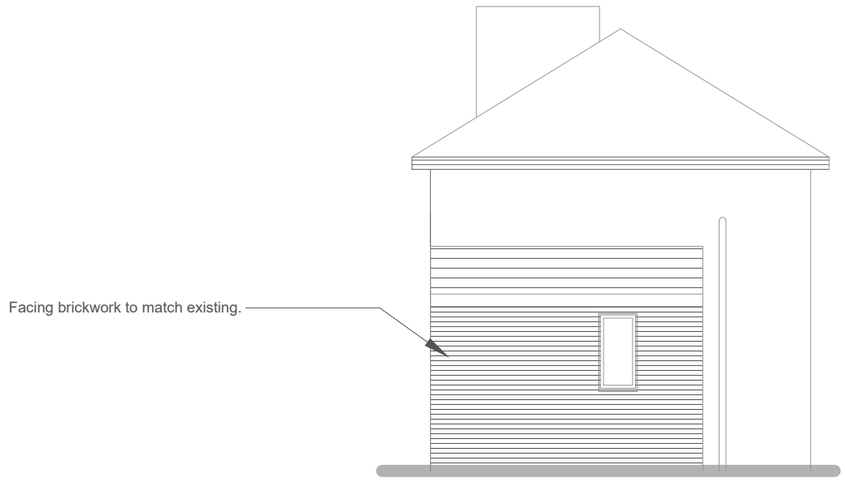
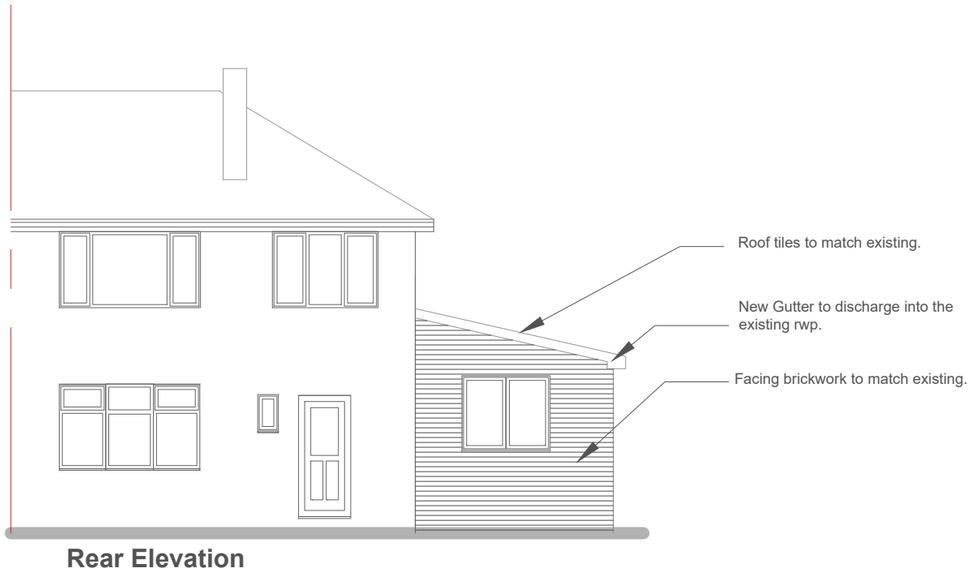
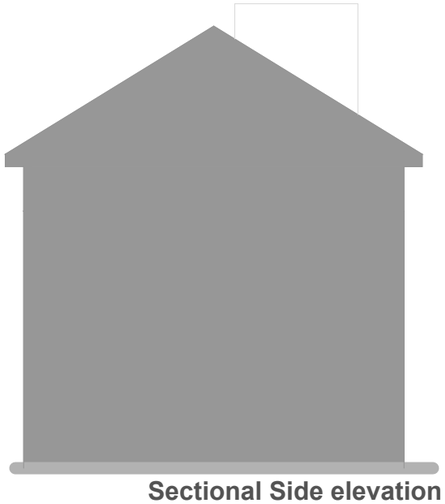
Front Elevation



Side Elevation



Rear Elevation



Sectional Side elevation

Elevations 1:100@A3

Proposed

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Appendix B: Groundsure Flood Report

Groundsure
LOCATION INTELLIGENCE

Flood

382787 388545

Overall Flood Risk

HIGH

Groundsure Flood complies with relevant Law Society practice notes on flood risk in property transactions.

Site plan

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Search Results

Rivers and the Sea
Medium
page 3

Surface Water
Significant
page 4

Groundwater
Low

Historic Flood
Not identified

Flood Defences
No

FloodScore™ insurance rating
High
page 7

Full assessments for other environmental risks are available in additional Groundsure searches including the Groundsure Avista 7 in 1 report. Contact Groundsure or your search provider for further details.

Overview of findings and recommendations

To save you time when assessing the report, we only provide maps and data tables of features within the search radius that we have identified to be of note. These relate to environmental risks that may have liability implications, affect insurance premiums, property values and/or a lender's willingness to lend.

You can view the fully comprehensive library of information we have searched on **page 7**.

Flooding

Flooding

An elevated level of flood risk has been identified at the property.

Next steps for consideration:

- check to see if the property is eligible for the Flood Re scheme, which enables many properties at risk of flooding to be insured at reasonable rates: http://www.floodre.co.uk/homeowner/about-us/
- investigate the insurance on offer for the property to ensure any implications on premiums are fully understood before completion
- the assessment in this report is based on the highest flood risk found within the site boundary. The detailed maps within the flood section clearly highlight which parts of the site are affected by flooding, allowing you to visualise whether flood risk affects the buildings or the associated land. If you would prefer an assessment that provides separate flood ratings for the main dwelling and the associated land, Groundsure can provide this for a fee of £35 plus VAT
- if the property has recently been constructed, the flood risk assessment contained within this report will not take into account any measures put in place by the developer to deal with flooding. You should seek further information from the developer on flood risk mitigation for the site
- investigate the various forms of flood resistance and resilience measures that will help protect your property in the event of a flood

Flooding / Risk of flooding from rivers and the sea

Risk of flooding from rivers and the sea

The property has a Medium chance of flooding in any given year, according to Risk of Flooding from Rivers and Sea (RoFRaS) data. This could cause problems with insuring the property against flood risk. However, if built before 2009, it may be eligible for insurance assistance from the Flood Re scheme: http://www.floodre.co.uk/

RoFRaS assesses flood risk from rivers and the sea in England and Wales, using local data and expertise. It shows the chance of flooding from rivers or the sea, taking account of flood defences and the condition those defences are in. The RoFRaS model uses local water level and flood defence data to model flood risk. See below for explanation of the RoFRaS levels of flood risk.

Please see **page 2** for further advice.

Environment Agency RoFRaS risk ratings

Very Low	Low	Medium	High
The chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.	The chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.	The chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.	The chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

Flooding / Surface water flood risk

Surface water flood risk

The property is likely to be prone to flooding following extreme rainfall, which may have an impact on insuring the property against flood risk. However, if built before 2009, it may be eligible for insurance assistance from the Flood Re scheme: http://www.floodre.co.uk/

The area in which the property is located has been assessed to be at a Significant risk of surface water flooding. This area is considered to have a 1 in 30 probability of surface water flooding due to rainfall in a given year to a depth of between 0.3m and 1.0m. However, as is the case with probability statistics and predictions,

this information should be used as a guideline only. The area may flood several years in a row, or not at all for many years. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

These risk calculations are based on Ambiental Risk Analytics maps.

Datasets searched

This is a full list of the data searched in this report. If we have found results of note we will state "Identified". If no results of note are found, we will state "Not identified". Our intelligent filtering will hide "Not identified" sections to speed up your workflow.

Flooding	
Risk of flooding from rivers and the sea	**Identified**
Flood storage areas: part of floodplain	Not identified
Historical flood areas	Not identified
Areas benefiting from flood defences	Not identified
Flood defences	Not identified
Proposed flood defences	Not identified
Surface water flood risk	**Identified**
Groundwater flooding	Not identified

Flood information

The Flood Risk Assessment section is based on datasets covering a variety of different flooding types. No inspection of the property or of the surrounding area has been undertaken by Groundsure or the data providers. The modelling of flood hazards is extremely complex and in creating a national dataset certain assumptions have been made and all such datasets will have limitations. These datasets should be used to give an indication of relative flood risk rather than a definitive answer. Local actions and minor variations, such as blocked drains or streams etc. can greatly alter the effect of flooding. A low or negligible modelled flood risk does not guarantee that flooding will not occur. Nor will a high risk mean that flooding definitely will occur. Groundsure's overall flood risk assessment takes account of the cumulative risk of river and coastal data, historic flood events and areas benefiting from flood defences provided by the Environment Agency/Natural Resources Wales (in England and Wales) and surface water (pluvial) and groundwater flooding provided by Ambiental Risk Analytics. In Scotland the river and coastal flood models are also provided by Ambiental Risk Analytics.

Risk of flooding from rivers and the sea

This is an assessment of flood risk for England and Wales produced using local data and expertise, provided by Environment Agency. It shows the chance of flooding from rivers or the sea presented in categories taking account of flood defences and the condition those defences are in. The model uses local water level and flood defence data to model flood risk.

Historic flood events

Over 86,000 events are recorded within this database. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that Environment Agency/Natural Resources Wales do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

Surface water flooding

Ambiental Risk Analytics surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or “pluvial” flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

Proposed flood defences

The data includes all Environment Agency/Natural Resources Wales's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards.

Flood storage areas

Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and Environment Agency/Natural Resources Wales, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

Groundwater flooding

Groundwater flooding is flooding caused by unusually high groundwater levels. It occurs as excess water emerging at the ground surface or within underground structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and it can result in significant damage to property. This risk assessment is based on a 5m Digital Terrain Model (DTM) and 1 in 100 year and 1 in 250 year return periods.

Ambiental FloodScore™ insurance rating

The property has been rated as **High** risk. Please see **page 2** for further advice.

Ambiental's FloodScore™ risk rating gives an indicative assessment of the potential insurance risk classification from flooding, which can provide an indication of how likely it is that a property's policy will be ceded to Flood Re. The assessment is based on Ambiental's river, tidal and surface water flood data and other factors which some insurers may use in their assessment are not included.

Flood Re is a re-insurance scheme that makes flood cover more widely available and affordable as part of your residential property home insurance. Properties at higher risk of flooding may have the flood part of their policy ceded to Flood Re by their insurer. It is important to understand that Flood Re does not apply to all situations. Exclusions from Flood Re includes properties constructed after 1 January 2009; properties not within domestic Council Tax bands A to H (or equivalent); commercial properties, certain buy to let scenarios and buildings comprising four or more residential units. A full list of the exemptions can be found on the Flood Re website (https://www.floodre.co.uk/can-flood-re-help-me/eligibility-criteria/).

The Ambiental FloodScore™ insurance rating is classified into six different bandings:

Very High indicates a level of risk that may make it more likely that standard insurance premiums will be higher, or additional terms may apply to the provision of flood cover. There is a very high possibility that the cover for flooding at the property will be ceded into the Flood Re scheme, particularly if the property has flooded in the past.

High indicates a level of risk that may make it more likely that standard insurance premiums will be higher, or additional terms may apply to the provision of flood cover. There is a high possibility that the cover for flooding at the property will be ceded into the Flood Re scheme, particularly if the property has flooded in the past.

Moderate-High indicates a level of risk that may make it more likely that standard insurance premiums will be higher, or additional terms may apply to the provision of flood cover. There is a moderate possibility that the cover for flooding at the property will be ceded into the Flood Re scheme, particularly if the property has flooded in the past.

Moderate indicates a level of risk that may make it more likely that standard insurance premiums will be higher, or additional terms may apply to the provision of flood cover. There is a low possibility that the cover for flooding at the property will be ceded into the Flood Re scheme, unless the property has flooded in the past.

Low indicates a level of risk that is likely to mean standard cover and premiums are available for flood cover. There is a low possibility the cover for flooding at the property will be ceded into the Flood Re scheme, unless the property has flooded in the past.

Very Low indicates a level of flood risk that should not have any impact on the provision of flood cover for the property.

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Appendix C: Hydraulic Modelling Output

1996
2006

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enhancing... improving... cleaning... restoring...
changing... tackling... protecting... reducing...
creating a better place... influencing...
inspiring... advising... managing... adapting...

Timperley and Sinderland Flood Mapping Study

Volume 2 – Final Report (May 2007)

NW750

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Environment Agency North West Region

Timperley and Sinderland

Final Modelling Report

May 2007

Timperley Brook

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Environment Agency
North West Region

Timperley and Sinderland

Final Modelling Report

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1	0	Draft	April 07	AES
2	1	Final	May 07	ATL

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1 INTRODUCTION AND BACKGROUND

1.1.1 An extensive flood mapping exercise was carried out by Halcrow for the whole of the Upper Mersey catchment in 2001[1]. The Environment Agency require an update and a refinement of the original study. The objectives are set out below:

- Update existing hydrology for the area
- Remove flood defences (where present) from the existing hydraulic models to run an 'undefended' case
- Run the following flood events; 1%, 1% plus climate change allowance and 0.1% Annual Exceedance Probability (AEP) and provide a comparison with the original study.
- Produce flood outlines for the 1%, 1% plus climate change AEP, and 0.1% AEP events
- Identify Areas Benefiting from defences (ABD) within the catchment.

1.2 DESCRIPTION OF CATCHMENT

1.2.1 Timperley and Sinderland Brook and their tributaries are situated in Altrincham in south west Manchester (Figure 1.1). The catchment is 50km^2 to its outfall at the Manchester Ship Canal. The area is of low lying topography with elevations ranging from 60mAOD to 5mAOD. Sinderland Brook is gauged at Partington, the remaining tributaries are ungauged. The area is heavily urbanised and the watercourse flows through extensive lengths of both open channels and culverted reaches. There are five hydraulic reaches in the catchment, details of which are provided in the following section.

1.3 STATEMENT OF RIVER REACHES

1.3.1 The study area includes the following reaches (Figure 1.1):

- Brownley Brook (from Concord Business Park to the confluence with Baguley Brook at Royalthorn Wood)
- Baguley Brook (from M56 crossing to the confluence with Timperley Brook)
- Fairywell Brook (from the M56 crossing to the confluence with Baguley Brook in Brooklands)
- Timperley Brook (from M56 crossing to the confluence with Baguley Brook)
- Sinderland Brook (from the confluence of Timperley and Baguley Brook to the Manchester Ship Canal)

2 DATA AVAILABILITY AND REVIEW OF PREVIOUS WORK

2.1 DATA AVAILABILITY

2.1.1 LiDAR data was supplied by the Environment Agency (EA) for the study area. This data was flown in two stages; the first in 2002 and the second in 2006. The 2006 data has been used and where this was not available the 2002 data set was used. The LiDAR was provided at a resolution of 2m and has a typical vertical accuracy of +/- 25mm. LiDAR coverage for the area is shown in Figure 2.1.

2.1.2 NFCDD data was provided by the EA and was used to identify where the formal flood defences are in the catchment. A site visit was also made to the area to verify defence locations and carry out a walkover inspection. Verified flood defences within the catchment are shown in Figure 2.2.

2.1.3 A series of cross section drawings were provided in the vicinity of Timperley/Baguley/Sinderland Brook confluence. A new housing development has been built since the previous study and river enhancement works have been carried out along a 1.8km reach of Sinderland Brook.

2.1.4 Hydraulic models constructed for the Section 105 flood mapping study were provided by the EA.

2.2 PREVIOUS STUDIES

2.2.1 The Timperley and Sinderland Brook catchment was modelled during the Upper Mersey Section 105 study. Hydraulic models for the study were constructed using iSIS software and calibrated against observed flood events. A range of return periods were run as part of this project but only the 1% AEP event was flood mapped.

2.2.2 An Areas Benefiting from Defences (ABD) study[2] was carried out for the EA by Royal Haskoning in April 2006. The report stated that there were few formal defences within the catchment. It concluded that the identification of ABD was not possible as the mapped Flood Zone 3 extent shows a ‘with defences’ case. It was recommended that a ‘without defences’ scenario should be produced to compare the two extents and highlight the ABD on the study reaches. Potential ABD’s were put forward in the report and these are listed below;

- Baguley Brook at Brooklands (where defences are present on right and left banks)
- Timperley and Sinderland Brooks downstream of the flood storage area at Balfour Road.

3 HYDROLOGICAL ASSESSMENT

3.1 SUMMARY

3.1.1 Hydrological analysis has been carried out to provide updated design flows for the hydraulic models. Details are provided in the hydrology report (Volume 1) and the 1% AEP inflows are shown in Table 3.1.

Sinderland and Timperley		**1% AEP (current study)**
Model	**Node label**	**Peak Flows (m^3s^{-1})**
Brownley	mr56	0.776
Brownley	mr0037	0.324
Fairywell	FAIR01_m65	2.396
Fairywell	FAIR01_m61	0.485
Fairywell	FAIR_mr0034	0.252
Baguley	mr0019	0.175
Baguley	m59	1.744
Baguley	mr57	1.184
Baguley	m60	0.000
Baguley	m61	0.000
Baguley	m62	1.839
Baguley	m63	1.068
Baguley	m66	1.448
Baguley	mr0033	2.329
Baguley	mr0035u	1.100
Timperley	mr0032	0.572
Timperley	m69	2.454
Timperley	m70	1.303
Timperley	m71	6.020
Timperley	m72	5.258
Sinderland	SIND_mr0087	5.859
Sinderland	SIND_mr0030u	4.602
Sinderland	SIND_m67	2.957
Sinderland	SIND_m73	0.842
Sinderland	SIND_m74	4.864
Sinderland	SIND_m75	3.158
Sinderland	SIND_m77	1.136
Sinderland	SIND_mr0088	3.055
Sinderland	SIND_m78	1.728

Table 3.1 Design flows

4 RIVER MODELLING

4.1 INTRODUCTION

4.1.1 The hydraulic models used in the current study were the following; BROW100.dat, FAIR100.dat, BAGU100.dat, TIMP100.dat and SIND100.dat.

4.2 DESCRIPTION OF RIVER AND RIVER REACHES

Brownley Brook

4.2.1 Brownley Brook is the smallest tributary in the catchment. It is an ordinary watercourse which flows through the Wythenshawe housing estate. The modelled reach is 4 km and has heavily culverted reaches. Brownley Brook is shown in Figure 4.1.

Fairywell Brook

4.2.2 Fairywell Brook follows a north westerly course through a large housing estate to join Baguley Brook just upstream of the Bridgewater Canal. The modelled reach is 6.2 km and is shown in Figure 4.2

Timperley Brook

4.2.3 Timperley Brook rises near Manchester Airport and flows in a north easterly direction through open country leading to Alrincham golf course. Downstream of the golf course the brook flows through housing estates and joins Baguley Brook to form Sinderland Brook at NGR 376583, 390187. The reach is shown in Figure 4.3.

Baguley Brook

4.2.4 Baguley Brook drains the largely urban area of Wythenshawe but also flows through Wythenshawe Park before entering Baguley itself. It continues to flow west through Brooklands to its confluence with Timperley Brook. The reach is shown in Figure 4.4.

Sinderland Brook

4.2.5 Sinderland Brook is formed at the confluence of Timperley and Baguley Brook on the western edge of Altrincham. It flows as through open fields in a westerly direction to its outfall at the Manchester Ship Canal. The reach is shown in Figure 4.5.

4.3 GEOREFERENCING

4.3.1 The Section 105 models provided by the EA were not georeferenced. Flood mapping requires georeferenced models to translate maximum water levels to locations on the digital terrain model.

4.3.2 Georeferencing was undertaken using iSIS-GIS (an in-house extension developed for Arcview). Grid references for the centre point of each model cross section are provided in the Section 105 study modelling reports. These were used as a basepoint to locate the remaining ordinates of the cross section and extracted. Grid referencing

information has been added to cross section data within the models. During the georeferencing exercise it became apparent that the cross section node labels in the Section 105 report did not always concur with the node labels within the model. In these circumstances approximate locations were sought by calculating distance to next and noting comments in the iSIS cross sections.

4.4 EXTENSION OF CROSS SECTIONS

4.4.1 The Section 105 models were built to accommodate the 1% AEP maximum water levels and flows. The current study models a 0.1% AEP flood event which required extension of some cross sections. On further investigation it became apparent that the 1% AEP water levels (used in the S105 study) exceeded the extent of the cross section in a number of locations. This was addressed in the current study by extending the sections into the floodplain using the LiDAR data provided. In some cases cross sections were extrapolated to the extent of the water level where the cross section geometry did not match the LiDAR ground levels. Details of the changes made to cross sections are given in Table A1-A3 (Appendix A).

4.5 ADDITION OF RESERVOIR AND SPILL UNITS

4.5.1 The above approach is not suitable when the out of bank area behaves as a flood storage pond. In these circumstances, the cross sections have been trimmed and spill units added to represent a flow route from the channel to the floodplain. The floodplain area is represented using iSIS reservoir units. Elevations from the LiDAR were used to provide reservoir geometry. Two additional reservoir units were added on Fairywell Brook in the vicinity of the recreation ground in Brooklands.

4.5.2 Changes made to the model using the above methods are summarised in Appendix A.

4.6 INCORPORATION OF NEW SURVEY

4.6.1 River restoration work has been carried out along Sinderland Brook as part of a new housing development. The original cannelised course has been restored to a meandering river, thus creating a wider floodplain and new and varied habitats. The new course is shown in Figure 4.6 below.

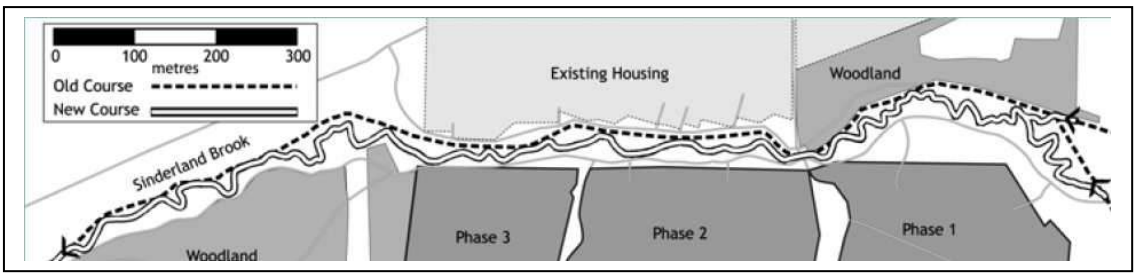

Figure 4.6 River Restoration Plan (source: http://therrc.co.uk/newsletters/issue20.pdf)

Photographs of the site are provided in Appendix B.

4.6.2 Cross section survey drawings were provided of the reach by the EA. Cross sections information was taken from the following drawings; 1002101/OB/007, 1002101/OB/008 and 1002101/OB/030. A total of 13 cross sections replaced a reach of 1.8km in length in the existing Sinderland Brook model. Interpolated sections were added to the model where necessary to improve stability.

4.6.3 No further changes were made to the existing Section 105 models. Run parameters were modified to increase stability but a complete review of the hydraulic models was beyond the scope of this study.

4.7 REMOVAL OF FLOOD DEFENCES

4.7.1 Flood defences, identified in the Royal Haskoning Report[2], were removed from the model to represent an 'undefended' case. Formal flood defences exist on Timperley and Baguley Brook only, so the existing models for Fairywell, Brownley and Sinderland are 'undefended' by default. The following defences were removed from the model;

- Timperley Brook – right and left banks at Navigation Road Recreation ground and Balfour Road storage basin. The control structure (orifice and sluice gate) at Balfour Road was removed from the model.
- Baguley Brook – right and left bank through the recreation ground at Brooklands.

4.7.2 The locations of the flood defences are shown on Figures 4.3 and 4.4. The LiDAR data has been used to provide ground elevations. The defences in the model have been lowered to these heights to represent the 'undefended' case.

4.7.3 In some areas the LiDAR data does not tie into the survey data within the model. Where this occurs, the flood defence has been lowered to a relative level which ties into the existing model. Details of the removal of flood defences are provided in Appendix A.

4.8 HYDRAULIC MODEL RUNS

4.8.1 A matrix of hydraulic model runs is provided in Table 4.1.

Reach	**1% AEP**		**1% AEP + climate change allowance**	**0.1% AEP**
	Undefended	Defended	Undefended	Undefended
Brownley	×	n/a	×	×
Fairywell	×	n/a	×	×
Baguley	×	×	×	×
Timperley	×	×	×	×
Sinderland	×	n/a	×	×

Table 4.1 Hydraulic model run matrix (NB. defended runs required for 1% AEP only)

5 MODEL RESULTS AND FLOOD MAPPING

5.1 MODEL RESULTS

5.1.1 Maximum water level results for each flood event are provided in Table C.1 in Appendix C. Results are provided for the existing and undefended case (where applicable). The results indicate a narrow range of water levels between the 1% AEP and 0.1% AEP event. The increase between the two events ranges between 0.3 mAOD for Fairywell Brook to 0.7 mAOD for Timperley Brook. The small increases are due to the low lying topography on the floodplain. Once the flood water is out of bank a large increase in flow may only produce a small increase in flood level.

5.1.2 Table C.2 compares results from the Section 105 study and the current study for the 1% AEP event. It is clearly seen that maximum water levels have decreased when compared to the original study. The decrease in water levels ranges from 0 to 4.5 % in the 1% AEP event. This is due to the reduction in design flows being used to run the models. Further detail on the design flows are provided in the hydrology report.

5.2 FLOOD MAPPING

5.2.1 The production of flood outlines consists of the creation of a water surface from the hydraulic model maximum water level results, and the computation of flood extents by spreading the floodwaters over the ground elevation model.

5.2.2 Flood outlines were generated for the following events

- 1% AEP (undefended and defended)
- 1% AEP plus climate change allowance (undefended)
- 0.1% AEP (undefended)

5.2.3 DeltaMapper software was used to create flood outlines for the Timperley and Sinderland Brook catchment. DeltaMapper is a tool for mapping and processing temporally and spatially varying data. The application title is from the **DEL**auney **T**ri**A**ngulation algorithm used within the application to generate interpolated surfaces. DeltaMapper has been developed by Halcrow Group. Water levels, model nodes, and a Digital Terrain Model (DTM) are imported to this software. A water surface TIN is constructed from the nodes and cross section information, and water levels are interpolated to create a water surface polygon. A depth grid is produced by the subtraction of the water surface from the DTM. Flood outlines are created from this depth grid using ArcView.

5.2.4 Level 2A flood maps are included in Appendix D. These show the calculated flood extents from the hydraulic models results.

5.3 AREAS BENEFITING FROM DEFENCES (ABD)

5.3.1 ABD's are identified where there is a difference in the 0.1% flood extent for the defended and the undefended case. This indicates which properties are benefiting from the flood defence along the watercourse.

Baguley Brook

5.3.2 There is an ABD adjacent to Baguley Brook in Brooklands. The area covers Dalebrook Road and Newlyn Drive on the right bank and Ashstead Road, Cranleigh Drive and Clover Croft on the left bank. The removal of the defences in the area causes an increase in flow spilling into the floodplain and ponding on the left and right banks to occupy a greater extent in the undefended case.

Timperley Brook

5.3.3 There is an ABD adjacent to Claremont Avenue downstream of the dismantled railway line. The removal of the control structure at Balfour Road storage area leads to an increase (0.5m) in maximum water levels in this reach in the 1% AEP event. Consequently, a larger flood extent is seen in the undefended case in this area.

6 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

6.1.1 The Timperley and Sinderland cachment has been modelled using updated design flows following a review of the hydrological analysis.

6.1.2 Model results from the current study show a decrease in maximum water levels when compared with results from the Section 105 study. The decrease is within a range of 0 – 4.5 %.

6.1.3 Flood defences have been removed from the models to produce an 'undefended' case. This applies only to Timperley and Baguley Brooks where formal flood defences are present.

6.1.4 Flood maps have been produced for the following flood events; 1% (defended), 1% plus climate change allowance and 0.1% AEP (both undefended).

6.1.5 The flood outlines produced indicate that there are two areas benefiting from defences within the catchment. These are located adjacent to Baguley Brook in Brooklands and Timperley Brook downstream of the Balfour Road storage basin.

Recommendations

6.1.6 A detailed review of the hydraulic models should be undertaken to incorporate any updated survey and improve model stability.

6.1.7 The models should be re-calibrated due to the update in design flows and the river restoration works on Sinderland Brook.

6.1.8 Due to the low lying nature of the catchment, some areas may benefit from a 2d modelling approach to provide more detailed flood routes and extents.

7 REFERENCES

[1] Upper Mersey S105 Project, Final Hydraulic Modelling Report, Halcrow 2001.

[2] Areas Benefiting From Defences – Sinderland and Timperley Brook Catchment, Draft Report, Royal Haskoning, 2006.

APPENDIX A
HYDRAULIC MODEL DETAILS

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Table A.2 Details of Changes to Baguley Model
Table A.3 Details of Changes to Timperley Model

APPENDIX B
SITE PHOTOGRAPHS

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Photo 5: Timperley Brook – Upstream of the confluence with Baguley Brook

Photo 6: Sinderland Brook river restoration

Photo 7: Gauging Station at Partington, Sinderland Brook

Photo 8: Timperley Brook downstream of the Bridgewater Canal crossing

Photo 9: Timperley Brook – Spillway at Balfour Road storage basin

Photo 10: Timperley Brook – Balfour Road storage basin control structure

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FLOOD MAPS

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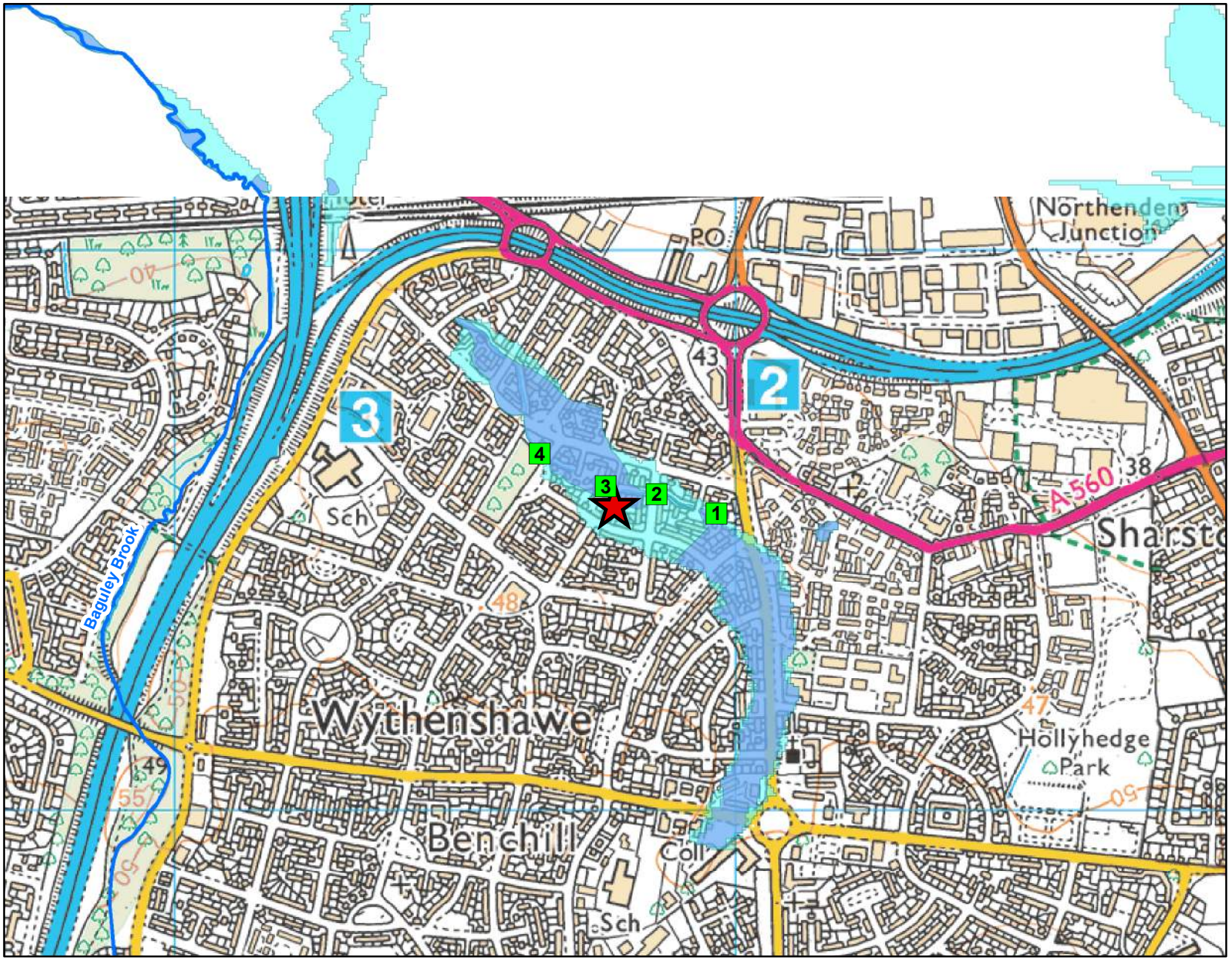
D2 Fairywell Brook

D3 Timperley

D4 Baguley Brook

D5 Sinderland Brook

Detailed Flood Map centred on Olney Avenue, Benchill, M22 8AB. Created on 06/07/2021 [GMMC222840SW]



Environment Agency

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Legend

- Site Location
- Model Measurements
- Main River
- Flood Zone 3
- Flood Zone 2

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					Undefended			
Map Reference	Model Node Reference	Easting	Northing	Data	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 35% Increase flow	1 % AEP (1 in 100 year) + 70% Increase flow	0.1 % AEP (1 in 1000 year)
1	BROW01_1074u	382969	388530	Modelled Water Level (m aodN)	42.00	42.00	42.14	42.17
				Modelled Flow (cumecs)		1.34	1.49	
2	BROW01_0959u	382862	388565	Modelled Water Level (m aodN)	41.42	41.42	41.44	41.44
				Modelled Flow (cumecs)		0.50	0.48	
3	BROW01_0869u	382772	388578	Modelled Water Level (m aodN)	41.13	41.13	41.15	41.15
				Modelled Flow (cumecs)		1.05	1.09	
4	BROW01_0752u	382654	388637	Modelled Water Level (m aodN)	40.02	40.02	40.06	40.06
				Modelled Flow (cumecs)		0.71	0.71	

Model data taken from Brownley Brook 2007

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes: *Climate Change Scenario - 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.