

FLOOD RISK ASSESSMENT

Location: Grange Road, West Cowick, Goole, DN14 9EL.

NGR: SE 65188 21529

W3W: buckling.chuck.coiling

Client: Mike Homes

Planning Application No: 23/03862/PLF

Reference: 23/03862/FRA

Version: 1

Date Completed: 14/02/2024

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ABBREVIATIONS

AEP	Annual Exceedance Probability
BGS	British Geological Society
CDA	Critical Drainage Area
CC	Climate Change
EA	Environment Agency
FFL	Finished Floor Level
FRA	Flood Risk Assessment
FRMS	Flood Risk Management Strategy
FWD	Floodline Warning Direct
GWSPZ	Ground Water Source Protection Zone
IDB	Internal Drainage Board
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
OS	Ordnance Survey
SFRA	Strategic Flood Risk Assessment
SOP	Standard of Protection
SUDS	Sustainable Drainage System
SWMP	Surface Water Management Plan



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EXECUTIVE SUMMARY

Location	<i>Grange Road, West Cowick, Goole, DN14 9EL.</i>
Development Proposal	Full planning for the erection of 3 bed detached dormer bungalow with detached double garage.
Flood Zone	Current Flood zone 1, Future 3a
Topography	~9.266mAOD
Sequential and Exception Testing	Required
Main Source of Flooding	River Aire (Fluvial)
Historic Flooding	Yes – but non directly affecting the site.
Fluvial and Tidal Flooding	Fluvial and Tidal
Surface Water Flooding (Pluvial)	Very Low Risk
Flooding from Reservoirs	Low Risk
Ground Water Flooding	<25% Susceptibility
Impacts on flood risk from the development	None
Proposed Flood Risk Resilience Measures	Recommendations proposed including a finished floor level 300mm above the adjacent road.
Surface Water Management (SUDs)	Not required
Conclusion	Upon assessment off the available data and the proposed development then it is concluded that the development is appropriate with a valid exception test, any future flood risk posed to the site can be managed within the design proposal.

1. INTRODUCTION

- 1.1. This report was commissioned by Mike Homes to establish the flood risk to the development site from all potential sources. If and where possible the Flood Risk Assessment (FRA) will highlight mitigation or resilience measures and propose these as part of the design. This will allow the reduction of flood risk to an acceptable level or make the development more resilient in the event of a flood.
- 1.2. The report is to be read in conjunction with the planning application **23/03862/PLF** and supporting information.
- 1.3. If required the report will also assess the life duration of the development and consider Climate Change (CC) and use, as well as associated flood risk from the development.
- 1.4. The Flood Risk Assessment will consider the following flood risk sources;
 - 1.4.1. Fluvial/Tidal Flooding
 - 1.4.2. Surface Water flooding
 - 1.4.3. Reservoir Flooding
 - 1.4.4. Ground Water Flooding
 - 1.4.5. Other sources of Flooding
- 1.5. The site is under the Lead Local Flood authority (LLFA) of East Riding of Yorkshire Council (ERYC) with Yorkshire Water (YW) as the general drainage undertaker for the area unless specified.
- 1.6. Cowick and Snaith Internal Drainage Board (IDB) was identified serving this catchment area for land drainage.
- 1.7. Under the National Planning Policy Framework (NPPF) Flood Risk Assessments (FRA) should be undertaken if any of the following are applicable;
 - 1.7.1. **Development is within Flood Zone 2 or Flood Zone 3 this includes any minor development or change of use.**
 - 1.7.2. A development which is more than 1 Hectare and is located within Flood Zone 1.



- 1.7.3. A development less than 1 Hectare and is in Flood zone 1, though includes change of use or classified as more vulnerable as per Table 2 flood risk vulnerability classification in the planning practise guidance.
- 1.7.4. An area which has been identified as having critical drainage problems as per the Environment Agency (EA) data.

2. DATA REVIEWED

The assessment comprises of a desk top study supported by third party information. The following data and information has been reviewed as part of the FRA:

- 2.1. Review of publicly available Flood Risk Mapping which is provided by the EA, information is either requested as package 4 or information is readily available online via the government website.
- 2.2. Desktop assessments of hydrogeological, hydrological and topographic which is attained through the British geological Survey (BGS) website, Ordnance Survey (OS) or the EA government website.
- 2.3. Where relevant the review of the Preliminary Flood Risk Assessment (PFRA) and Strategic Flood Risk Assessment (SFRA) commissioned by the Lead Local Flood Authority.

3. LICENCE AND COPYRIGHTED INFORMATION USED WITHIN THE REPORT

- 3.1. Environment Agency information © Environment Agency and database right. All rights reserved.
- 3.2. OS data © Crown copyright and database right 2023.
- 3.3. Element used from the ERYC document library including the local SFRA, S19 and NPPF
- 3.4. Google Map Images



4. EXISTING SITE

- 4.1. The proposed development site is located at **Grange Road, West Cowick, Goole, DN14 9EL.**
- 4.2. The NGR for the site **SE 65188 21529**
- 4.3. What3Words for the site is **buckling.chuck.coiling**
- 4.4. The existing ground elevation is approximately **9.266mAOD** but would need confirming with local datum.
- 4.5. The ground at the rear of the proposed property falls away significantly to an elevation of approximately 6.8mAOD
- 4.6. West Cowick is a catchment of Goole.
- 4.7. The site sits off Grange Lane in West Cowick. The existing site can be seen in **Figure 1 and Figure 2.**
- 4.8. The surrounding site is used for residential and agricultural purposes, West Cowick is made up of new and old dwellings, the village adjoins Snaith market town and is approximately 1 mile from East Cowick.
- 4.9. The existing site is a grassed area with residential properties surrounding the plot. The site is currently unused and unattended with some stored materials.
- 4.10. The front of the site has a boundary designated by a grass verge which then leads on to Grange Lane. The rear and sides of the plot lead to neighbouring properties and gardens.
- 4.11. To the North of the site the River Aire is located.
- 4.12. To the South of the site on the opposite side of the M62 Motorway the Canal as well as River Don/Dutch is situated. Southfield Reservoir is also located South of the M62 and is adjoined to the canal.
- 4.13. There are other waterbodies in the area but these are local drainage infrastructure such as dykes.
- 4.14. The River Aire is located approximately 1.2KM from the proposed development.
- 4.15. The Canal is located approximately 2KM from the proposed development.
- 4.16. The River Don/Dutch is located approximately 2KM from the proposed development.
- 4.17. The Southfield Reservoir is located approximately 2.1KM from the proposed development.



- 4.18. The closest dyke to the site is located approximately 800m from the proposed development.
- 4.19. The River Aire and Don is Main River and therefore maintained by the EA.
- 4.20. The dykes service the local area and fields for surface water these are maintained by Snaith and Cowick IDB.
- 4.21. The majority of the ground surrounding the site is developed for residential purpose, outside of the immediate settlements land is used for agriculture.
- 4.22. The area is serviced by the A1041 leading to other main roads including the A19 and the A614.
- 4.23. Land drainage and localised gullies service these areas without any known issues in the immediate proximity.
- 4.24. According to the BGS database the bedrock geology consists of Sherwood sandstone group – sandstone the superficial layer is LACUSTRINE BEACH DEPOSITS - SAND AND GRAVEL



Figure 1 Google View from East entrance of Grange Road



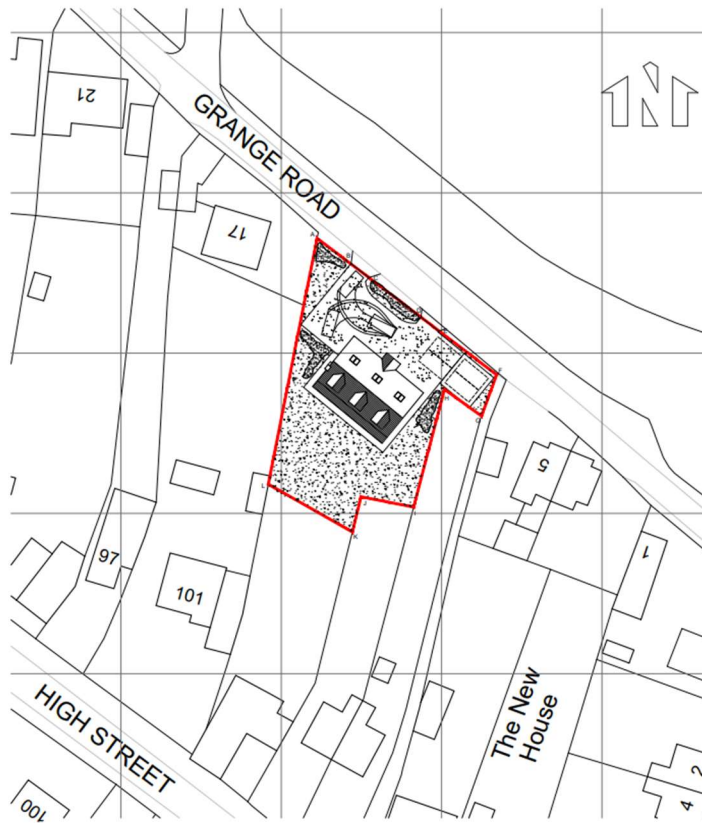


Figure 2 Google view of plot looking from the West Entrance of Grange Road

5. DEVELOPMENT PROPOSAL

- 5.1. The proposal is for full planning for the construction of a residential property.
- 5.2. This will provide a dormer bungalow with kitchen, dining, living space and one bedroom on the ground floor; the first floor will accommodate two bedrooms and washing facilities.
- 5.3. Outside will be landscaped for residential purpose with a double detached garage.
- 5.4. The proposed development can be seen in Appendix 1 or refer to ADP23/P131 1-6 as part of the planning application.
- 5.5. Figure 3 shows the proposed development outline in red.
- 5.6. It is assumed both foul and surface water will be accommodated by the existing infrastructure that services the other residential properties. If this is not feasible then a septic tank is assumed as well as a soak away for surface water.
- 5.7. The outside grounds to the property mainly compromise of permeable ground and vegetation, yet hard standing is likely for both access and egress around the property as well as access from Grange Road.





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Site area - 0.086 hectares
 Total units - 1
 Mix - 3 bedroom
 Floor area - 172m²
 Car parking - 1 x double garage
 Car parking - 4 x spaces

Boundary

- A,B - New 1.2m high black metal railing.
- B,C - New vehicle opening.
- C,D - New 1.2m high black metal railing.
- D,E - New vehicle opening.
- E,F - New 1.2m high black metal railing.
- F,G - New 1.2m high close boarded fence.
- G,H - New 1.2m high close boarded fence.
- H,I - Existing 1.2m high close boarded fence.
- I,J - Existing 1.2m high close boarded fence.
- J,K - New 1.2m high close boarded fence.
- K,A - New 1.2m high close boarded fence.

**ARCHITEK
 DESIGN & PLANNING**

Site at Grange Road
 West Cowick
 Site Layout

Scale 1:500 @ A3
 Date 13.12.23
 Drawn bc

ARCHITEK DESIGN & PLANNING
 t - 07881 554676
 e - info@architekdesignandplanning.co.uk
 w - www.architekdesignandplanning.co.uk

Drawing No. Revision

ADP23/P131/02

Figure 3 Proposed site development plan



6. FLOOD RISK

6.1. FLUVIAL/TIDAL FLOODING

- 6.1.1. The EA Flood Risk Planning Map shows that the site falls within Flood Zone 1 with the area is benefiting from Flood Defences maintained by the EA. See Figure 4 for the flood risk map for planning.
- 6.1.2. However, the client has been informed from the planning authority that the future flood zone for the site may come into Zone 3a. See figure 5 for the SFRA future flood risk zone.
- 6.1.3. This gives a **High** probability of flooding from River or Sea for the designated plot.
- 6.1.4. High risk land gives a 0.5% or greater probability of occurring in any year for flooding from the sea and a 1% or greater probability of occurring in any year for fluvial (river) flooding
- 6.1.5. The main risk source flood risk is from the River Aire which is both Tidal and Fluvial.
- 6.1.6. Two historical flood events have been recorded affecting the area including one surface water event and the other a fluvial event, neither of which directly flooded the proposed development site see Appendix 2.



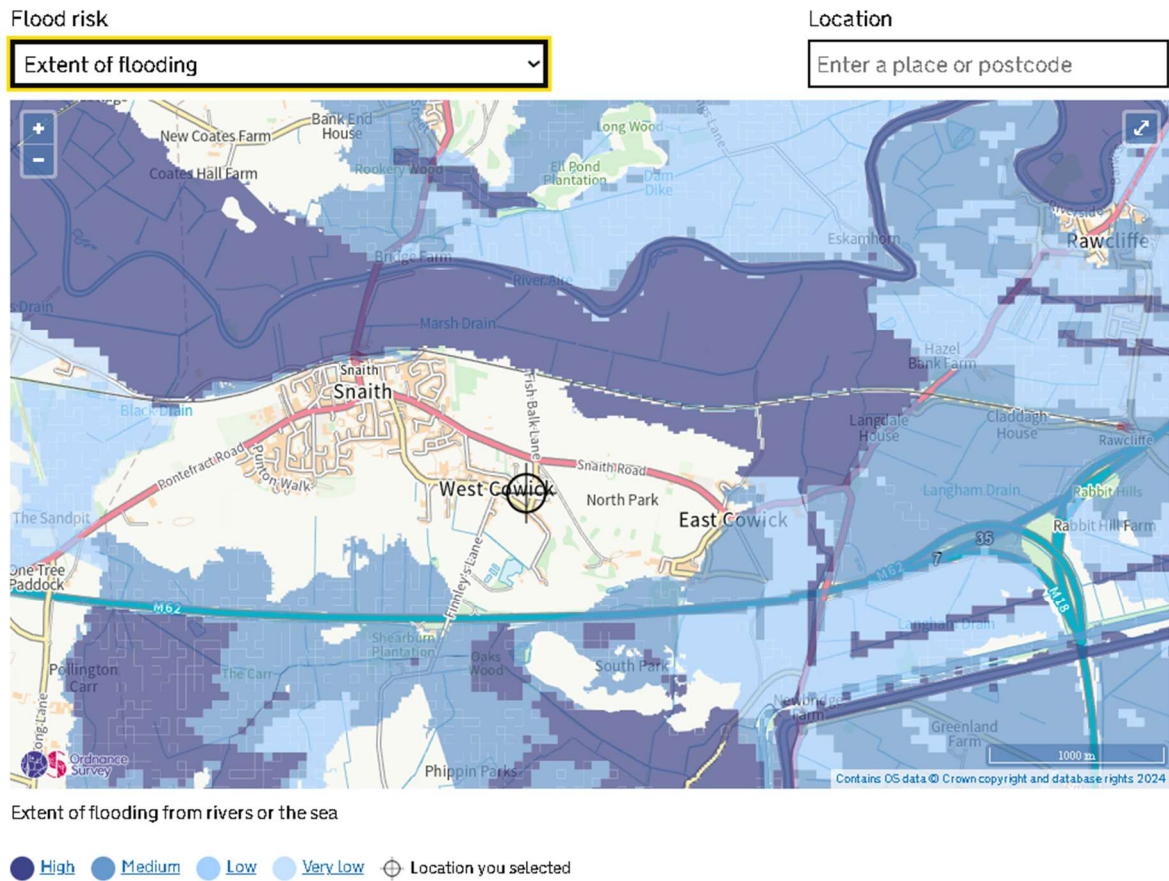


Figure 4 Flood Risk Map For planning

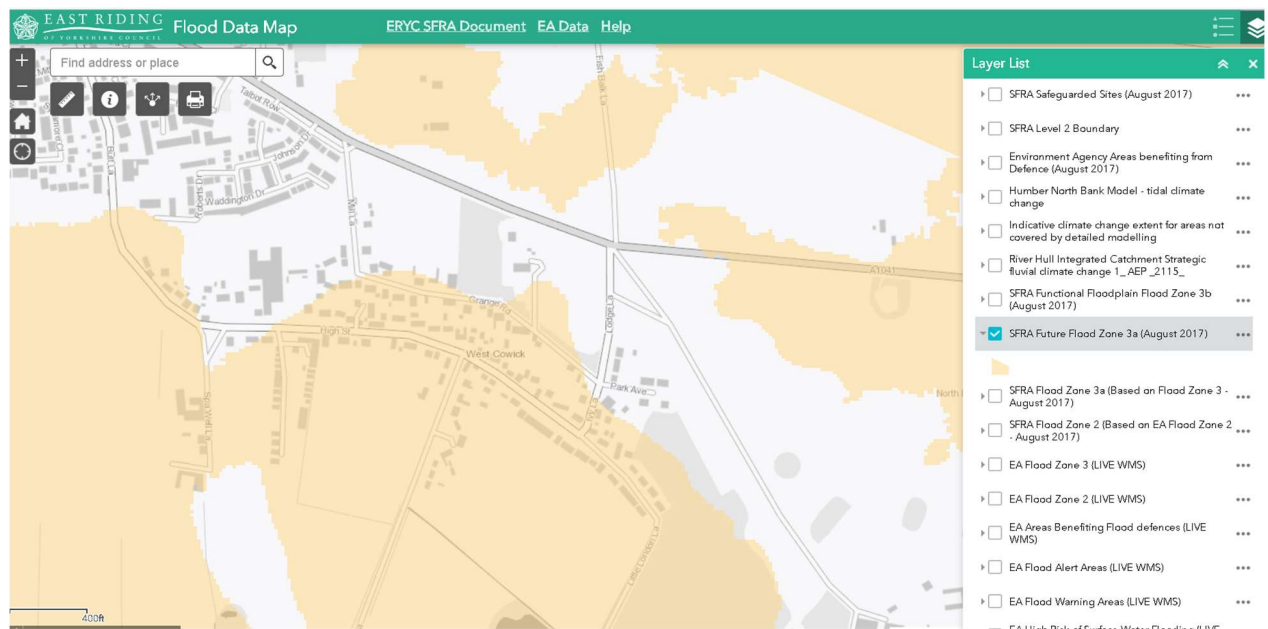


Figure 5 SFRA future flood risk Zone

6.2. SURFACE WATER FLOODING

6.2.1. The risk of surface water flooding according to the flood warning information service is considered **Very Low Risk**.

6.2.2. This gives an assumed risk below 0.1 % chance of flooding in any given year.

6.2.3. Figure 6 shows the surface water flood map for the given area.

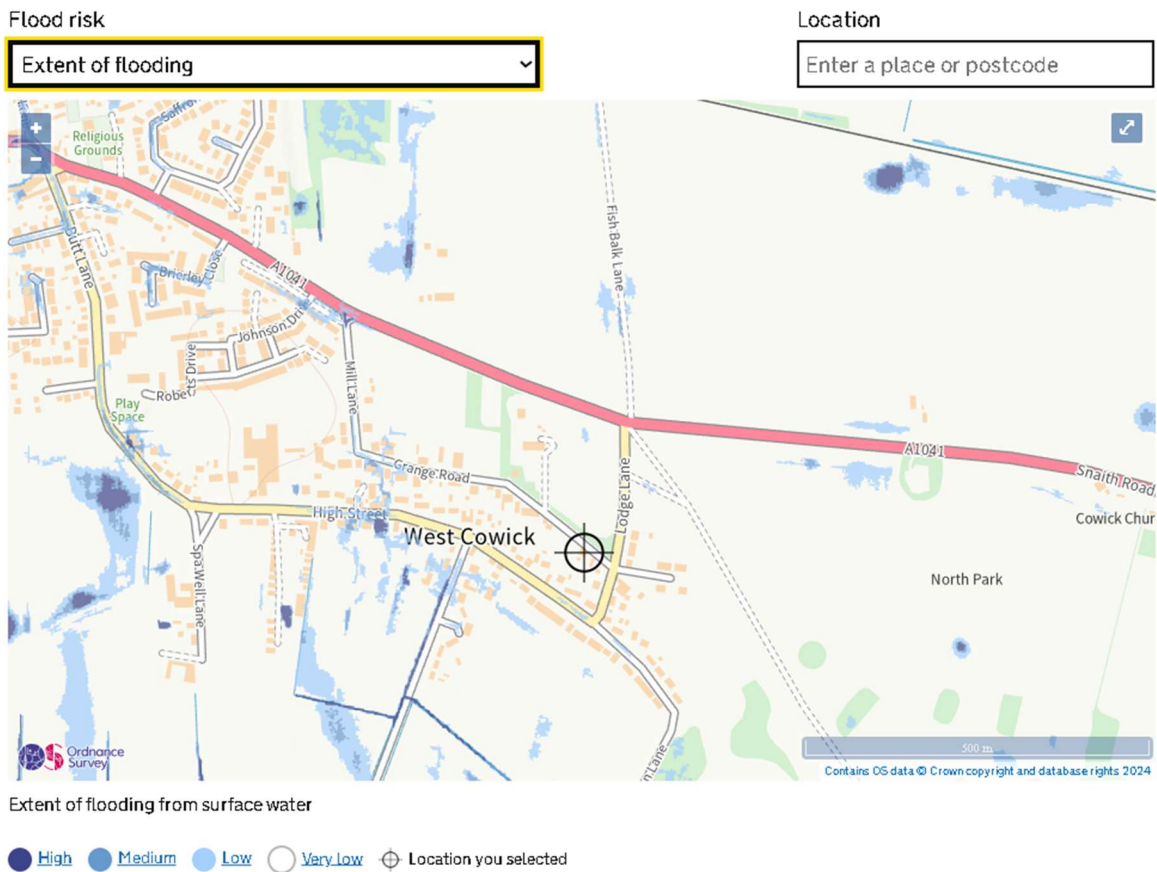


Figure 6 <https://flood-warning-information.service.gov.uk>



6.3. RESERVOIR FLOODING

6.3.1. The proposed site sits outside the inundation area of reservoir flooding, when the river is within flood See Figure 7. However as per part 6.1.2 the mechanism of the reservoir will be reviewed and the residual risk assessed for future associated flood risk to the site.

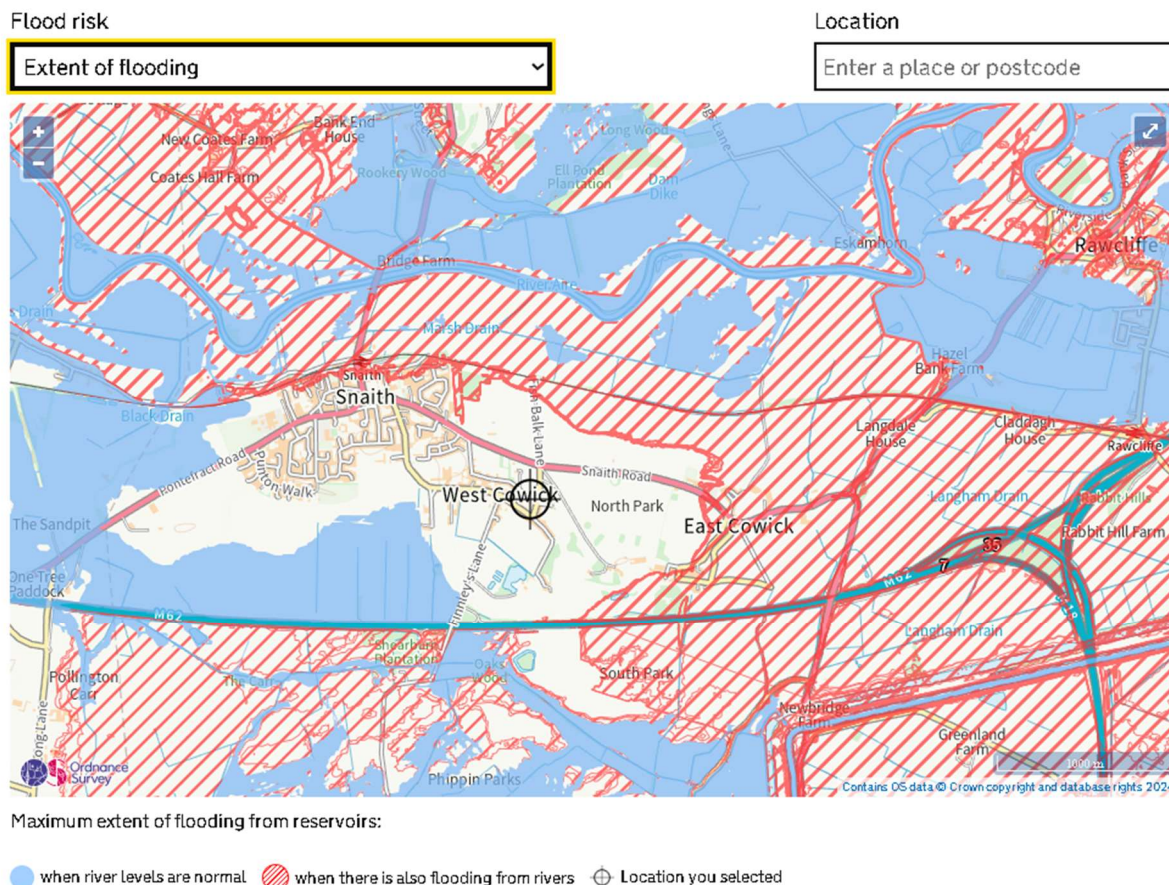


Figure 7 Reservoir Extents

6.4. GROUND WATER FLOODING

6.4.1. Ground water flooding occurs when sub-surface (below ground level) water emerges up to the surface, causing flooding to infrastructure. This has the potential to lead to surface water runoff, and depending on topography can cause effect elsewhere

6.4.2. According to the SFRA groundwater risk mapping indicates areas in proximity to the River Aire are more susceptible to groundwater flooding including areas to the North East of Snaith of Selby District.

6.4.3. The SFRA's groundwater emergence map shows that the site sits within a 25% ground water susceptibility area. See appendix 4

6.4.4. The long-term risk attained via the EA website indicates the site is unlikely to suffer ground water flooding.

6.5. OTHER SOURCES OF FLOODING

6.5.1. No other sources of flooding have been identified within the area

7. ACCESS EGRESS AND ESCAPE

7.1. The EA undertakes the flood warning services within England and Wales and can offer advice on public action when the warning is issued. It must be noted that these warnings will relate to flooding from Rivers and Sea only unless stipulated by the EA within that area, the warning guidance can be seen in Figure 8. Flooding from other sources such as localised flash flooding, surface and groundwater or backing up of localised drainage systems is not provided.

7.2. Residents can attain flood warnings by signing up via (www.environment-agency.gov.uk/floodline). Warnings are issued by TV and Radio weather broadcasts and specific warnings are issued via by telephone, mobile, email, SMS text message, fax or pager using an Automatic Voice Messaging (AVM) system. The EA's Floodline 0845 988 1188 service for England and Wales carries recorded information on flood warnings in force anywhere in England and Wales. The information is regularly updated and available 24 hours a day. The Flood Warning Service has three different categories depending on the current severity and forecast, these categories are identified and described in Figure 8.

7.3. In a major unprecedented event exceeding the Standard of Protection (SOP) offered by the flood defences and the reservoir or in the case of failure of these defences, a lot of the land north of Snaith is at risk of flooding, as well as areas within East Cowick and South of Snaith

7.4. Local to the proposed site sits the village of Snaith this area sits outside of both the current and future flood risk zone therefore it is proposed that the occupants of the dwelling take refuge within Snaith if they have reasonable lead times.



- 7.5. During the Storn Dennis event those who were flooded out and evacuated took refuge in both Snaith Church and Snaith high school. Snaith High school is at risk of coming into flood zone 3a in the future therefore the church will be assumed as the safe refuge point.
- 7.6. Access and Egress from the development will be via the public highways heading towards Snaith Via A1041, the journey would take approximately 4 minutes by car.
- 7.7. The church has an estimated elevation at 9.3m AOD approximately 3m above 1:100 +20% CC allowance (Defended) returns.
- 7.8. Proposed route to this area can be seen in Figure 9.
- 7.9. If it is not possible to vacate the premises before a flood event, then appropriate refuge should be attained on site. Therefore, a minimum finished floor level (FFL) will be proposed for the dwelling.
- 7.10. It is worth noting that the proposed development site sits at a similar elevation to that of the church which is considered a safe refuge area.




Three-day flood risk forecast	 FLOOD ALERT	 FLOOD WARNING	 SEVERE FLOOD WARNING	Warning no longer in force
What it means Be aware. Think ahead. Keep an eye on the weather situation.	What it means Flooding is possible. Be prepared.	What it means Flooding is expected. Immediate action required.	What it means Severe flooding. Danger to life.	What it means No further flooding is currently expected for your area.
When it's used Daily forecasts of flood risk on our website www.environment-agency.gov.uk . These are updated more frequently for higher flood risk situations.	When it's used Two hours to two days in advance of flooding.	When it's used Half an hour to one day in advance of flooding.	When it's used When flooding poses a significant risk to life or significant disruption to communities.	When it's used When a flood warning or severe flood warning is no longer in force.
Triggers • Information updated daily on the Environment Agency website. • The information includes the current and forecast situation and how this is likely to affect each county in England and Wales over the next three days.	Triggers • Forecasts that indicate that flooding from rivers may be possible. • Forecast intense rainfall for rivers that respond very rapidly. • Forecasts of high tides, surges or strong winds.	Triggers • High tides, surges coupled with strong winds. • Heavy rainfall forecast to cause flash flooding of rivers. • Forecast flooding from rivers.	Triggers • Actual flooding where the conditions pose a significant risk to life and/or widespread disruption to communities. • On-site observations from flooded locations. • A breach in defences or failure of a barrier that is likely to cause significant risk to life. • Discussions with partners.	Triggers • Risk of flooding has passed. • River or sea levels have dropped back below severe flood warning or flood warning levels. • No further flooding is expected. • Professional judgment and discussions with partners agree that a severe flood warning status is no longer needed.
Impact on the ground Maps will show one of four levels of risk for each county: • Green = no risk of flooding • Yellow = low risk of flooding • Amber = medium risk of flooding • Red = high risk of flooding	Impact on the ground • Flooding of fields, recreation land and car parks. • Flooding of minor roads. • Flooding of farmland. • Spray or wave overtopping on the coast.	Impact on the ground • Flooding of homes and businesses. • Flooding of rail infrastructure. • Flooding of roads with major impacts. • Significant waves and spray on the coast. • Extensive flood plain inundation (including caravan parks or campsites). • Flooding of major tourist/recreational attractions.	Impact on the ground • Deep and fast flowing water. • Debris in the water causing danger. • Potential or observed collapse of buildings and structures. • Communities isolated by flood waters. • Critical infrastructure for communities disabled. • Large number of evacuees. • Military support.	Impact on the ground • No new impacts expected from flooding, however there still may be: • standing water following flooding; • flooded properties; • flooding or damaged infrastructure.
Advice to the public/media • Check the forecast on our website. • Remain aware of the impending weather conditions for your area.	Advice to the public/media • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Avoid walking, cycling or driving through flood water. • Farmers should consider moving livestock and equipment away from areas likely to flood. • Call Floodline on 0845 988 1188 for up-to-date flooding information. • Monitor local water levels on the Environment Agency website www.environment-agency.gov.uk .	Advice to the public/media • Protect yourself, your family and help others. • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place. • If you are caught in a flash flood, get to higher ground. • Call Floodline on 0845 988 1188 for up-to-date information.	Advice to the public/media • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services. • Call 999 if you are in immediate danger. • Call Floodline on 0845 988 1188 for up-to-date flooding information.	Advice to the public/media • Be careful. Flood water may still be around for several days and could be contaminated. • If you've been flooded, ring your insurance company as soon as possible.
Advice to operational organisations • The three-day forecast is the public facing version of the Flood Guidance Statement that category 1 and 2 responders receive. • Advice for organisations varies depending on the level of flood risk and is provided on the Flood Guidance Statement issued by the Flood Forecasting Centre.	Advice to operational organisations • Check your flood response plans to see how your organisation needs to respond. • Speak to your local Environment Agency Flood Warning Duty Officer for the latest forecast information. • Dial Into Flood Advisory Service teleconferences. • Advise the public to call Floodline on 0845 988 1188 for up-to-date flooding information. • Please report any flooding in your area to your local Environment Agency office.	Advice to operational organisations • Check flood response plans for actions required at this stage. • Speak to your local Environment Agency Flood Warning Duty Officer for the latest forecast information. • Advise the public to call Floodline on 0845 988 1188 for up-to-date flooding information. • Please report any flooding in your area to your local Environment Agency office.	Advice to operational organisations • Check flood response plans for actions required at this stage. • Advise the public to put their safety first and to be ready to evacuate should the authorities decide it's needed. • Develop clear messages for local communities and the public.	Advice to operational organisations • Recovery phase will have started. • Advise the public to call Floodline on 0845 988 1188 for advice on what to do if they have been affected by flooding.

Figure 8 Flood Warning Categories



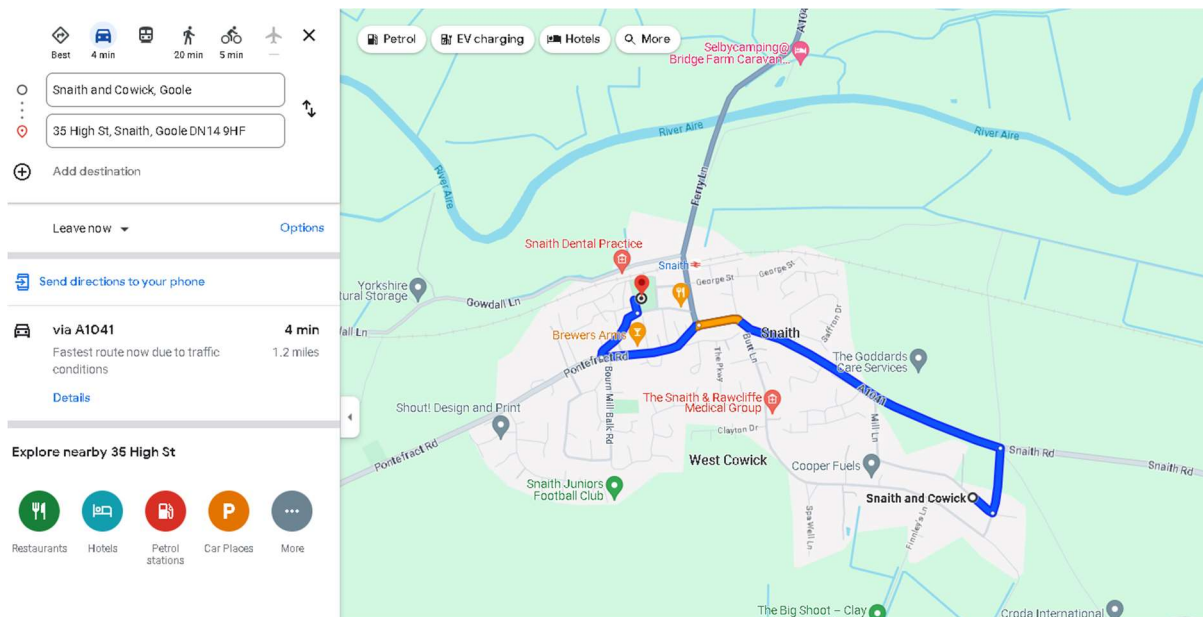


Figure 9 Egress Route

8. SITE FLOOD RISK ASSESSMENT

8.1. FLUVIAL/TIDAL FLOODING

8.1.1. According to Table 2: Flood Risk Vulnerability Classification in the Planning Practise Guidance - Flood Risk and Coastal Change April 2015 the proposed development is classified as **More Vulnerable**.

8.1.2. Considering this and upon review of Table 3: flood risk vulnerability and flood zone 'compatibility' it states development is '**appropriate**' for this site with a valid Exception test See figure 10.

8.1.3. If the current flood risk status is assumed i.e. flood zone 1 then the site is appropriate for development without the need for exception testing. For the sake of this FRA we will be assuming the site will come into a 3a (High risk area)

Table 1: Flood risk vulnerability and Flood Zone compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	✓	Exception test required	✓	✓
Flood Zone 3a	Exception test required	✓	✗	Exception test required	✓
Flood Zone 3b (Functional Floodplain)	Exception test required	✓	✗	✗	✗

Key
 ✓ Development is appropriate.
 ✗ Development should not be permitted

Figure 10 SFRA Vulnerability/Flood Zone Compatibility



- 8.1.4. The River Aire is a main river operated and maintained by the EA, ownership is typically under the riparian ownership of properties/land either side of the channel to the centre line of the River. However, it is assumed that the EA would address flood risk concerns by either enforcement or undertaking maintenance.
- 8.1.5. Snaith and Cowick is protected by formal defences running alongside the River Aire, varying between engineered embankments, pump stations and penstocks. A 1:50 SOP for these defences has been stated in the information provided by the EA, however in combination with the washlands a much higher SOP is likely for the area but has not been stated.
- 8.1.6. The front banks are classified as a reservoir asset within the Reservoir Act it is therefore expected the EA undertakes S12 and S10 inspection at relevant frequencies with any statutory requirements undertaken within a timeframe presented by the supervising engineer.
- 8.1.7. In accordance with the T98 asset assessment the defences where provided are categorised as Good
- 8.1.8. There are presently no modelled flood defence breach scenarios which encroach into the development site boundary therefore a residual risk assessment on available information will be applied to determine the sites risk. In order to determine the flood risk for the development site then the mechanism of flooding for the area needs to be understood as well as the likely flow paths.
- 8.1.9. The section 19 commissioned by ERYC, the SFRA as well as locally sourced assessments will help determine mechanism of flooding for the area.
- 8.1.10. The Lower Aire is serviced by a number of washlands also considered as reservoirs. The closest reservoir to Snaith is known as Snaith Ings, this is charged by the upstream reservoir known as Gowdall Ings. Snaith Ings is usually filled via a penstock in a dividing bank call Pour Bank.
- 8.1.11. Gowdall Ings is charged by Hensall Ings (Upstream) this is filled by a mechanism of penstocks and overtopping embankments.



8.1.12. The front embankment along the River Aire are designed to overtop and fill the upstream reservoirs. Therefore, reservoir flooding and fluvial flooding for the sake of this FRA will be considered in the same context due to their engineered relation.

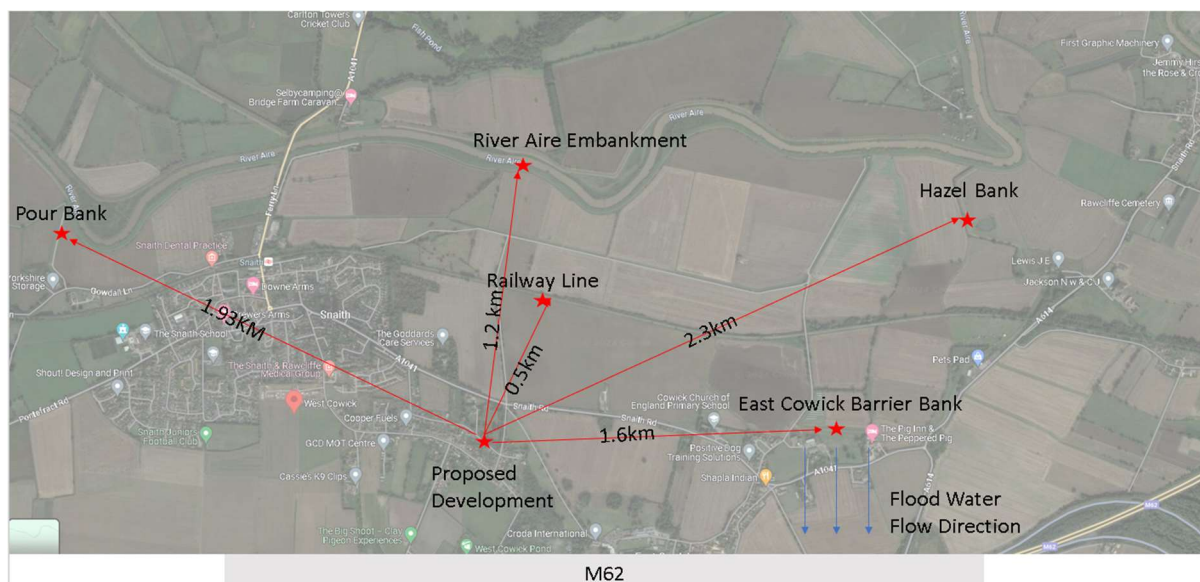


Figure 11 Reservoir Layout

8.1.13. Snaith lngs then becomes impounded by a numbers or assets including high ground, the local railway line, the River Aire front embankments, Hazel embankment and a barrier/spillway embankment in East Cowick. See Figure 11 for the reservoir layout.

8.1.14. Upon breaching the reservoir flood waters appear to migrate south of the development site impounding against the M62 where limited discharge capacity causes flood waters to deepen and extend out across the fields. See Figure 12 for the assumed flow path scenario.



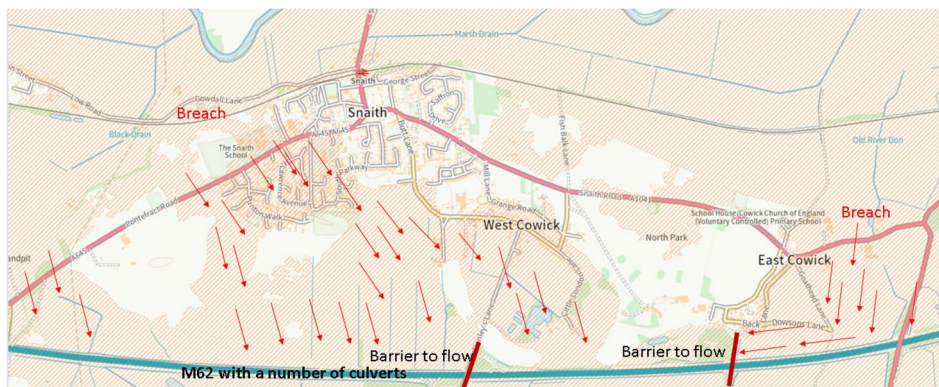


Figure 12 Flow Path Assessment

8.1.15. From this assessment we can assume that due to the topography of the area the proposed development doesn't sit within the direct flow path during a breached scenario and that waters flow to lower elevations before they impound against the M62. Flood waters would then appear to extend from south of the site until they affect the proposed development.

8.1.16. Next, we will assess the elevation of the site in relation to the M62, Existing Defences, 2016 Upper Humber Model results and other recently approved Finished Floor Levels.

8.1.17. See appendix 5 for the used modelling returns in this assessment.

Site Reference	(1) Front Embankment 53750	(2) Front Embankment 26895	(3) Barrier Bank 179149	(4) Field at the base of the M62	(5) Node point 02670302173 Defended 1:200+ 20%CC (Tidal)	(6) Node point 02670302173 Defended 1:100+ 20%CC (Fluvial)	(7) Node point 02670302173 undefended 0.1% AEP	(8) Agreed Finished Floor Levels for the Bellway Development
Elevation (mAOD)	6.16	6.32	4.91	~4.00	6.135	6	4.999	6.6
Difference in site elevation (9.266mAOD)	3.106	2.946	4.356	5.266	3.131	3.266	4.267	2.666

Table 1 Site elevation assessment

8.1.18. Assessment of level see Table 1.

(1) The front barrier bank in Snaith Ings sits at an elevation 3.106m below the proposed site development. When you assess this in conjunction with (2) the defence on the opposing side of the River Aire which sits 2.946m below the proposed development then significant

areas would be within flood reducing the risk associate with the site as flood water disperse into lower lying grounds on both side of the River Aire.

(3) The barrier embankment/spillway in East Cowick sits at an elevation of 4.356m below the proposed development, this site would overtop before any of the other assets. In the event of a breach it would be fair to assume a flood mechanism similar to that of Storm Dennis would occur, causing flooding to East Cowick before levels could start migrating south of the development site. For this to occur water depths within this area would need to achieve ~5.266m. In the Storm Dennis event levels on back lane achieved around 400mm.

(5) (6) (7) When comparing the site elevation to the 2016 Upper Humber Modelling for the following returns;

- Defended (Tidal) 1:200 + 20% CC
- Defended (Fluvial) 1:100 + 20% CC; and
- Undefined 1:1000 event

we note that all levels sit in excess of 3m below the highest water level.

(8) The most recent application for the Bellway development in Snaith with excess of 100+ properties have an agreed finished floor level of 6.6mAOD. This was agreed with the EA due to the lack of support breach modelling data. The proposed site on grange lane sits and an elevation of 2.666m above this agreed level.

8.1.19. Considering the information presented in section 8.1 then the site risk in the event of a breach or a controlled flood is relatively low to very low.

8.1.20. A proposed FFL of 300mm above the 1:1000 design level (worst case) sits significantly below the current site elevation, and therefore a FFL should be sat at 300mm or more above the adjacent road level.



8.2. SURFACE WATER FLOODING

- 8.2.1. The EA Surface water datasets consider the area to be at Very Low Risk and there are no known issues with the drainage system or its capacity servicing this site.
- 8.2.2. The sites elevation is relatively high compared to the South and the East of the site, this existing topography shows that any possible surface water is likely to be a local nuisance to the proposed development and not a flood risk. The direct development doesn't have a topography to allow any ponding water within its direct vicinity
- 8.2.3. CC has the potential to lead to a bigger demand on the existing system with EA 2022 guidance stating 5-20% (Central Estimate) increase in rainfall intensity.
- 8.2.4. If we were to set a FFL based upon the surface water risk we need to consider that severity is much lower than fluvial flooding, flood extents are less widespread, and duration of flooding is shorter, so the required freeboard can be reduced. For surface water flooding, it is recommended that finished floor levels are set at least 150mm above the 1 in 100-year plus climate change flood level.
- 8.2.5. Considering this and the current risk level then any residual risk from surface water will be managed by introducing a minimum 300mm threshold level from the adjacent road.

8.3. RESERVOIR FLOODING

- 8.3.1. Reservoir failure is considered low in this country due to the strenuous laws and regulations undertakers have to abide by. The local reservoir undertaker is the EA, and it is assumed that they also undertake the maintenance, and is inspected on an annual basis by an independent panel engineer therefore reducing risk of a sudden failure or breach.
- 8.3.2. The residual risk of these needs to be considered during the FRA from reservoirs at this location, it would be fair to consider the risk of reservoir failure as very low.



8.3.3. Although the site currently sits outside of the inundation area for the reservoir the FRA has assessed the risk in line with the fluvial risk due to the relation between the Ings/reservoir and the River Aire.

8.3.4. Therefore, any mitigation proposed has been accommodated within section 8.1

8.4. GROUND WATER FLOODING

8.4.1. Ground water flooding for the site as a <25% susceptibility on the development, however there have been no known historical issues of ground flooding for the site.

8.4.2. The site sits at a much higher elevation than ground to the South of the site and there are no known surface water issues here which would be expected if the area had ground water issues.

8.4.3. Any potential ground water events would likely flow to lower lying ground unaffecting the proposed development.

8.5. OTHER SOURCES OF FLOODING

8.5.1. No other sources of flooding were identified for the site.

9. CONCLUSION

9.1. This FRA has considered the potential risk associated with flooding from Fluvial, Surface Water, Reservoir, Ground water and other sources including any potential impact from climate change to the proposed development site.

9.2. The site is considered more vulnerable and sits in Flood Zone 1(protected by flood defences). However, the SFRA states that the site has the potential to come within Flood Zone 3a (High risk). It must be noted that it only just gets introduced into Flood Zone 3a on the forecast maps.

9.3. No Fluvial and Tidal breach modelling is available for the site for these future breach events. The 2016 Upper Humber modelling, comparison to existing assets and recent residential development FFL was assessed to determine the residual risk of the site. The sites elevation sits 2m above any of the other comparing elevations mentioned.



- 9.4. The site has an elevation of 4.267m above the 1in1000 non defended model results 3.131m above the defended 1:200 + 20% CC Tidal and 3.266m above the 1:100 +20% CC Fluvial events.
- 9.5. Considering 9.4 then the finished floor level should be set at 300mm above the adjacent access road (Grange Road) which will have the higher elevation than any of the designed return periods.
- 9.6. All other flood sources are deemed low to negligible therefore no mitigation will be proposed, as the proposed FFL would address an localised risk.
- 9.7. As per section 8.1.2 the site does require an exception test due to the vulnerability status and the potential flood risk zone.
- 9.8. A number of recommendations have been highlighted in section 10, due to the low risk of the site are not deemed compulsory but good practice.
- 9.9. The development sits outside the requirement of SUDS as it is below the required threshold of 10 dwellings. Although it is advised and where it is achievable the development should try to incorporate the implementation of SUDS to alleviate the demand on the existing system.

Based upon the information available, information provided by the client and proposed recommendations highlighted within Section 10 then the proposed development is of low risk to flooding and with a valid exception test is appropriate for the proposed development.

10.RECOMMENDATIONS

- 10.1. The finished floor level should be sat at no lower than 300mm above the Grange Road elevation adjacent to the property.
- 10.2. The following recommendations are an advisory and not seen as a compulsory requirement due to the low risk of the site.
 - 10.2.1. A site survey to accurately portray the elevation of the ground should be undertaken. If there is a significant variation to the current assumed levels then the assessment highlighted in section 8 should be re-calculated to make sure the proposed finished floor level remains the highest elevation.
 - 10.2.2. All main boards and boilers should be located at the highest practical elevation in the dwelling.



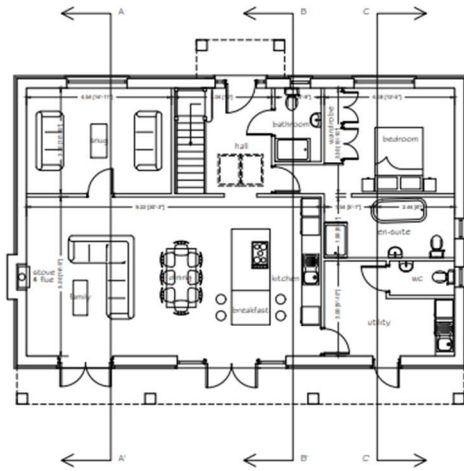
- 10.2.3. Any doors or openings accessible to the ground floor from outside of the building should be water tight or fitted well to reduce the risk of ingress during any event and any potential wave action.
- 10.2.4. Internal Wall linings – The use of water-resistant lime plaster or installing plaster board horizontally as a sacrificially section in the event of flooding should be installed on the ground floor.
- 10.2.5. Ground floor finishes should be designed to a highly durable standard which can withstand exposure to flood water without any deterioration. Examples would be concrete flooring finished with ceramic, marble or stone tiling.
- 10.2.6. At any thresholds to the property ground should run away from the dwelling to avoid any ingress of water.
- 10.2.7. The existing permeable ground of the site will reduce due to the proposed introduction of a new dwelling. Although it is assumed the existing infrastructure will be utilised to remove surface and foul from the site it is advised that a soakaway/attenuation and septic tank are considered, therefore reducing the impact of the development.
- 10.2.8. The development should consider air brick covers and any of PFR measures as standard.
- 10.2.9. Good practice elsewhere should also be encouraged such as water butts, landscaping and finishing's, incorporating permeable areas in the design
- 10.2.10. Occupants of the property should develop a flood risk plan.
- 10.2.11. It is advised that the proprietors of the site signs up to The EA Flood Warning System where available. This will allow time to prepare for flooding or have sufficient time to evacuate or implement a Flood Plan.



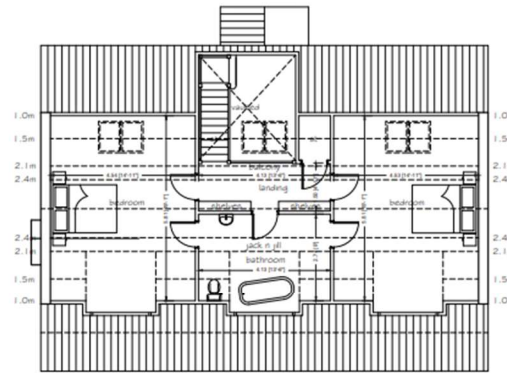
APPENDICES



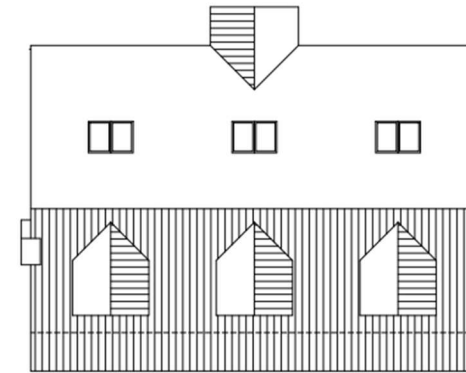
Appendix 1 – Planning Proposal



PROPOSED GROUND FLOOR PLAN



PROPOSED FIRST FLOOR PLAN



PROPOSED ROOF PLAN

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Site at Grange Road
West Cowick
Proposed Floor Plans

Scale 1:100 @ A2

Date 12.12.23

Drawn ac

ARCHITEK DESIGN & PLANNING
t - 07881 554676
e - info@architekdesignandplanning.co.uk
w - www.architekdesignandplanning.co.uk

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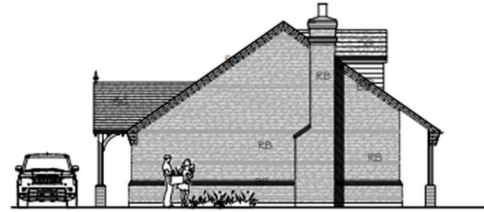
ADP23/P131/03



Appendix 1 – Planning Proposal



PROPOSED FRONT ELEVATION



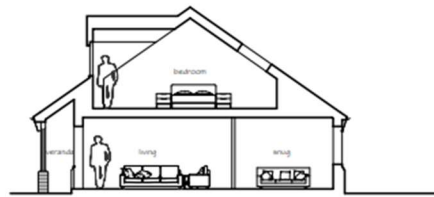
PROPOSED SIDE SECTION

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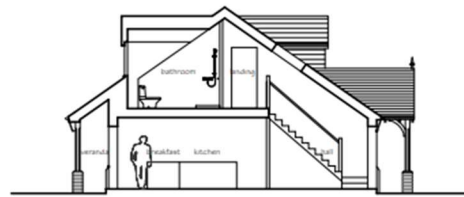


EXTERNAL SPECIFICATION Details

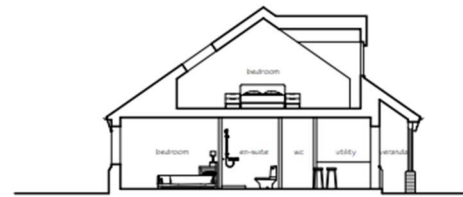
- RB - Flaming brickwork. Red roof tiles being brick. Render either a light cream or white.
- GR - Peppering brickwork with dark brown glazing. Colour of all bricks and roof tiles to match.
- BS - Brickwork. 2.5 brick courses deep peppering. Green glazing with white mortar. Peppering to be a similar colour to the colour of the brickwork.
- T - External concrete work, walls, bases, external doors and windows. Colour: Light Grey.
- GS - Roof - Slate grey roof tiles.
- FD - Front door - Oak finish with leaded glass. Colour: Light Oak.
- RP - Rear and half front garden terraces.



PROPOSED SIDE SECTION A-A'



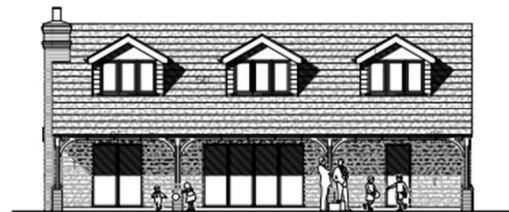
PROPOSED SIDE SECTION B-B'



PROPOSED SIDE SECTION C-C'



PROPOSED SIDE SECTION



PROPOSED REAR ELEVATION

ARCHITEK
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Site at Grange Road
West Cowick
Proposed Elevations

Scale 1:100 @ A2

Date 15.12.23

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ARCHITEK DESIGN & PLANNING

T - 07881 554476

E - info@architekdesignandplanning.co.uk

W - www.architekdesignandplanning.co.uk

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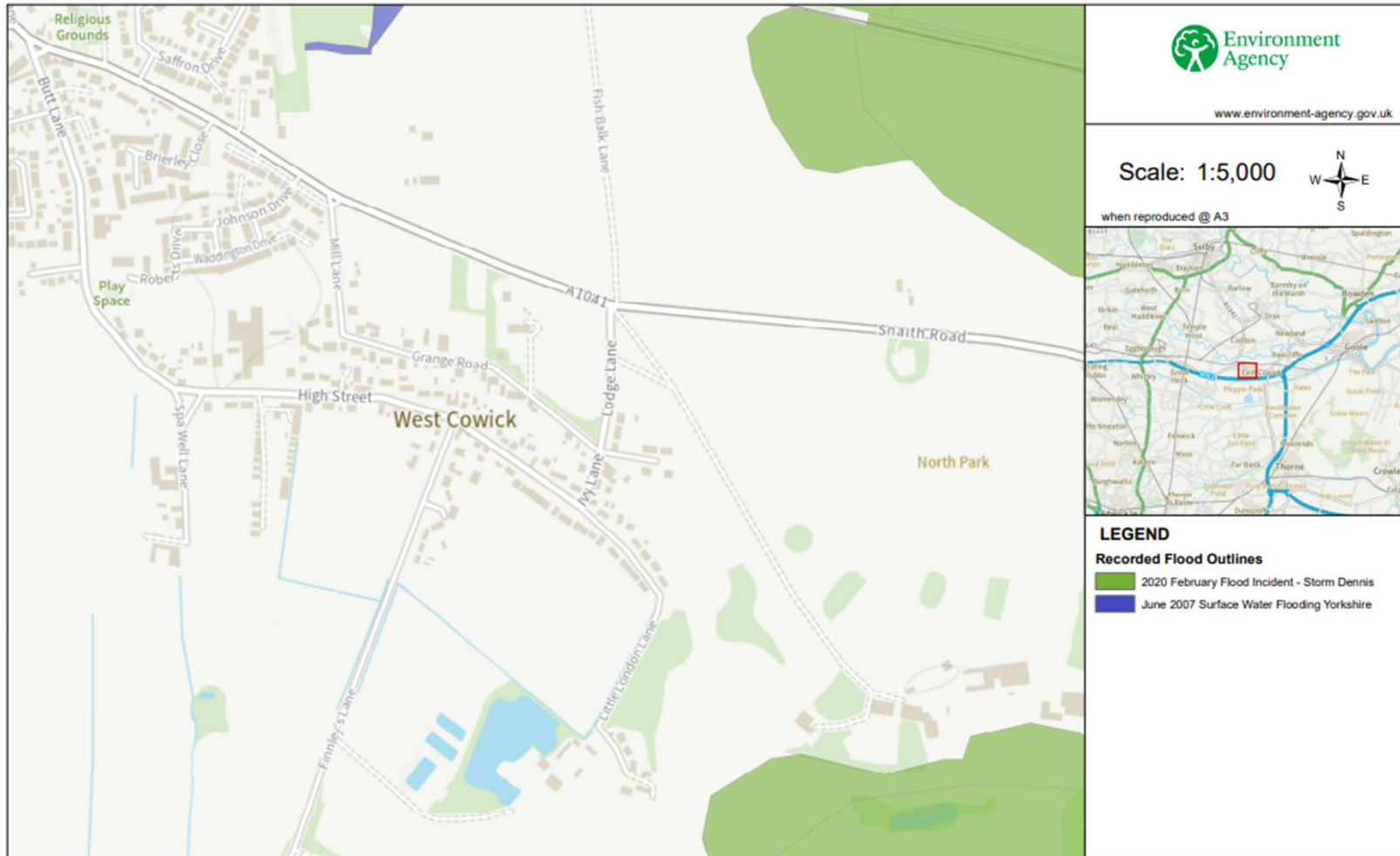
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Appendix 2 – Historical Flooding Plan

RFI/2024/343674 Historic Flood Map centred on 465186E 421512N

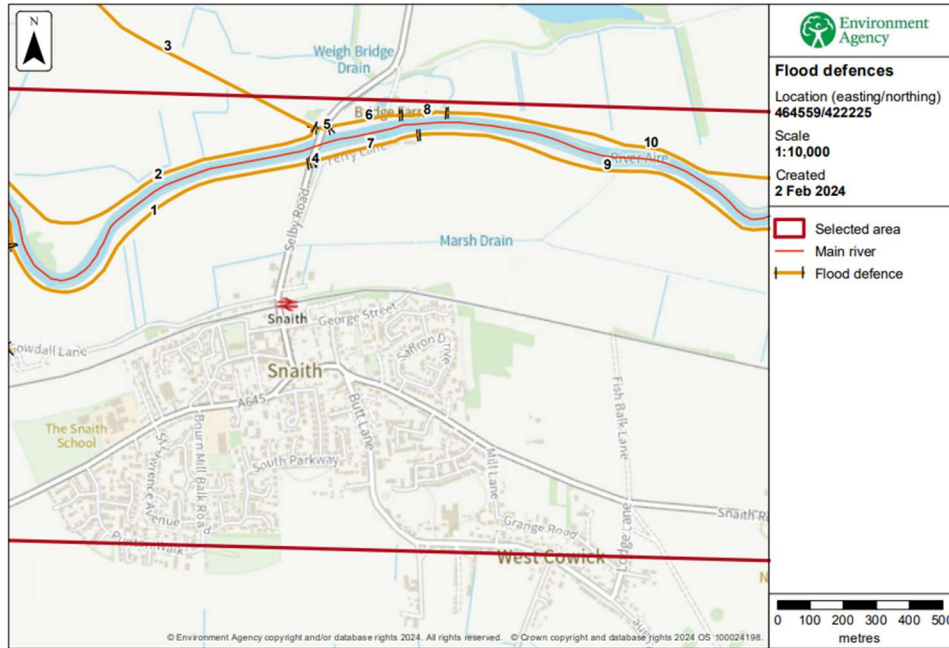
Date created: 02/02/2024



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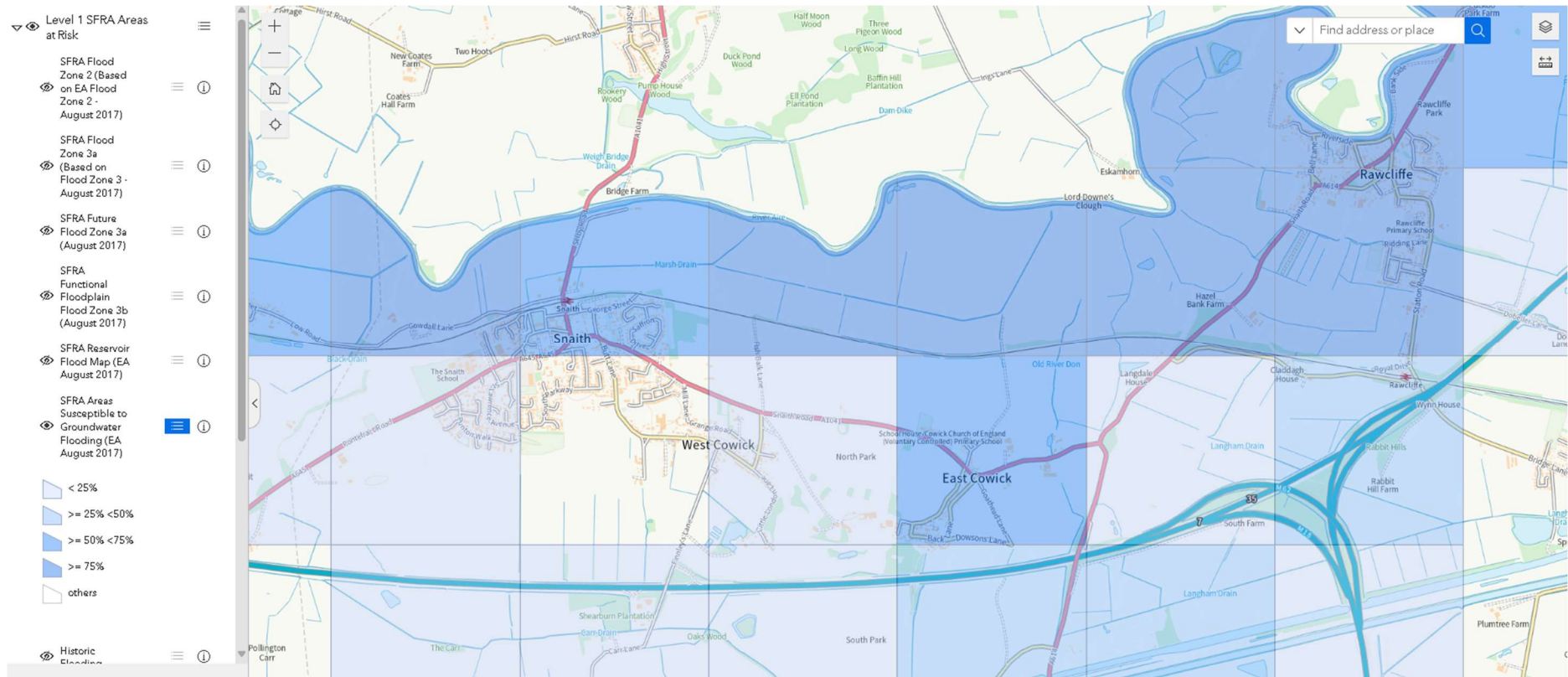
Appendix 3 – Flood Defence Data



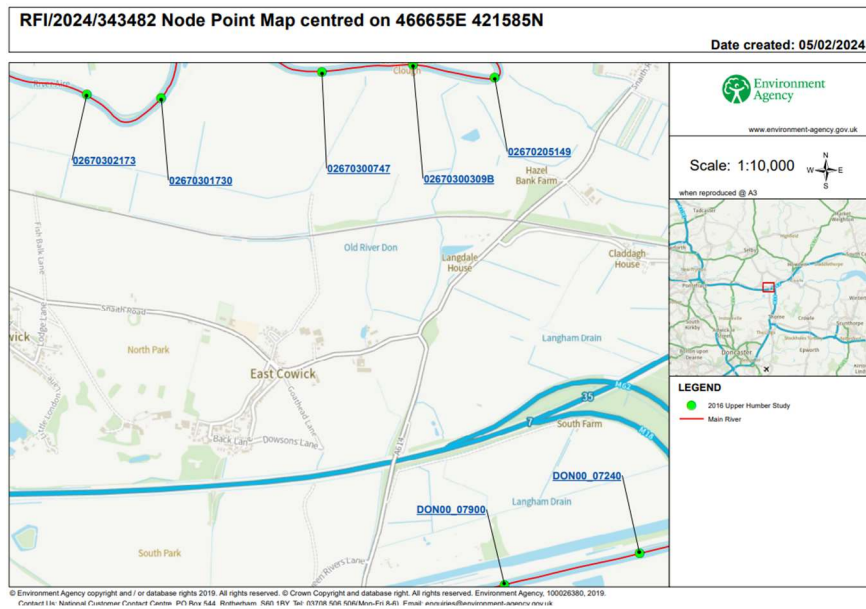
Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	74739	Embankment	50		6.28	6.40	
2	26897	Embankment	50		6.57	6.03	
3	27378	Embankment	50		6.62	6.58	
4	27381	Bridge Abutment	50				
5	26896	Bridge Abutment	50				
6	52909	Embankment	50	Good	6.32	6.65	
7	27380	Embankment	50		6.16	6.05	
8	541322	Embankment		Good			
9	53750	Embankment	50		6.10	6.16	
10	26895	Embankment	50	Good	5.83	6.32	

Appendix 4 – Flood Return Map (Defended)



Appendix 5 – Modelled Return periods (2016 Upper Humber)



2016 Upper Humber Defended Model Results - RFI/2024/343482 (Level - mAO, Flow - m³/s)

Node point	Annual Exceedance Probability (AEP)											
	10% AEP (1 in 10)		3.33% AEP (1 in 30)		1.33% AEP (1 in 75)		1% AEP (1 in 100)		0.5% AEP (1 in 200)		0.1% AEP (1 in 1000)	
	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
DON00_07240	5.316	217.802	5.449	233.922	5.573	254.04	5.646	256.44	5.972	266.33	6.196	271.315
DON00_07900	5.265	217.63	5.397	233.763	5.551	254.792	5.621	256.259	5.986	266.054	6.205	270.242
2670205149	5.403	265.774	6.058	266.781	6.14	286.666	6.153	293.871	6.163	304.242	6.199	322.097
02670300309B	5.396	265.689	6.061	266.773	6.138	286.361	6.15	293.673	6.16	304.296	6.196	315.427
2670300747	5.42	265.597	6.067	266.766	6.137	286.033	6.148	293.456	6.158	304.481	6.197	317.88
2670301730	5.582	265.298	6.076	266.748	6.134	284.979	6.144	292.843	6.155	306.522	6.196	314.134
2670302173	5.629	265.17	6.082	266.748	6.136	284.532	6.145	292.582	6.16	306.811	6.2	315.114

2016 Upper Humber Undefended Model Results - RFI/2024/343482 (Level - mAO, Flow - m³/s)

Node point	Annual Exceedance Probability (AEP)							
	10% AEP (1 in 10)	3.33% AEP (1 in 30)	1.33% AEP (1 in 75)	1% AEP (1 in 100)	0.5% AEP (1 in 200)	0.1% AEP (1 in 1000)		
	Level	Level	Level	Level	Level	Level	Level	
DON00_07240	3.773	3.913	4.108	4.167	4.252	4.464		
DON00_07900	3.812	3.944	4.138	4.197	4.278	4.488		
2670205149	4.521	4.644	4.668	4.698	4.788	4.98		
02670300309B	4.522	4.645	4.669	4.699	4.789	4.982		
2670300747	4.525	4.647	4.67	4.701	4.791	4.985		
2670301730	4.529	4.651	4.674	4.704	4.795	4.992		
2670302173	4.533	4.655	4.677	4.707	4.798	4.999		

2016 Upper Humber Defended Climate Change Model Results - RFI/2024/343482 (Level - mAO, Flow - m³/s)

Node point	Annual Exceedance Probability (AEP)			
	1% AEP (1 in 100) + 20% CC (Fluvial)		0.5% AEP (1 in 200) + 20% CC (Tidal)	
	Level	Flow	Level	Flow
DON00_07240	5.482	273.673	5.924	127.901
DON00_07900	5.485	273.279	5.882	123.697
2670205149	5.87	302.374	6.123	227.192
02670300309B	5.863	302.362	6.124	214.614
2670300747	5.899	302.35	6.127	221.747
2670301730	5.964	304.196	6.133	212.11
2670302173	6	304.241	6.135	207.958