

Flood Risk Assessment for Planning

November 2020

Our reference: 90087-Perriment-KingSt **Prepared for:** Mr John Lawson

Location: 49 King Street Whitehaven CA28 7JH



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Document Issue Record

Project:	Flood Risk Assessment for Planning
Client:	Mr John Lawson
Application:	Change of use of the first and second floors to 2no. residential apartments
Location:	49 King Street, Whitehaven, CA28 7JH
Our reference:	90087-281020-Perriment-KingSt
Version:	v1.0 061120

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Contents

1.	. Key Facts	4
	1.1 Flood Risk Posed:	4
	1.2 Flood Risk Mitigation:	4
2.	. Introduction	5
3.	Existing Situation	6
	3.1 Site Usage:	6
	3.2 Geography and Topography:	6
	3.3 Geology and Soil:	7
4.	Development Proposal	10
5.	Assessment of Flood Risk	13
	5.1 Flood Zones:	13
	5.2 Fluvial (Irish Sea):	14
	5.2.1 Modelled flood levels and extents:	14
	5.2.2 Flood Storage Areas:	14
	5.2.3 Flood Defences	14
	5.2.4 Residual risk (breach or overtopping of flood defences):	14
	5.2.5 Historical flood events:	15
	5.2.6 Internal Drainage Boards:	15
	5.3 Pluvial (Surface Water):	15
	5.4 Groundwater:	16
	5.5 Sewer Surcharge:	17
	5.6 Other Sources:	17
6.	Flood Risk Management	19
	6.1 Vulnerability to flooding:	19
	6.3 Safe Escape and Flood Action Plan:	19
	6.4 Flood Warning:	20
	6.5 Flood Plan:	21
	6.6 Off-Site Impacts:	21
	6.6.1 Fluvial floodplain storage:	21
	6.6.2 Surface Water Drainage:	22
7.	Sequential and Exception Test	23
8.	Discussion and Conclusions	24
A	ppendix	



1. Key Facts

1.1 Flood Risk Posed:

- Site within Flood Zone 3 (High Risk).
- Fluvial risk originating from Irish Sea, approximately 120 east of the site.
- EA Product 4 data requested.
- No Flood Storage Areas located in close proximity to the site.
- According to EA records, the site is not within an area that has previously flooded.
- Risk of pluvial flooding would appear to be "Medium".
- Risk of sewer surcharge and groundwater flooding would appear to be low.

1.2 Flood Risk Mitigation:

- Flood proofing will be incorporated as appropriate.
- Due to the scale of the development, a full Surface Water Drainage Strategy is not required at this stage of planning.
- A flood warning and evacuation plan which will be prepared in liaison with the Council's Emergency Planners and tied in with the local emergency plans for the area.
- The applicant will register with the Environment Agency Floodline Warnings/Alert Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.



2. Introduction

Unda Consulting Limited have been appointed by Mr John Lawson (hereinafter referred to as "the applicant") to undertake a Flood Risk Assessment for the proposed development at 49 King Street, Whitehaven, CA28 7JH (hereinafter referred to as "the site"). The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance.

The purpose of the study is to support a planning application for the proposed development. This report presents our findings based on the readily available information and data relating to the site and surrounding drainage area.

The site appears to be located within Flood Zone 3 as defined by the Environment Agency (EA) on their Flood Map for Planning. Under the National Planning Policy Framework (NPPF), a FRA is required if a proposed development:

- includes building or engineering works in Flood Zone 2 or 3;
- includes building or engineering works on land classified by the Environment Agency as having critical drainage problem;
- changes the use of land or buildings in a location at risk of flooding from rivers or the sea, or with critical drainage problems;
- changes the use of land or buildings in a way that increases the flood vulnerability of the development where it may be subject to other sources of flooding;
- is larger than 1 hectare.

The assessment should demonstrate to the Local Planning Authority (LPA) and EA how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its potential users.

- whether the proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate.



3. Existing Situation

3.1 Site Usage:

The site is occupied by a retail shop on the ground floor with ancillary areas/ storage on the first and second floor levels.



Figure 1: Aerial photograph of site and surrounding area (Source: Google Earth)

3.2 Geography and Topography:

The site is located approximately 120m east of the marina and 150m west of the Tower Chapel St Nicholas.

Environment Agency LiDAR has been used to assess the topography across the site and wider area. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground surface. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at high spatial resolutions. The EA's LIDAR data archive contains digital elevation data derived from surveys carried out by the EA's specialist remote sensing team. Accurate elevation data is available for over 70% of England. The LiDAR technique records an elevation accurate to +0.15m every 1m. This dataset is derived from a combination of the full dataset which has been merged and re-sampled to give the best possible coverage. The dataset can be supplied as a Digital Surface Model (DSM) produced from the signal returned to the LIDAR (which includes heights of objects, such as vehicles, buildings and vegetation, as well as the terrain surface) or as a Digital



Terrain Model (DTM) produced by removing objects from the Digital Surface Model. 1.0m horizontal resolution DTM LiDAR data has been used for the purposes of this study.

The site is relatively flat with topographic levels ranging between approximately 5.54mAOD and 5.60mAOD.

3.3 Geology and Soil:

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site is Pennine Middle Coal Measures Formation - Mudstone, Siltstone and Sandstone.

The site is underlain by Alluvium - Clay, Silt, Sand and Gravel superficial deposits.

The soil type taken from the UK Soil Observatory website is relatively deep soils from Riverine Clay, Sands and Gravel soil parent material, with a Clay to Sandy loam texture.



Figure 2: Local bedrock geology (Source: BGS)

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Figure 3: Local superficial deposits (Source: BGS)

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Figure 4: Local soil types (Source: UKSO)



4. Development Proposal

The proposed planning application is for the change of use of the first and second floors to 2no. residential apartments.

Proposed site plans are provided below and in the report Appendix.



Figure 5: Proposed ground floor plans for the development (Source: hdp associates)





Figure 6: Proposed first floor plans for the development (Source: hdp associates)





Figure 7: Proposed second floor plans for the development (Source: hdp associates)

5. Assessment of Flood Risk

5.1 Flood Zones:

Within planning, Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's website.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 1: Flood Zones

The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.



Figure 8: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)



The site is located within Flood Zone 3 (High Probability), which means it is defined as land having a greater than 1 in 200 annual probability of tidal flooding.

The risk would appear to be predominantly tidal and originate from the Irish Sea located 120 west of the site.

5.2 Fluvial (Irish Sea):

The Irish Sea separates the islands of Ireland and Great Britain. It is connected to the Celtic Sea in the south by St George's Channel, and to the Inner Seas off the West Coast of Scotland in the north by the North Channel. Anglesey is the largest island within the Irish Sea, followed by the Isle of Man.

5.2.1 Modelled flood levels and extents:

Modelled flood levels and flood extents have been requested from the EA as part of a Product 4 data request.

5.2.2 Flood Storage Areas:

Flood Storage Areas are areas that act as a balancing reservoir, storage basin or balancing pond. Their 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. Flood storage areas do not completely remove the chance of flooding and can be overtopped or fail in extreme weather conditions.

According to Environment Agency data, there are no Flood Storage Areas located in close proximity to the site.

5.2.3 Flood Defences

According to the EA, this location is currently protected by both a sea wall with flood gates. The sea wall within the harbour has a length of 595.55m and a design standard of 200 years.

5.2.4 Residual risk (breach or overtopping of flood defences):

Breaching of flood defences can cause rapid inundation of areas behind flood defences as flow in the river channel discharges through the breach. A breach can occur with little or no warning, although they are much more likely to concur with extreme river levels or tides when the stresses on flood defences are highest. Flood water flowing through a breach will normally discharge at a high velocity, rapidly filling up the areas behind the defences, resulting in significant damage to buildings and a high risk of loss of life. Breaches are most likely to occur in soft defences such as earth embankments although poorly maintained hard defences can also be a potential source of breach.

Overtopping of flood defences occurs when water levels exceed the protection level of raised flood defences. The worst case occurs when the fluvial or tidal levels exceed the defence level as this can lead to prolonged flooding. Less severe overtopping can occur when flood levels are below defence levels, but wave action causes cyclic overtopping, with intermittent discharge over the crest level of the defence. Flood defences are commonly designed with a freeboard to provide protection against overtopping from waves. The risk from overtopping due to exceedance of the flood defence level is much more significant than the risk posed by wave overtopping. Exceedance



of the flood defence level can lead to prolonged and rapid flooding with properties immediately behind the defences at highest risk.

Flood defences may act to defend the site from direct inundation, but there is residual risk from each (failure) and overtopping (exceedance) of any flood defences in place.

As the site is defended by a sea wall with flood gates it could be at risk from the defences failing or being overtopped.

5.2.5 Historical flood events:

EA records indicate that there have been no previous floods on this site.

5.2.6 Internal Drainage Boards:

The site is not located within an Internal Drainage Board (IDB) area.

5.3 Pluvial (Surface Water):

Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.

The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- 1:30 (3.3%)
- 1:100 (1%)
- 1:1000 (0.1%)

The mapping below shows the Risk of Flooding from Surface Water with the site located at the centre of the crosshair. Please note that the EA to not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.

The EA Risk of Flooding from Surface Water Map suggests that the land adjacent to the site lies in an area of "Medium" Risk of flooding from surface water.

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Figure 9: Extract from Environment Agency Surface Water Flood Map (Source: EA)

5.4 Groundwater:

Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.

No information has been provided to suggest that the site is susceptible from groundwater flooding.

The Environment Agency has defined Source Protection Zones for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.

The zones are used in conjunction with the EA Groundwater Protection Policy to set up pollution prevention measures in areas that are at a higher risk, and to monitor the activities of potential polluters nearby.



The published Environment Agency Groundwater Vulnerability map shows the site is not located within a Groundwater Source Protection Zone.

5.5 Sewer Surcharge:

Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

No further information has been provided to suggest that the site is susceptible to sewer surcharge flooding.

5.6 Other Sources:

Reservoirs with an impounded volume in excess of 25,000 cubic metres (measured above natural ground level) are governed by the Reservoirs Act and are listed on a register held by the Environment Agency. The site lies outside of the maximum inundation extent on the EA Reservoir Inundation Map. The EA also advise on their website that reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. All major reservoirs have to be inspected by specialist dam and reservoir Engineers. In accordance with the Reservoirs Act 1975 in England, these inspections are monitored and enforced by the EA themselves. The risk to the site from reservoir flooding to occur. The Environment Agency Reservoir Flood Map illustrated below, illustrates the largest area that might be flooded if the storage area were to fail and release the water it is designed to hold during a flood event.

Records of flooding from reservoirs and canals are erratic as there is no requirement for the Environment Agency to provide information on historic flooding from canals and raised reservoirs on plans. In particular, the NPPF does not require flood risk from canals and raised reservoirs to be shown on the Environment Agency flood zones.

Overflows from canals can be common as they are often fed by land drainage, and often do not have controlled overflow spillways. Occasionally, major bank breaches also occur, leading to rapid and deep flooding of adjacent land.

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Figure 10: Extract from Environment Agency Risk of Flooding from Reservoirs Map (Source: EA)



6. Flood Risk Management

6.1 Vulnerability to flooding:

The NPPF classifies property usage by vulnerability to flooding.

The existing site is occupied by shop storage "less vulnerable" respectively under the NPPF.

Post development, the site will become "more vulnerable", as the application is for the Change of use of the first and second floors to 2no. residential apartments. Therefore, there will be an increase in vulnerability post development.

6.2 Physical Design Measures:

Due to the nature of the proposed development, which uses the confines of the existing structure, it is not possible to raise existing finished floor levels. To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the development where practically possible.

These measures can include the following:

- Waterproof screed used on floors;
- Closed-cell foam used in wall cavities;
- External walls rendered resistant to flooding to first floor level;
- Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Boilers, control and water storage / immersion installed at first floor level or above;
- Gas meter installed at first floor level or above;
- Plumbing insulation of closed-cell design;
- Non-return valves fitted to all drain and sewer outlets;
- Anti-syphon fitted to all toilets;
- New kitchen units of solid, water resistant material;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at ground floor level;
- Stairs of solid hardwood construction with wood faces treated to resist water penetration.

The applicant should also consider the use of demountable flood defence barriers to defend ground level doorways and low windows.

6.3 Safe Escape and Flood Action Plan:

The NPPF requires a route of safe escape for all residents and users to be provided from new residential properties in Flood Zone 3. Safe escape is usually defined as being through slow moving flood water no deeper than 25cm.



The entire site is located within Flood Zone 3. As such, safe escape will be provided by a flood warning and evacuation strategy which will be prepared in liaison with the Council's Emergency Planners, and tied in with the existing emergency plans for the local area.

6.4 Flood Warning:

The EA is responsible for issuing flood warnings. Flood warnings are issued to the emergency services and local authorities. Both private individuals and organisations can sign-up to receive warnings via phone, text or email. This system of receiving warnings is currently voluntary.

Advice regarding severe flood warnings will generally be given during weather forecasts on local radio and TV. In the case of extreme events, warnings can also be disseminated via door to door visits by the police or locally appointed flood wardens.

The site lies within an Environment Agency Flood Warning Area. The EA issue flood warnings/alerts to specific areas when flooding is expected. It is recommended that the applicant registers online with the free Environment Agency Floodline Warnings/Alert Direct service at www.gov.uk/sign-up-for-flood-warnings to receive flood warnings by phone, text or email.

The site is located within both flood alert and warning area.

The flood warning service has three types of warnings that will help you prepare for flooding and take action:

Flood Warning	Flood Alert	Flood Warning	Severe Flood Warning
What it means?	Flooding is possible.	Flooding is expected.	Severe flooding.
	Be prepared.	Immediate action required.	Danger to life.
When it's used?	Two hours to two days in advance of flooding.	Half an hour to one day in advance of flooding.	When flooding poses a significant threat to life.
	Be prepared to act on your flood plan.	Move family, pets and valuables to a safe place.	Stay in a safe place with a means of escape.
What to	Prepare a flood kit of essential items.	Turn off gas, electricity and water supplies if safe to do so.	Be ready should you need to evacuate from your home.
ao?	Monitor local water levels and the flood forecast on our website.	Put flood protection equipment in place.	Co-operate with the emergency services. Call 999 if you are in immediate danger.

Table 2: EA Flood Warning Service



6.5 Flood Plan:

It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

Before a flood:

- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood.
- Know how to turn off electricity and water supplies to the site.
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.

During a flood:

- Activate the evacuation plan and evacuate the site.
- Remove cars from the site if there is sufficient warning and the water levels are not rising rapidly.
- Switch off water and electricity for the site.
- Tune into your local radio station on a battery or wind-up radio.
- Listen to the advice of the emergency service and evacuate if told to do so.
- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

After a flood:

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you don't have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics and water checked by qualified engineers before switching them back on.

6.6 Off-Site Impacts:

6.6.1 Fluvial floodplain storage:

The NPPF requires that where development is proposed in undefended areas of floodplain, which lie outside of the functional floodplain, the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain. Flood storage capacity can be maintained by lowering ground



levels either within the curtilage of the development or elsewhere in the floodplain, in order to maintain at least the same volume of flood storage capacity within the floodplain.

In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.

For development in a defended flood risk area, the impact on residual flood risk to other properties needs to be considered. New development behind flood defences can increase the residual risk of flooding if the flood defences are breached or overtopped by changing the conveyance of the flow paths or by displacing flood water elsewhere. If the potential impact on residual risk is unacceptable then mitigation should be provided.

The proposed development is a change of use, with no external alterations, therefore post development there will be no loss of fluvial floodplain storage.

6.6.2 Surface Water Drainage:

The development will utilise Sustainable drainage systems (SuDS) design in accordance with the NPPF for Planning Applications and the drainage hierarchy as follows:

- 1. Store rainwater for later use;
- 2. Infiltration techniques;
- 3. Attenuate rainwater by storing in tanks for gradual release;
- 4. Discharge rainwater direct into watercourse;
- 5. Discharge rainwater into surface water sewer;
- 6. Discharge rainwater into a combined sewer;

However, based on the development plans provided, the proposal is for the change of use of the existing building and does not incorporate any external alterations to the built footprint. As such, there will be no change in the impermeable coverage post development and therefore no change in the surface water runoff generation from the site.

There will be no change to the existing on-site drainage system.



7. Sequential and Exception Test

The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

The site is situated within Flood Zone 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea). Post development, the site will become "more vulnerable" throughout, as the application is for the change of use of the first and second floors to 2no. residential apartments.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Zone 2	\checkmark	Exception Test required	\checkmark	\checkmark	\checkmark
Zone 3a	Exception Test required	Х	Exception Test required	\checkmark	\checkmark
Zone 3b	Exception Test required	Х	Х	X	\checkmark

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Using the table above, the proposed application is considered to be suitable within Flood Zone 3, with the implementation of the Exception Test.



8. Discussion and Conclusions

Unda Consulting Limited have been appointed by Mr John Lawson undertake a Flood Risk Assessment for the proposed development at 49 King Street, Whitehaven, CA28 7JH. The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance.

The proposed planning application is for the change of use of the first and second floors to 2no. residential apartments. Post development, the site will become "more vulnerable", as the application is for the change of use of the first and second floors to 2no. residential apartments. Therefore, there will be an increase in vulnerability post development.

The site is located within Flood Zone 3 (High Probability), which means it is defined as land having a greater than 1 in 200 annual probability of tidal flooding. The risk would appear to be predominantly tidal and originate from the Irish Sea located 120 west of the site.

A Product 4 data request has been made to the EA.

EA records indicate that there have been no previous floods on this site.

Due to the nature of the proposed development, which uses the confines of the existing structure, it is not possible to raise existing finished floor levels. To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the development where practically possible. The finished floor levels will remain the same post development.

The entire site is located within Flood Zone 3. As such, safe escape will be provided by a flood warning and evacuation strategy which will be prepared in liaison with the Council's Emergency Planners, and tied in with the existing emergency plans for the local area.

The EA Risk of Flooding from Surface Water Map suggests that the land adjacent to the site lies in an area of "Medium" Risk of flooding from surface water.

No information has been provided to suggest that the site is susceptible to sewer surcharge or groundwater flooding.

In summary:

- Site within Flood Zone 3 (High Risk).
- Fluvial risk originating from Irish Sea, approximately 120 east of the site.
- EA Product 4 data requested.
- No Flood Storage Areas located in close proximity to the site.
- According to EA records, the site is not within an area that has previously flooded.
- Risk of pluvial flooding would appear to be "Medium".
- Risk of sewer surcharge and groundwater flooding would appear to be low.
- Flood proofing will be incorporated as appropriate.



- Due to the scale of the development, a full Surface Water Drainage Strategy is not required at this stage of planning.
- A flood warning and evacuation plan which will be prepared in liaison with the Council's Emergency Planners and tied in with the local emergency plans for the area.
- The applicant will register with the Environment Agency Floodline Warnings/Alert Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

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Appendix

• Proposed and existing plans.



Notes:				
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