

Whitby Maritime Hub

Flood Risk Assessment

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1. Introduction

1.1 Overview

Fairhurst are appointed to undertake a Flood Risk Assessment (FRA) for the proposed Whitby Maritime Hub development, located within Endeavour Wharf.

The proposed development is a three storey building and external spaces within the existing wharf comprising solely of 'water compatible' tenant uses, as defined within the NPPF.

The location of the proposed development is provided in Figure 1.

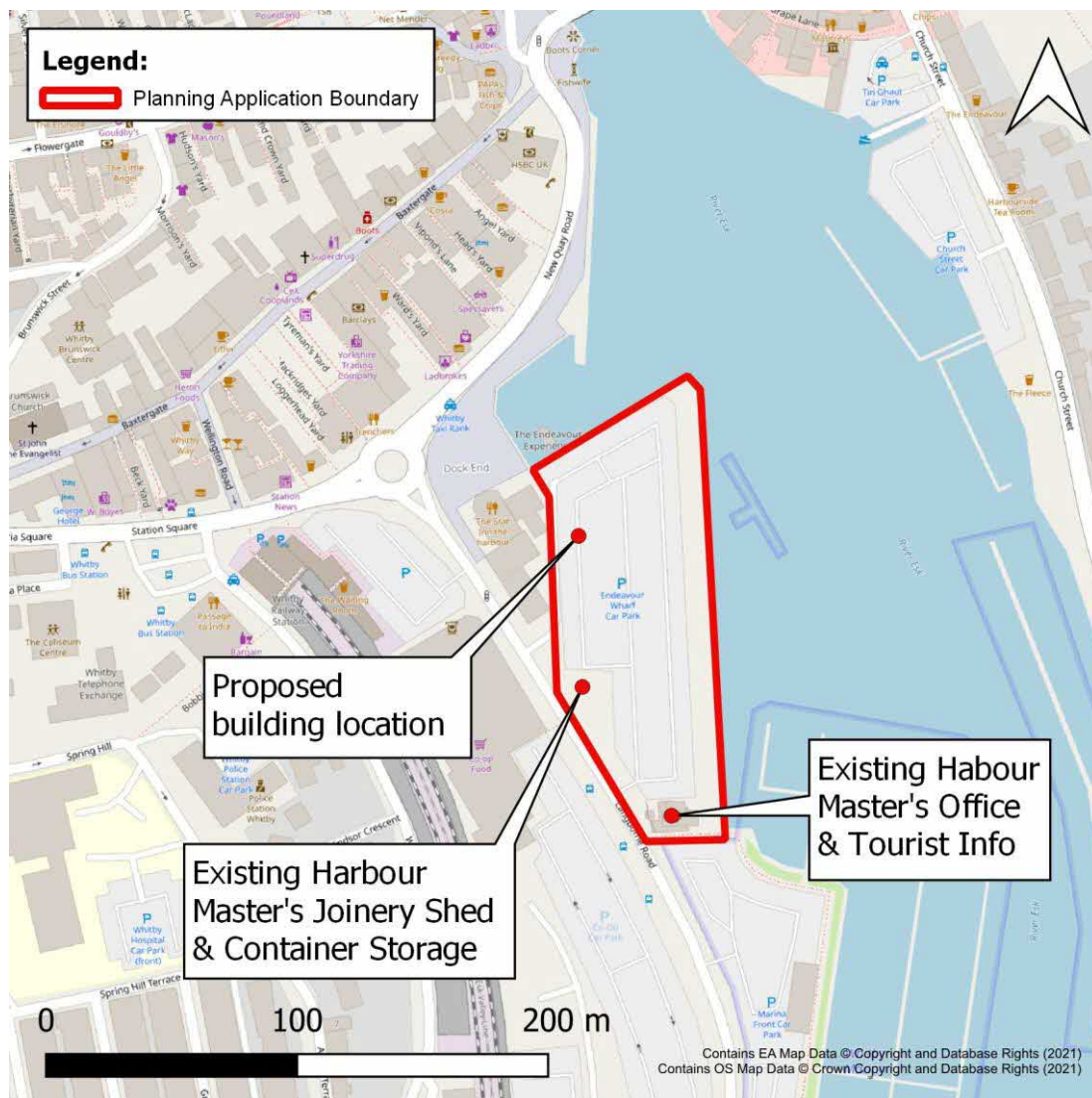


Figure 1 - Site Location Plan

2. Legislative Framework

2.1 National Planning Policy

One of the key aims of the National Planning Policy Framework (NPPF) and Planning Policy Guidance (PPG) is to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is necessary in such areas, national policy promotes approaching the design of these with safety in mind, without increasing flood risk elsewhere. Furthermore, where possible, overall flood risk should be reduced.

A risk-based approach should be adopted at all levels of planning. Applying the source pathway-receptor model to planning for development in areas of flood risk requires:

- A strategic approach which avoids adding to the causes or “sources” of flood risk, by such means as avoiding inappropriate development in flood risk areas and minimising run-off from new development onto adjacent and other downstream property, and into the river systems;
- Management of flood “pathways” to reduce the likelihood of flooding by ensuring that the design and location of the development maximises the use of SuDS, and takes account of its susceptibility to flooding, the performance and processes of river/coastal systems and appropriate flood defence infrastructure, and of the likely routes and storage of floodwater, and its influence on flood risk downstream; and
- Reducing the adverse consequences of flooding on the “receptors” (i.e. people, property, infrastructure, habitats and statutory sites) by avoiding inappropriate development in areas at risk of flooding.

A FRA should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account.

In areas at risk of river or sea flooding, preference should be given to locating new development in Flood Zone 1. If there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources.

Flood risk has been categorised as High, Medium and Low based on the probability of inundation. Extracts from Tables 1, 2 and 3 of the Flood Risk and Coastal Change PPG are provided below, which highlights the likely response to planning applications within each Flood Zone.

The Maritime Hub is a water compatible development and therefore can take place within all Flood Zones, provided suitable mitigation measures have been undertaken. Further information on the classification is provided in Section 3.

Table 1 - Extract from the Flood Risk and Coastal Change Planning Practice Guidance

<p>Zone 1: Low Probability</p> <p>Definition This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).</p> <p>Appropriate uses All uses of land are appropriate in this zone.</p> <p>Flood risk assessment requirements For development proposals on sites comprising one hectare or above, the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.</p>
<p>Zone 2: Medium Probability</p> <p>Definition This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.</p> <p>Appropriate uses Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are <i>only</i> appropriate in this zone if the Exception Test is passed.</p> <p>Flood risk assessment requirements All development proposals in this zone should be accompanied by a flood risk assessment.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.</p>
<p>Zone 3a: High Probability</p> <p>Definition This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.</p> <p>Appropriate uses The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.</p>

The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- Relocate existing development to land in zones with a lower probability of flooding; and
- Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

Definition

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.

The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would typically flood with an annual probability of 1 in 33 (3.3%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and relocate existing development to land with a lower probability of flooding.

Table 2 - Flood risk vulnerability classification from the Flood Risk and Coastal Change Planning Practice Guidance

<p>Essential infrastructure</p> <ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines
<p>Highly vulnerable</p> <ul style="list-style-type: none"> • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”).
<p>More vulnerable</p> <ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
<p>Less vulnerable</p> <ul style="list-style-type: none"> • Police, ambulance and fire stations which are not required to be operational during flooding.

- Buildings used for shops, financial, professional and other services,
- Restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in “more vulnerable”, and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

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

Flood risk vulnerability classification (see Table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗
<p>Extract from the Flood Risk and Coastal Change Planning Practice Guidance</p> <p>Key: ✓ Development is appropriate. ✗ Development should not be permitted.</p>						

The proposed development is water compatible and located within Flood Zone 3b. As such, the exception test is not required.

2.2 Local Planning Policy

Local Planning Policy covering Whitby is set out in the current Scarborough local plan, which was adopted on 3 July 2017 and guides the future development of the borough in the period up to 2032. Flood risk policy is set out in ENV 3 Environmental Risk:

Policy ENV 3 Environmental Risk

Proposals will be expected to mitigate against the implications of environmental risk and the effects of climate change. This will be achieved by

- a. avoiding development in high flood risk areas by following a sequential approach in giving priority to lowest risk areas as identified by the North-East Yorkshire Strategic Flood Risk Assessment or any subsequent update or replacement. Where the Sequential Test cannot be passed, the Exception Test should be utilised in order to demonstrate whether the development's wider benefits to the community outweigh the flood risks, whether the development can be made safe, and whether it has, wherever possible, reduced flood risk overall;
- b. seeking opportunities from new development that may help to reduce the causes and impacts of flooding, and safeguarding land which is needed for flood risk management purposes (as identified in DEFRA's Programme of flood and coastal erosion risk management schemes and other Environment Agency or Lead Local Flood Authority documents);
- c. ensuring water supply and water resources are managed and water efficiency measures are incorporated to reduce resource need, in line with the Environment Agency's licensing strategies;
- d. using mitigation measures such as Sustainable Drainage Systems where possible in order to facilitate development in areas of sensitive drainage and to meet the requirements of the Water Framework Directive;
- e. ensuring development has adequate provision for foul and surface water disposal in advance of occupation;
- f. ensuring development does not lead to pollution of controlled waters in line with the requirements of the Water Framework Directive;
- g. requiring development to manage waste from the site (both during construction and operation) in a sustainable way consistent with the waste hierarchy;
- h. requiring the remediation or mitigation of contaminated or unstable land to reduce unacceptable risks to the environment through development;
- i. monitoring and seeking to maintain good ambient air quality standards; and
- j. ensuring development does not contribute to or exacerbate coastal erosion and/or landslip and ensuring development is not exposed to the risks of coastal erosion and/or coastal flooding.

Further information is provided as follows:

Flood Risk

8.25 The Local Planning Authority will adopt the sequential approach in accommodating development (as detailed in the NPPF and NPPG) and any proposals that will involve an exception to this approach will need to demonstrate appropriate measures have been taken in order to ensure any adverse impacts are mitigated.

8.26 The Local Plan aims to ensure development is avoided in areas at the highest risk of flooding and manage the risk of flooding to ensure there are no adverse impacts elsewhere. The North-East Yorkshire Strategic Flood Risk Assessment (SFRA) (February 2010) and Environment Agency data are used to identify areas at being of high, medium or low-risk to flooding.

8.27 The NPPF and NPPG seek to ensure the impacts from flood risk are avoided or limited wherever possible and in doing so seek the utilisation of both the Sequential and Exception Tests.

8.28 The Sequential Test states development should not be permitted on land when there are reasonably available sites in areas with a lower probability of flooding as defined by the SFRA. Where this may not be possible, the Exception Test must be used in order to demonstrate wider sustainability benefits to the community are accrued that outweigh flood risk and demonstrate that the development can be achieved without increasing flood risk elsewhere through a site-specific flood risk assessment. In this instance, proposals should be supported by a demonstration that they are in accordance with relevant policy and guidance such as the Flood and Water Management Act 2010, the SFRA, the NPPF and NPPG and any future updates.

8.29 Development should also be designed to ensure any residual risk can be safely managed, is appropriately flood resilient and resistant and seeks to fully utilise sustainable drainage systems in addition to ensuring it is in accordance with Policy DEC 1: Principles of Good Design. Proposals should meet the standards of ensuring sufficient attenuation and long term storage should be provided to accommodate at least an event with a 1 in 30 chance of occurring in any given year. Any design should also ensure that storm water resulting from an event with a 1 in 100 chance of occurring in any given year, plus 30% to account for climate change, and surcharging the drainage system can be stored on the site without risk to people or property and without overflowing into a watercourse. The Borough Council will also seek to be proactive by considering how new development may present opportunities to help to reduce the causes and impacts of flooding; safeguarding land that may be required for flood management both at the present time and in the future; and facilitating the relocation of development to more sustainable locations where climate change may increase the risk from flooding. The Borough Council will respond favourably to proposals for sustainable flood risk management

3. Development Site

3.1 Existing Site Conditions

The development site is located just off Langborne Road, Whitby, 600m upstream of the mouth of the Esk. The proposed footprint of the Maritime Centre is situated on the northern half of the Endeavour Wharf Car Park. Its carriageway build-up is predominantly made up of cast in-situ concrete. The subterranean configuration and condition, including the steel reinforcement arrangement is presently unknown. The concrete is encased by sheet piles, which border the River Esk.

The first section of this sea-reclaiming structure was constructed in the 1940's, based on maps contained within the 1st Line Defence UXO Report 'DA17159-00 Detailed UXO Risk Assessment':

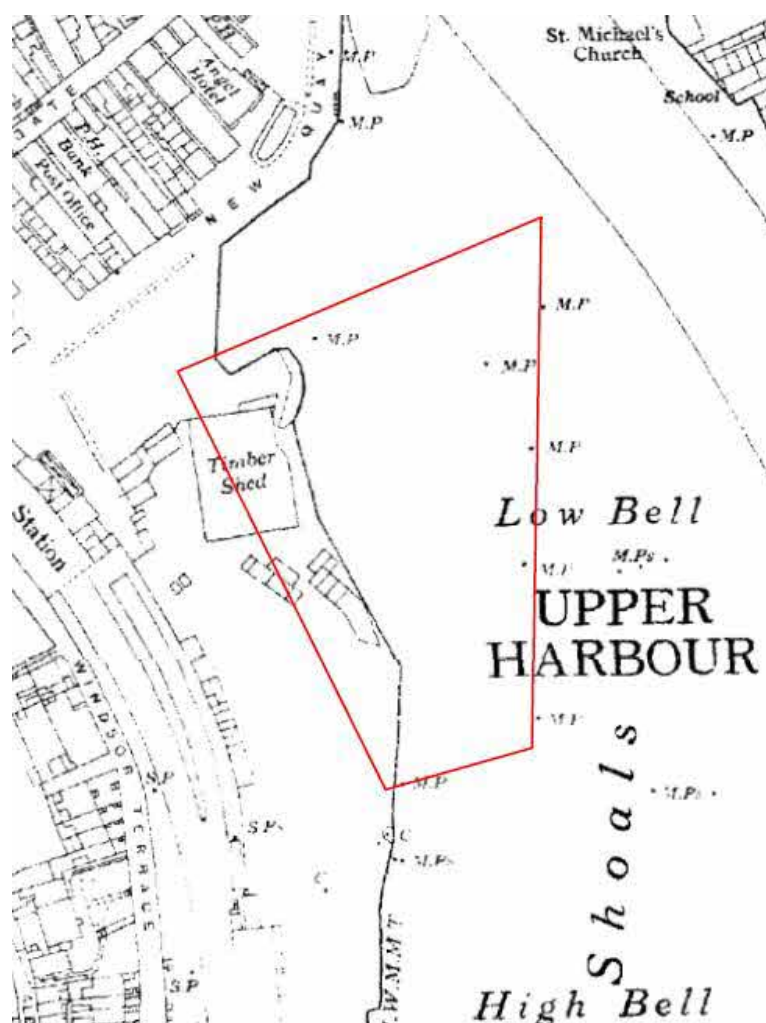


Figure 2 - Site Location Plan, 1938 Historical Map. Source: Landmark Maps

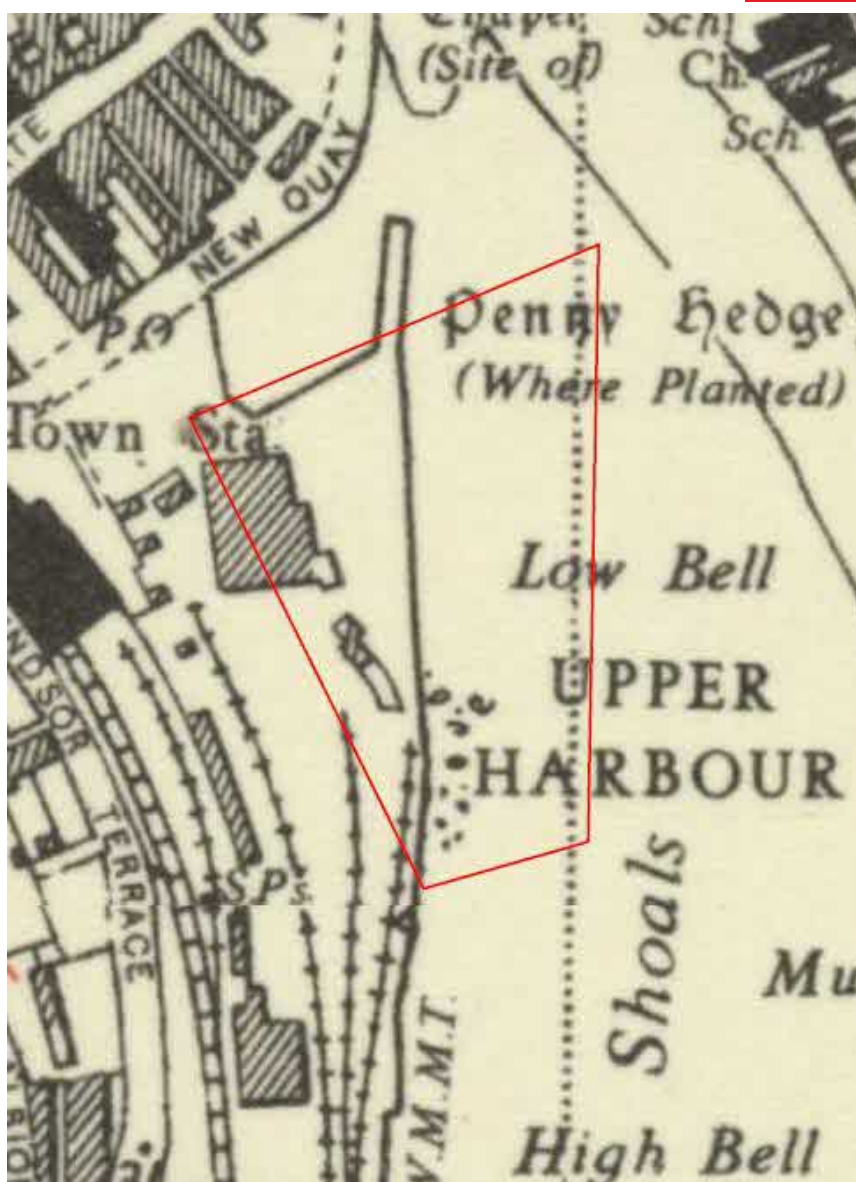


Figure 3 - Site Location Plan, 1950 Historical Map. Source: Historic Maps Scotland

Endeavour Wharf was extended in 1964¹, and a new transit shed was built in 1996. It is unknown when the wharf was extended further to its current extents. However, it is noted that remedial works to some of the sheet piles and a 170m strip of concrete slab (eastern side, bordering the river Esk) were undertaken in 2017. A water main was diverted during these works too, with the installation of new water points and drainage / weep holes²

¹ https://historicengland.org.uk/research/results/reports/7427/RCZASYorkshireandLincolnshire_WhitbytoReightonReportandGazetteers

² <https://southbaycivils.co.uk/wp-content/uploads/2020/03/Endeavour-Wharf.pdf>

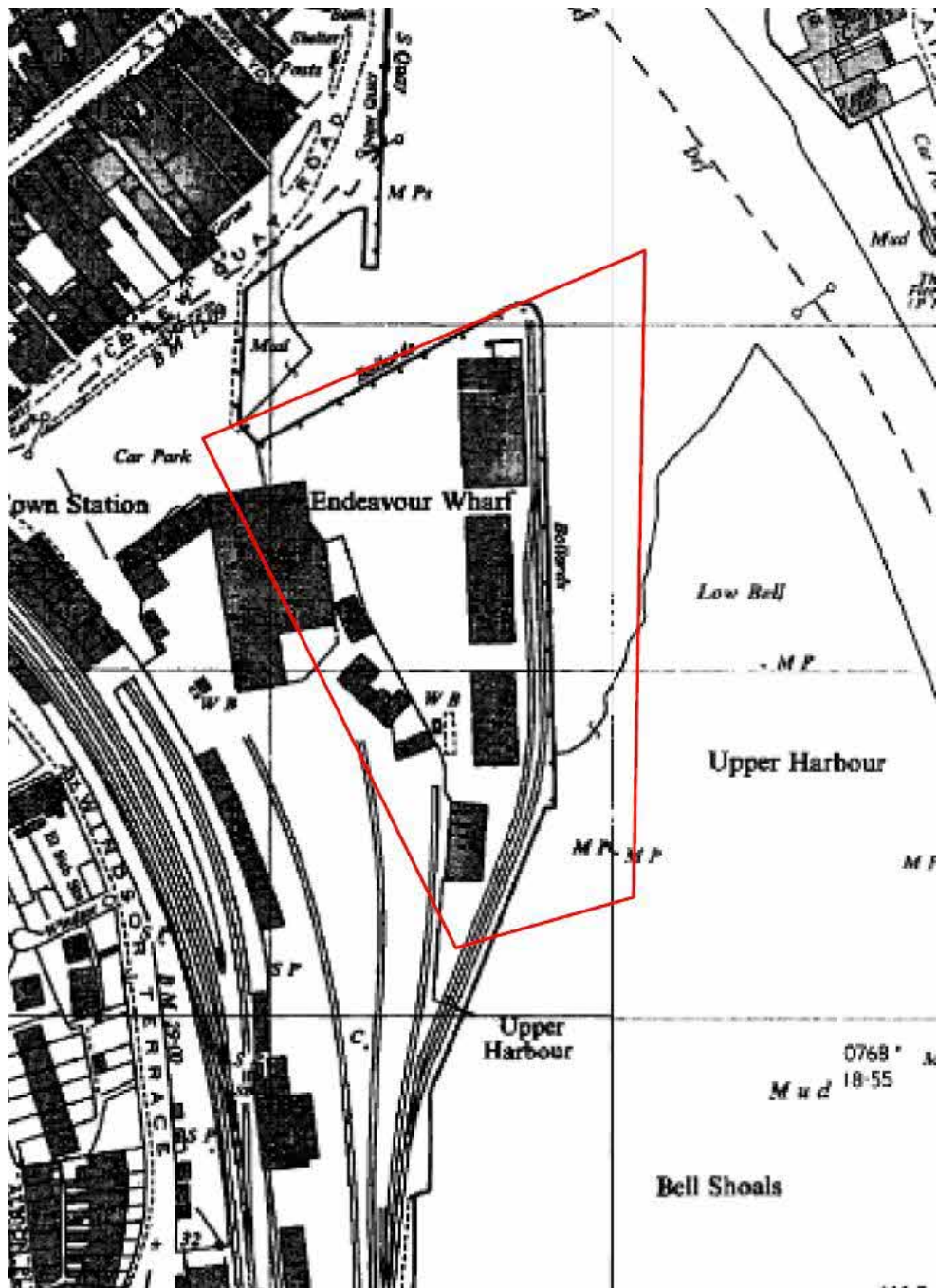


Figure 4 - Site Location Plan, 1950 Historical Map. Source: Historic Maps Scotland

Table 4 – Key Site Details

Site location	Endeavour Wharf, Whitby, North Yorkshire
Site area (ha)	0.62
National grid reference	NZ 89952 10865
Postcode	YO21 1DN
Existing land use	Car Park
Local Planning Authority	North Yorkshire County Council (NYCC)

In addition to the Endeavour Wharf (active) car park, the study area is surrounded by the following amenities:

- A café to the south west along Langborne Road with commercial developments beyond;
- A public car park, existing harbourmaster office and tourist information shop to the south;
- The River Esk to the east and north; boat moorings are situated along these sides of the wharf.

Access to the site is via Langborne Road.

3.2 Topographical Levels

A topographical survey was carried out for this development in February 2023.

The surveyed levels ranged between 3.29m AOD and 3.89m AOD. The existing levels fall into the drainage channel, running all the centre of the site from south to north.

A copy of the topographical survey for the site is provided in **Appendix A**.

3.3 Existing Watercourses

The River Esk borders the site to the east as shown in Figure 5 below:

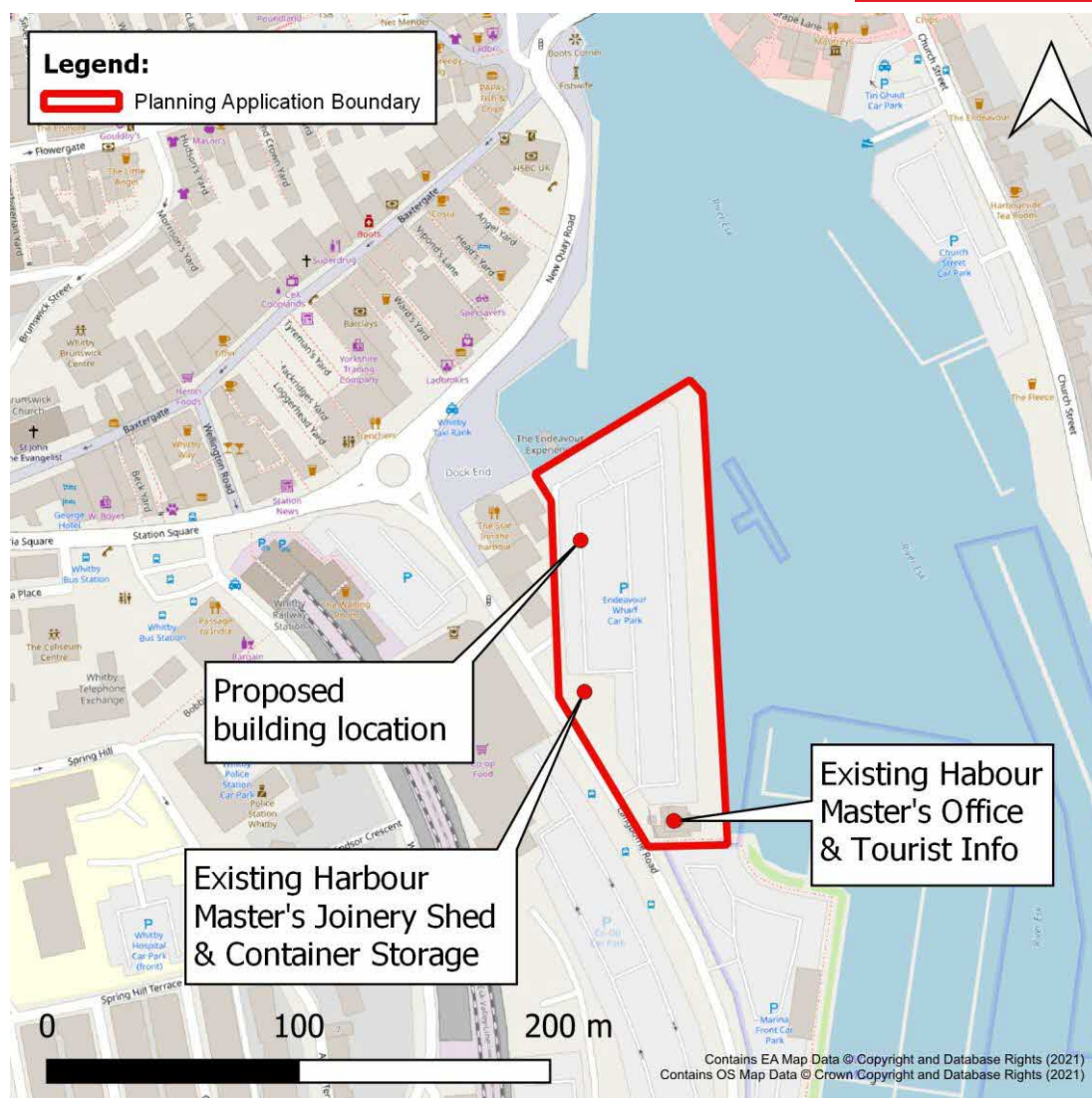


Figure 5 - Nearby Watercourses

3.4 Proposed Development

3.4.1 Proposals

The proposal at Endeavour Wharf is for the development of a three storey building with external active wharf connecting the building to the River Esk. Its design life is to be 75 years. The aesthetic of the Maritime Hub has been designed to integrate with Whitby's vernacular, with input from the local planning authority and Historic England. There will be no residential accommodation provided for staff on site. The proposed site plans are provided in **Appendix B**.

3.4.2 Flood Risk Vulnerability Classification

Location	Accommodation Type	Tenant & Site Uses	How these Satisfy the 'Water Compatible' Definition Under National Policy Planning Framework (NPPF)
Externals	Active Wharf	<p>Continued mooring and maintenance of tourism, leisure boats and fishing vessels.</p> <p>Continued location of 'The Whitby Endeavour' tourist attraction</p> <p>Continued mooring the Harbour Master dredge</p> <p>Continued access, parking and external storage associated with the marine and fishing industries.</p>	<p>Around 400 leisure boats, 15 full time fishing vessels, 12 chartered fishing boats and 5 tour boats operate at and around the active wharf. Endeavour Wharf is therefore related to 'docks marinas and wharves' and 'dockside fish processing' which are classified as water compatible under NPPF - Annex 3: Food Risk Vulnerability Classification.</p> <p>In addition the dredge that is moored directly outside the proposed new building and which will be managed from inside the new proposed building is directly used for 'sand and gravel workings' and 'flood control infrastructure' which are classified as water compatible under NPPF - Annex 3: Food Risk Vulnerability Classification.</p>
Ground Floor	Harbour Master Flood Equipment Store & Workshop	The Harbour Master is responsible for carrying out maintenance and repair work of their fleet of vessels, and investigating other vessels that may have been involved in marine incidents. In addition, since Endeavour Wharf was first constructed over 75	Having their workshop, within the Maritime Hub, on the wharf itself is critical to this continued upkeep of one of Whitby's key pieces of infrastructure. It is therefore considered that this water compatible development fulfils the criteria of 'Ship

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		<p>years ago, it has required perpetual maintenance and repair work in order to keep it in a safe, operational state. The Harbour Master plays a crucial role in this work through their existing workshop which is already situated on Endeavour Wharf within the application boundary. This building is no longer fit for purpose and will be moved into a purpose-built facility within the new building.</p> <p>When the harbourmaster receives an alert for expected coastal flooding from the Met Office, it is their responsibility to cordon off the wharf and clear it of any loose items that could pose a risk of damage. They're also responsible for clearing up the debris and ensuring the facilities are safe for public use after a flood. The equipment used to carry out these activities needs to be continued to be stored on the wharf itself so that alerts can be acted upon promptly, and that so no members of the public are put at risk. It is therefore essential that these functions take place in the proposed location.</p>	<p><i>building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location</i> with the NPPF - Annex 3: Food Risk Vulnerability Classification planning criteria.</p> <p>The criteria of '<i>flood control infrastructure</i> would be satisfied.</p>
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Ground Floor	Wharf Workshop Spaces	These spaces are allocated for activities compatible with the active wharf, and comprise of small workshop spaces which open out onto Endeavour Wharf. Expected tenant uses comprise of fishing and marine storage and maintenance activities. As owners and operators of the development North Yorkshire Council will stipulate and ensure that only uses which accord with the classification of water compatible development, as defined in NPPF Annex 3: Flood Risk Vulnerability Classification, will be permitted.	The criteria of ' dockside fish processing and refrigeration and compatible activities requiring a waterside location ' and ' ship building, repairing and dismantling ' would be satisfied.
	Lobster Hatchery Seawater Tank	The sea water tank would primarily be used for further growing the local lobster population. After a recent decline in lobster numbers, the Whitby Lobster Hatchery have sustainably been cultivating thousands of hatchlings and rebalancing the marine ecosystem ³ . They intend on expanding their operations by introducing a new, larger tank within the ground floor space, which would be within easy-access of their mooring on the wharf-side.	The criteria of ' dockside fish processing and refrigeration and compatible activities requiring a waterside location ' is fulfilled by the Hatchery's efforts to replenish the area's Lobster stocks.

³ <https://whitbylobsterhatchery.co.uk/>

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<p>Ground Floor</p>	<p>Whitby & District Fishing Industry Training Workshop & Stores / drying room</p>	<p>This space would be used to carry out practical lessons on boatmanship, fish processing, life safety and demonstrating fishing scenarios⁴. Essential to this vocational training is the ability to break-out onto the active wharf and adjacent moored vessels.</p>	<p>This use would meet the classification of <i>‘ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location’</i>.</p>
<p>First Floor</p>	<p>Harbour Master Office, Emergency Planning & Meeting Rooms</p>	<p>The Harbour Master is already located on Endeavour Wharf within the application boundary. The existing building is no longer fit for purpose. The Harbour Master role is enshrined in legislation under the Harbours, Docks and Piers Clauses Act 1847.</p> <p>The Harbour Master’s office space will be located on the first floor; acting as a base for much of their daily activities with an essential prominent view of the Esk and the Estuary. These include communicating with Vessel Traffic Services (VTS) and the port authority shipping control office to assist in navigating traffic along the River Esk, communicating warning</p>	<p>The Harbour Master role is intrinsic to the operation and maintenance of Endeavour Wharf including the provision of <i>‘navigation facilities’</i> which are classified as water compatible development under NPPF - Annex 3: Food Risk Vulnerability Classification.</p>

⁴ <https://www.whitbyfishingschool.co.uk/>

		<p>messages to vessels, creating marine safety management systems and formal risk assessments. All of these activities would constitute the operation of <i>'navigation facilities'</i>.</p> <p>Having a corner space within the Maritime Hub, with views over the stretch of river that they're responsible for overseeing, would greatly assist with their day-to-day activities, and allow them to detect and respond to danger quicker. It is also essential to their duties of clearing away loose items and closing the car park easier ahead of expected flooding events. The management of 400 leisure boats, 15 full time fishing vessels, 12 chartered fishing boats and 5 tour boats requires an unrestricted waterside viewpoint.</p> <p>Whitby's Harbour Master is accountable for managing the safety of navigation in a port in accordance with local, national (Port Marine Safety Code⁵) and international legislation and industry codes of practice. This is done by facilitating the safe and efficient use of the harbour: conducting marine risk assessments; producing, documenting, operating and reviewing port marine safety systems and policies; and delegating authority⁶. There is one</p>	
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⁵ [Port Marine Safety Code \(publishing.service.gov.uk\)](http://publishing.service.gov.uk)

⁶ [Harbour master / Institute for Apprenticeships and Technical Education](#)

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		lead Harbour Master and two deputies that rely on the Whitby base to carry out their duties.	
	Fishing Industry Lab	This lab will be used as a base to monitor fish and water samples taken from the local marine ecosystem and utilise the wider active wharf site to deploy marine vehicles for sampling operations. These operations are solely focussed on protecting and improving the marine ecosystem and thus the sustainability of maritime industries.	The criteria of ' dockside fish processing and refrigeration and compatible activities requiring a waterside location ' is fulfilled by the activities undertaken by the Fishing Industry Lab.
	Whitby & District Fishing Industry Training Rooms	This space would be used to train local young people and workers in the commercial fishing industry and other maritime industries. Fundamental to this vocational training is the ability to provide desk-based briefing, safety and training sessions; whilst offering the practicality and immediacy to break out into practical lessons in workshop spaces (on the ground floor) and on the active wharf. This training fundamentally requires a waterside location, the use of moored vessels with desk based training in very close proximity.	The criteria of ' dockside fish processing and refrigeration and compatible activities requiring a waterside location ' is fulfilled by the training syllabus.

In all other areas of the building, any building use not clearly defined and justified above must fall under the Water Compatible development classification as defined in NPPF Annex 3.

The information provided above demonstrates that the proposed uses of the Whitby Maritime Hub fall within the classification of water compatible development. The location of the building within Endeavour Wharf is essential to the activities which will take place at the building, therefore justifying the requirement to locate the development within Flood Zone 3b.

3.5 Proposed Surface Water Drainage Considerations

The proposed surface water sewer network designed to service the Maritime Hub will connect onto the existing 150mm diameter sewer before discharging into the Esk via an existing outfall. These connections will be made as close as physically possible to the outfalls, due to the condition of the existing surface water sewer network being in a substandard condition for a substantial portion of its total length, as highlighted in the 'P22-01573-MET-EXT-CTV-RPT-GC-1-Drainage condition survey report'. Large cracks, joint displacements, and blockages were some of the defects listed within the survey.

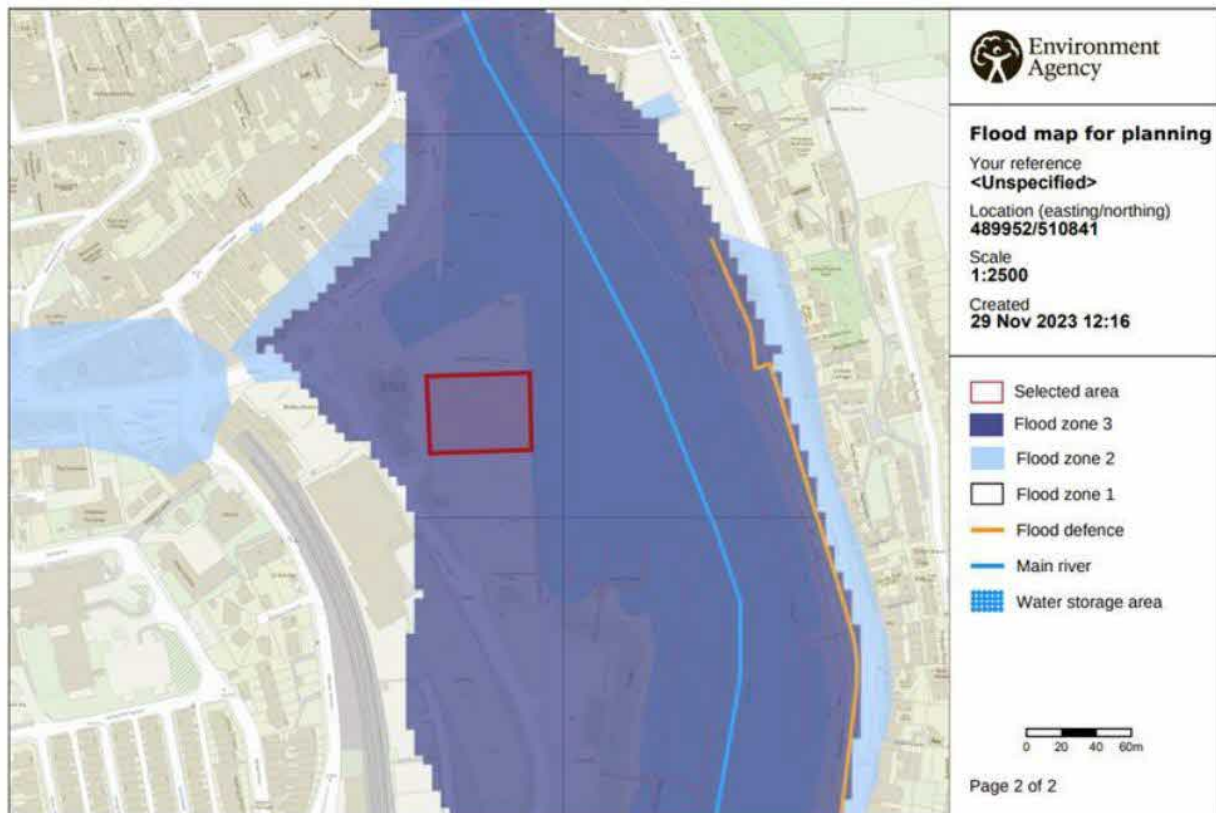
The proposed surface water sewer network, consisting of a series of 150mm diameter uPVC pipes laid in 100mm of Type-Z concrete surround, generally at a 1 in 100 gradient, will serve the collection of gullies, rain water pipes and linear drains around the Maritime Hub. The linear drains will consist of 100mm wide gratings, located at the perimeter of the application boundary. The existing linear drain running through the centre of development will be removed and grouted, while keeping the downstream sections of this operational, which sit outside of the proposed development. Further details are provided in Appendix E.

The site is fully impermeable in its current state and drains to the River Esk via drainage infrastructure and direct runoff. The proposed development will therefore not increase the area of hardstanding or the associated discharge rate from the site. As such there will be no increase in flood risk associated with surface water as a result of the development.

2. Sources of Flood Risk Information

4.1 Environment Agency (EA)

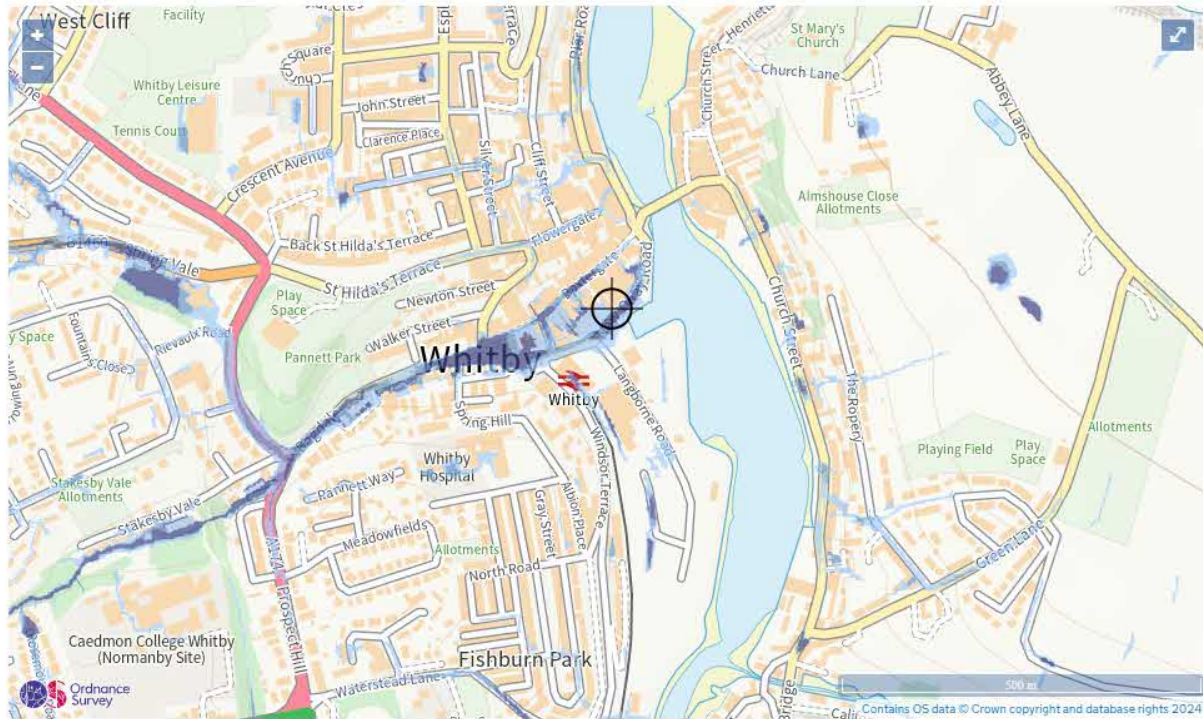
The below EA flood map shows that the entire proposed development site is within flood zone 3. The primary source of flood risk to the site is the adjacent River Esk, which is tidally influenced. There are no formal flood defences shown. Flood zone 3 represents areas that have a high probability of flooding: 0.5% probability or greater of flooding from the sea, and 1% or greater probability of flooding from fluvial sources.



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Figure 6 - Extract from the Environment Agency's Flood Map for Planning

The EA 'Risk of Flooding from Surface Water' map indicates a narrow section of 'low risk' area, where the flooding is predicted to occur on a 0.1% probability, i.e. a 1 in 1000 year basis. This correlates with the low point in the site where there is an existing channel drain, the conveyance capacity of which would not be represented on the flood risk map.



Extent of flooding from surface water

● High
 ● Medium
 ● Low
 Very Low
 ⊕ Location you selected

Figure 7 - Extract from Environment Agency's Risk of Flooding from Surface Water map

EA mapping shows that there has been historic flooding at the site (Figure 7). Records of flooding in Whitby dating back to 1800s indicate that there is a long history of tidal flooding in the area. The most recent flooding event was in December 2013's storm surge which affected the Yorkshire coast.

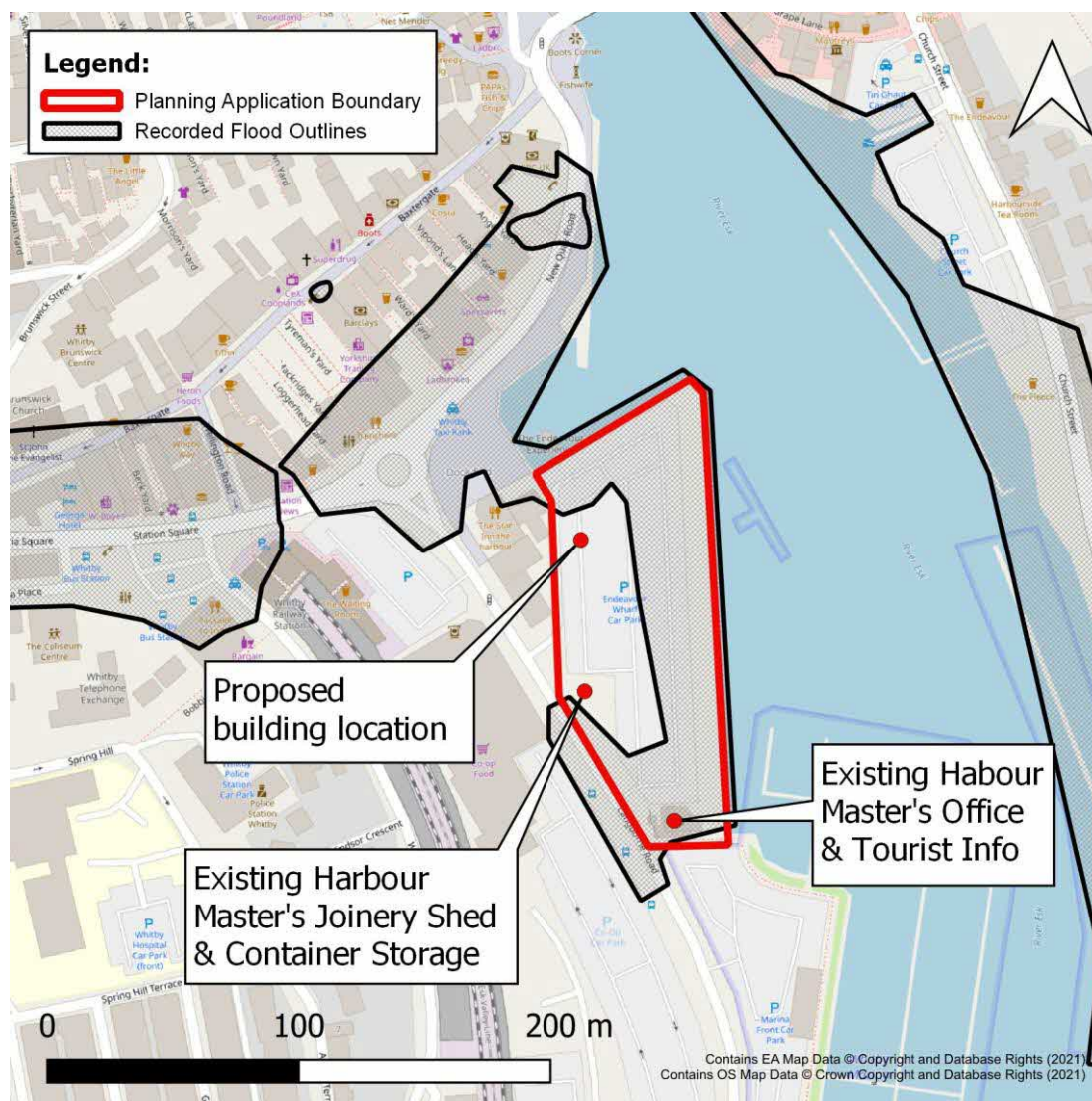


Figure 8 - Environment Agency historical flood mapping

4.2 Strategic Flood Risk Assessments (SFRA)

The most recently-produced SFRA, completed in 2021 identifies that Endeavour Harbour is at risk of flooding from the River Esk. The SFRA sets out requirements for the contents of site-specific FRAs.

It states that statutory consultees should be consulted with from an early stage to understand their requirements. From the outset of this project, the Environment Agency have been involved with all key decisions taken with respect to flood risk management. This liaison has included formal meetings and open email dialogue with their planning permit advisory team.

They've provided critical input into the preferred model types, and what flood events should be assessed – these will be expanded upon later in the report.

The SFRA then stipulates that the latest flood risk data and guidance be incorporated into the report. This has been done through the engagement of JBA consulting to undertake quantitative analysis of fluvial and tidal flood risks at the site, as summarised in Section 5 of this report.

4.3 Sewerage Company

Yorkshire Water (YW), the sewerage operator in the region, is required by The Water Services Regulation Authority (OFWAT) to maintain a record of flooding incidents due to hydraulic capacity problems on the sewerage network.

Their apparatus within the development area is shown within Appendix C. Utility plans show Yorkshire Water sewers running in proximity of the site, for example a 750mm combined sewer running on Langborne Road to the west of the site. There is also a 300mm surface water sewer running adjacent to the combined sewer on Langborne Road.

If sewer capacity was to be exceeded, water would flow onto the hard surface and follow local levels to the nearest low point.

There were only 3 recorded cases of sewer flooding within the YO21 1 area. This represents a low risk going forward.

As mentioned in section 3.1, it is known that a water main was diverted in 2017, which runs along the eastern area of the wharf. A desktop study also found that there were remedial works carried out to a 1200mm diameter water main in 2011⁷. The likelihood is that this is the same water main that was diverted in 2017, but this is to be confirmed by Yorkshire Water. This main, however, is not shown within appendix C. There is a YW-operated pumping station located at the north-west corner of the proposed development⁸.

⁷ https://waterprojectsonline.com/wp-content/uploads/case_studies/2011/Whitby-Endeavour-Wharf-Sewer-Repair-2011.pdf

⁸ <https://www.fluvial-innovations.co.uk/2017/01/17/floodstop-flood-barrier-deployments-during-uk-tidal-surge/>

3. Flood Risk Analysis

5.1 Potential Sources of Flood Risk

There are several potential sources of flooding that require consideration:

- **Coastal flooding:** Extreme sea levels and coastal waves have the potential to cause rapid inundation of a development, posing a threat to the welfare of occupants and potentially preventing emergency access to properties and essential infrastructure.
- **Fluvial flows:** Extreme fluvial flood events have the potential to cause rapid inundation of a development, posing a threat to the welfare of occupants and potentially preventing emergency access to properties and essential infrastructure.
- **Overland flow:** Overland flow occurs when the infiltration capacity of the ground is exceeded in a storm event. This could result in water travelling as sheet flow overland or excess water being conveyed from one location to another via local road networks.
- **Infrastructure failure:** The failure of conveyance infrastructure such as culverts or bridges, or the failure of any man-made water storage or conveyance infrastructure that could increase the risk of flooding at the site.
- **Sewer flooding:** If the capacity of sewers is exceeded in an extreme event, or a blockage occurs, surcharging of the network can result in surface flooding. The local drainage network should be considered with a view to assessing flood risk to the site.
- **Groundwater:** High groundwater levels could exacerbate flooding occurring at low points on any given site, potentially contributing to flood risk from other sources.

5.2 Coastal Flood Risk

Quantification of coastal flood risk has been provided by JBA Consulting. The outputs are provided in the report 'Endeavour Wharf Coastal Flood Risk Overview' which is included in Appendix D of this Flood Risk Assessment. A summary of the outputs is provided below.

To investigate flood risk to the site from extreme tidal water levels, a projection modelling approach was undertaken using the latest coastal extreme water levels, sea level rise guidance, and site-specific topography.

The analysis was undertaken using the 3.3%, 0.5% and 0.1% AEP events which represent Flood Zone 3b (classified as functional floodplain), Flood Zone 3 and Flood Zone 2 respectively.

The results confirm that the site would be inundated in a 3.3% AEP event and is therefore classified as Flood Zone 3b.

Based on government guidance, the estimated tidal flood level at the site for new development should be based on a 1 in 200 annual probability (0.5% AEP) plus an allowance for climate change. Using the 75-year design life of the development, the key tidal flood level for design purposes corresponds to the 0.5% AEP RCP 8.5 Higher Central 2099 epoch level of **4.83mAODN**.

Endeavour Wharf, located roughly 1km upstream of the River Esk mouth, is sheltered from incoming sea and swell waves. Therefore, the threat of wave action from the North Sea is not considered an important flood risk factor at the site, and only extreme tidal water levels are considered.

To estimate flood durations at the site, design tide curves were generated following Environment Agency guidance. Flood duration was determined when the water level exceeds the average elevation of the site which is 3.5mAODN.

During a 0.5% AEP present-day extreme water level event, the flood duration is expected to be 2.75h and 3.25h for the first and second tide peaks, respectively. During a 0.5% AEP event under Higher Central climate change conditions in the 2099 epoch, the flood duration is expected to be 4.25h and 4.75h for the first and second tide peaks, respectively.

It is expected that the site would drain very quickly as the tidal water levels recede below the site elevation, with no raised defences to hold flood waters back.

At the request of the Environment Agency sensitivity testing has been undertaken to consider the potential impacts of alternative development lifespans and climate change scenarios. This has been based on information provided in the JBA report which is included in Appendix D.

For a 75 year lifespan, the upper end climate change (2099 epoch) flood level is 5.07mAODN.

Beyond the current lifespan of Whitby Maritime Hub, the sensitivity tests undertaken project that, for the 2124 epoch and inclusive of the effects of climate change, the higher central level is 5.13mAODN, and the upper end level is 5.50mAODN.

Environment Agency guidance on flood risk assessment climate change allowances recommends that for Nationally Significant Infrastructure Projects (which are major infrastructure projects such as new harbours, roads, power stations and power lines) or for new settlements or significant urban extensions it may be necessary to assess the impact of a “H++” climate change scenario. The proposed Maritime Hub on the existing Endeavour Wharf does not fall under these categories, but for completeness an H++ scenario has been considered. The peak H++ level, accounting for a forecasted 1.9m of sea level rise, is 6.01mAOD.

As discussed in Section 6, the first floor level of the building is to be set at 7.855mAOD, and so provides a significant freeboard above the sensitivity test flood levels considered.

5.3 Fluvial Risk

Quantification of fluvial flood risk has been provided by JBA Consulting. The outputs are provided in the report ‘Endeavour Wharf Coastal Flood Risk Overview’ which is included in Appendix D of this Flood Risk Assessment. A summary of the outputs is provided below.

Based on the Flood Risk Assessment Standing Advice, the estimated fluvial flood level at the site for new development should be based on a 1 in 100 annual probability (1% AEP) plus an allowance for the impact of future climate change. The results of the hydraulic modelling indicate that the 1% AEP flood level for the higher central climate change allowance is **4.31 mAODN**.

The estimated flood duration based on the average elevation of the site (3.5mAODN) would be 8 hours for the 1% AEP current day event and 12 hours for the climate change event.

The results indicate that tidal flooding is the dominant flood mechanism at the site. A joint probability analysis has been undertaken to test the potential for dependence between tide levels and fluvial flood risk. The results showed virtually no dependence between extreme river flows and extreme tide surges. This is quite a common finding for river catchments draining to the east coast of England. It is therefore concluded that the quantification of fluvial flood risk uses an appropriate combination of tidal and fluvial probabilities.

5.4 Overland Flow

The EA 'Risk of Flooding from Surface Water' map indicates a narrow section of 'low risk' area, where the flooding is predicted to occur on a 0.1% probability, i.e. a 1 in 1000 year basis. This correlates with the low point in the site where there is an existing channel drain, the conveyance capacity of which would not be represented on the flood risk map.

New drainage systems are proposed for the site which will be designed in accordance with current standards, thereby mitigating the risk of surface water flooding. Further details are provided in **Section 3.5**. With this mitigation in place, there is considered to be a low risk to the proposed development from pluvial flooding.

5.5 Infrastructure Failure

The failure of conveyance infrastructure such as culverts and bridges could increase the risk of flooding to the site. Whitby Swing Bridge is located downstream of Endeavour Wharf and if this were to block it could increase flood levels during a fluvial flood event. However the dominant flood mechanism at the site is tidal flooding and blockage of the bridge would not impact on peak tide levels. The residual risk of bridge blockage is accounted for in setting the first floor level at 7.855 mAODN, which provides a freeboard of over 3 m above the 1% AEP flood level for the higher central climate change allowance.

The site is not indicated to be at risk of flooding from reservoirs on the EA flood maps and there are no other known sources of infrastructure failure which could affect flood risk at the site.

5.6 Sewer Flooding

The current car park is served by existing surface water drainage infrastructure which discharges to the River Esk. New drainage systems are proposed for the site which will be designed in accordance with current standards, thereby mitigating the risk of sewer flooding. Further details are provided in **Section 3.5**. With this mitigation in place, there is considered to be a low risk to the proposed development from sewer flooding.

5.7 Ground Water

Groundwater flooding can occur when ground water levels exceed the ground surface levels as a result of prolonged rainfall events resulting in a saturated ground. The underlying superficial deposits, as detailed in Section 3.5 has a major influence on where this type of

flooding occurs. It is most common in low lying areas underlain by permeable rocks (aquifers) at a shallow depth

Groundwater risk was assessed by reviewing freely available online information:

- The Cranfield University Soilscales map⁹ describes soils underlying the site to comprise of 'Slightly acid loamy and clayey soils with impeded drainage'.
- BGS online mapping¹⁰ shows the site to be underlain by superficial deposits of 'Alluvium – Clay, silt, sand and gravel' overlaying a bedrock geology of 'Saltwick Formation and Cloughton Formation – Sandstone, siltstone and mudstone'.

The North Yorkshire County Council SFRA Volume (published in October 2016) references the North Yorkshire Preliminary Flood Risk Assessment (PFRA) which states the following for groundwater flooding in the general North Yorkshire area:

- *“There is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding. For example, it is known to be a cause of flooding to a small number of properties in some areas as a result of natural springs in the hillside next to properties, and, that both groundwater and surface water flooding ponds in nearby low lying areas.”*

Based on the description from the PFRA and given that the proposed development site is developed with impermeable concrete, there is considered to be a near-zero risk of groundwater emergence occurring at the site.

⁹ <http://www.landis.org.uk/soilscales/#>

¹⁰ <https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001515>

3. Flood Risk Mitigation Measures

6.1 Development Type

Endeavour Wharf is located within *Flood Zone 3B*, which is classified as functional floodplain. This is defined as land which would typically flood with an annual probability of 1 in 33 (3.3%) or greater in any year. Within Flood Zone 3B The Flood Risk and Coastal Change Planning Practice Guidance stipulates that only water compatible development is acceptable without the need for an Exception Test. The proposed end uses of the Whitby Maritime Hub are considered to accord with the definition of Water Compatible Development as set out in Section 3 of this report.

As owners and operators of the development North Yorkshire Council will stipulate and ensure that future tenancies will only be allowed on the basis of uses which accord with the classification of water compatible development will be allowed.

6.2 Finished Floor Levels (FFL)

The ground floor of the Whitby Maritime Hub is to be set to provide level access to the surrounding ground levels to facilitate the proposed uses, including forklift trucks and other plant requiring access. During a .5% AEP tidal flood level with an allowance for climate change the ground floor could be inundated therefore a flood resilience strategy has been adopted for the design and use of the building which is set out in Section 6.4 below.

The finished floor level of the first floor of the building will be set at 7.855 mAODN. This will provide a freeboard of over 3 m above the 0.5% AEP tidal flood level with an allowance for climate change. This will enable the building to remain operational during a flood event of this magnitude and further detail on this aspect is provided in Section 6.5 below. In the event that the lifespan of the development is extended at a later date, the first floor's FFL will also sit over 2.5m above the upper end climate change epoch 2124 level. The first floor will also sit 2m above the H++ climate change scenario predicted 0.5% AEP sea level.

6.3 Flood Resistance Measures

The ground floor of the building is to adopt a flood resilient water entry strategy, which is set out in Section 6.4 below. The construction materials used for the ground floor will be completely impermeable. The C40/50 grade concrete to be used is designed to retain structural integrity while being inundated with water.

6.4 Flood Resilience Measures

During a 0.5% AEP tidal flood level with an allowance for climate change the peak flood level at the site would be 4.83mAODN, resulting in a flood depth of approximately 1 m in the ground floor of the building.

The design of the building will allow for water entry of the ground floor via doorways. Flood resilience will be provided by the following measures:

- The usage of water resistant materials for the development's structure, building materials and finishes. Internal doors will be GRP. External doors and windows are

made of aluminium with an anodized finish, suitable for a C4 environment. Door fixings will be stainless steel or galvanised. Sill levels will sit above the key 4.83mAODN flood level. Any exposed elements will be given an additional galvanised coating.

- No finish will be applied to internal block walls to avoid water damage and subsequent replacement. There are no finishes to the ground floor envelope other than an epoxy resin floor that has impact resistance along with spillages expected to be found in storage and workshop environments.
- Electrical services and equipment which is vulnerable to flooding, including the externally-located air source heat pump, will be set at a minimum level of 4.83 mAODN to be above the design flood level. The level of these items could be varied in the future if required, taking account of the climate change sensitivity tests (Section 5.2) or emerging updates to climate change allowances. The main incoming supply is to be fed into directly into the second floor.
- The proposed 16 person elevator, comprised of c316 external grade stainless steel and aluminium, will be supplied by KONE and have a watertight pit and lift shaft. All switchgear will be painted will receive additional coating appropriate for a C4 environment and water resistance. A water sensor will be fitted so that, in the event of a flood, the lift will be raised to level one, with the doors automatically opening upon reaching this floor. The oversized goods and passenger lift will assist with the movement of any key equipment out of the ground floor and onto an upper floor in the event of a flood management plan being enacted prior to a flood event. This lift and shaft is of a suitable specification to... The lift pit includes a sump for clearance of flood water after a flood event, prior to returning the lift back into normal service.
- All water will be able to drain freely out of the development either directly out the main doors and into a linear drain outdoors or via internal gullies within each of the workshops.
- The tenants will be given approximately 2 hours of notice (based on past instances) by the Met Office ahead of anticipated flood events. This gives the Maritime Hub's management staff and harbourmaster sufficient time to execute their typical flood evacuation plan. The EA's flood alerts will supplement this evacuation process. Further information is provided in Section 6.5.
- All furniture will have the ability to be secured in to prevent any damage from occurring to the building and/or property when any storm water enters the premises. All valuables will be stored above the 4.83 mAOD flood level.
- Once the flood event has passed the water will retreat out of the ground floor via the positive gradient that the floor will be constructed at. The general fall will be towards the main doors of the workshop, but there will also be a shallow, isolated low spot in front of the doors containing a gully to dispose of any excess water during day-to-day activities within the workshop, without having the open the main door. Once the water has left the footprint of the building, it will continue to fall towards a series of proposed linear drains within the boundary of the application. These will discharge into the existing network immediately before they reach the outfall points into the River Esk. A detailed drainage plan is contained within **Appendix E**.

6.5 Flood Warning and Response Plan

A draft flood evacuation plan has been produced by North Yorkshire Council, which is included in Appendix F.

7. Report Conditions

The report is based upon the information that has been acquired and/or made available to Fairhurst via the various searches and consultations completed as part of this assessment. In some cases, anecdotal information has been relied upon, where documented evidence has been absent.

The conclusions drawn in the above report are considered correct, although any subsequent additional information may allow refinement of the conclusions.

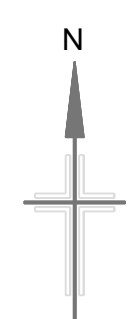
All work carried out in preparing this report has utilised Fairhursts' professional knowledge and understanding of the current UK standard and codes, terminology and legislation. Changes in this guidance may occur at any time in the future, and therefore cause any conclusions to become inappropriate or incorrect. Should this be the case then an updated assessment will be required based upon the latest released guidance.

This report has been produced using information contained within online mapping and documents prepared by others, where this is the case a footnote link has been provided for corroboration of the data. Fairhurst can accept no liability or responsibility for the accuracy of the information provided.

Appendix A
Topographical Survey



Notes
 This drawing and the information contained therein is issued in confidence and is the copyright of Met Geo Environmental Limited. Disclosure of this information to Third Parties and unauthorised copying or replication of this data without approval is forbidden.



Grid OS National Grid. Using the OS GPS Network and applying OSTN02 transformation and then removing the scale factor for true distances with a one-step transformation centred on S1.
Datum OS Level Datum. Using the OS GPS Network and applying OSGM02 National Geoid Model to obtain local area corrections.

Station Listing

Station	Easting	Northing	Level
L1	489887.403	510840.196	4.415
L2	489885.913	510867.603	3.970
L3	489940.375	510875.117	3.399
L4	489954.456	510820.161	3.538
L6	489955.919	510784.165	3.498
S1	489922.890	510825.264	4.161
S4	489910.551	510765.063	4.336

KEY

AIR VALVE	AV	ANCHOR BOX	AB
BENCH MARK	BM	ARB OUTLET	AO
BW	BW	LAMP POST	LP
BOLLARD	BL	MANHOLE (CIRCULAR)	MC
BONE HOLE	BH	MANHOLE (RECTANGULAR)	MR
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MT
BUS STOP	BS	MARKER POST	MP
CABLE TV SUPPLY	CT	ODULTY	OD
CABLE TV COVER	CTC	ROOFING EYE	RE
COLUMN	CL	SON POST	SP
COMPRESSOR	CO	TELECOM COVER	TC
CONCRETE	CON	TELEGRAPH POLE	TP
ELECTRICITY COVER	EC	THRESHOLD LEVEL	TL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TR
FIRE HYDRANT	FH	TRAIL PIT	TP
GAS VALVE	GV	WASH OUT	WO
GATE	GA	WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COOK	WSC
INSPECTION COVER (RECTANGULAR)	IRC	WATER STOP VALVE	WSV
COVER LEVEL	CL	CHAMBER BASE LEVEL	CB
INVERT LEVEL	IL	WATER SURFACE LEVEL	WS
UNABLE TO REACH	UTR	UNABLE TO MEASURE	UM
CURB OF TREE TRUNK	CT	DIRECTION OF TREE TRUNK	DT
HEIGHT TO TOP OF TREE CANOPY	HT	MULTI SOLE TREE	MS
LOADER GRAB RAIL	LGR		
WOODING POINT	WP		

Rev	Date	Drawn	Description	Check

Met
 GEO ENVIRONMENTAL

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 F: +44 (0) 1132 008 901
 E: admin@metgeoenvironmental.com
 W: www.metgeoenvironmental.com

Client
 WILLMOTT DIXON CONSTRUCTION LIMITED

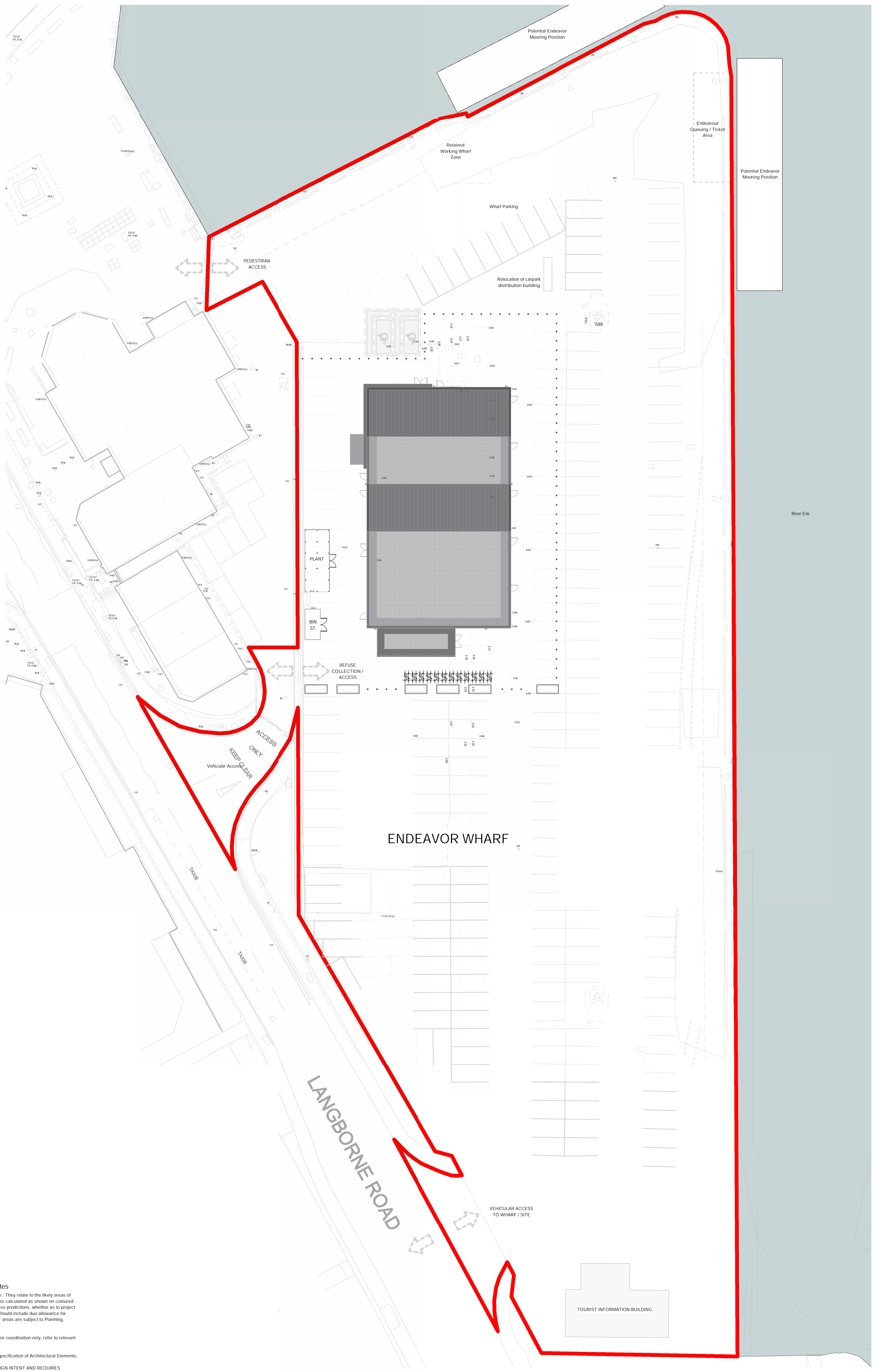
Site
 ENDEAVOUR WHARF
 LANGBOURNE ROAD, WHITBY, YO21 1YW

Title
 TOPOGRAPHICAL SURVEY

Surveyed	CAC, LD	Drawn	CAC
Check	DA	Date	07/02/2023
Scale	1:200	Job No	P22-01573
		Sheet Size	A0
		Rev	01

DWG Ref
 Project Number Origin Zone Level Desc Type Role Sheet
 P22-01573 METEXT XX TOP M2 G 001

Appendix B
Proposed Site Layout



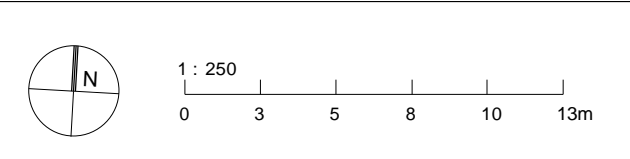
Proposed Application Boundary plan
1:250

90 Series General Arrangement Notes

1. Any areas indicated on the plans are approximate. They relate to the likely areas of the building at the current state of the design and are calculated as shown on coloured plans. Any decision to be made on the basis of these predictions, whether as to project viability, pre-letting, lease agreements or the like, should include due allowance for design development and building tolerances. Floor areas are subject to Planning, Building Control and other statutory approvals.
2. Any structural, services or fit out detail shown is for coordination only, refer to relevant Consultants/Clients information for details.
3. Refer to Enjoy NBS for full outline performance specification of Architectural Elements.
4. THE CONTENT OF THIS DRAWING IS FOR DESIGN INTENT AND REQUIRES FURTHER DESIGN DEVELOPMENT AND COORDINATION WITH ALL RELEVANT CONSULTANTS, SUB-CONTRACTORS, SPECIALIST DESIGNERS AND STATUTORY AUTHORITIES.

Notes.
TOPOGRAPHICAL SURVEY BASED ON MET SURVEYS DRAWING
P22-01573-MET-EXT-XX-TOP-M2-G-1-2D Topographical Survey

Application Boundary



Contractor must verify all dimensions on site before commencing any work or shop drawings. If this drawing exceeds the quantities taken in any way the Architects are to be informed before the work is initiated. Only figured dimensions to be taken from this drawing. Do not scale off this drawing. Drawings based on Ordnance Survey and / or existing record drawings - design and drawing content subject to Site Survey, Structural Survey, Site Investigations, Planning and Statutory Requirements and Approvals. Authorised reproduction from Ordnance Survey Map with permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved. Enjoy Design Ltd.

P02	Site Boundary Update	MP	06.12.23	RG
P01	First Issue	RG	16.02.23	RG
Rev.	Des.	By	Date	Ch.

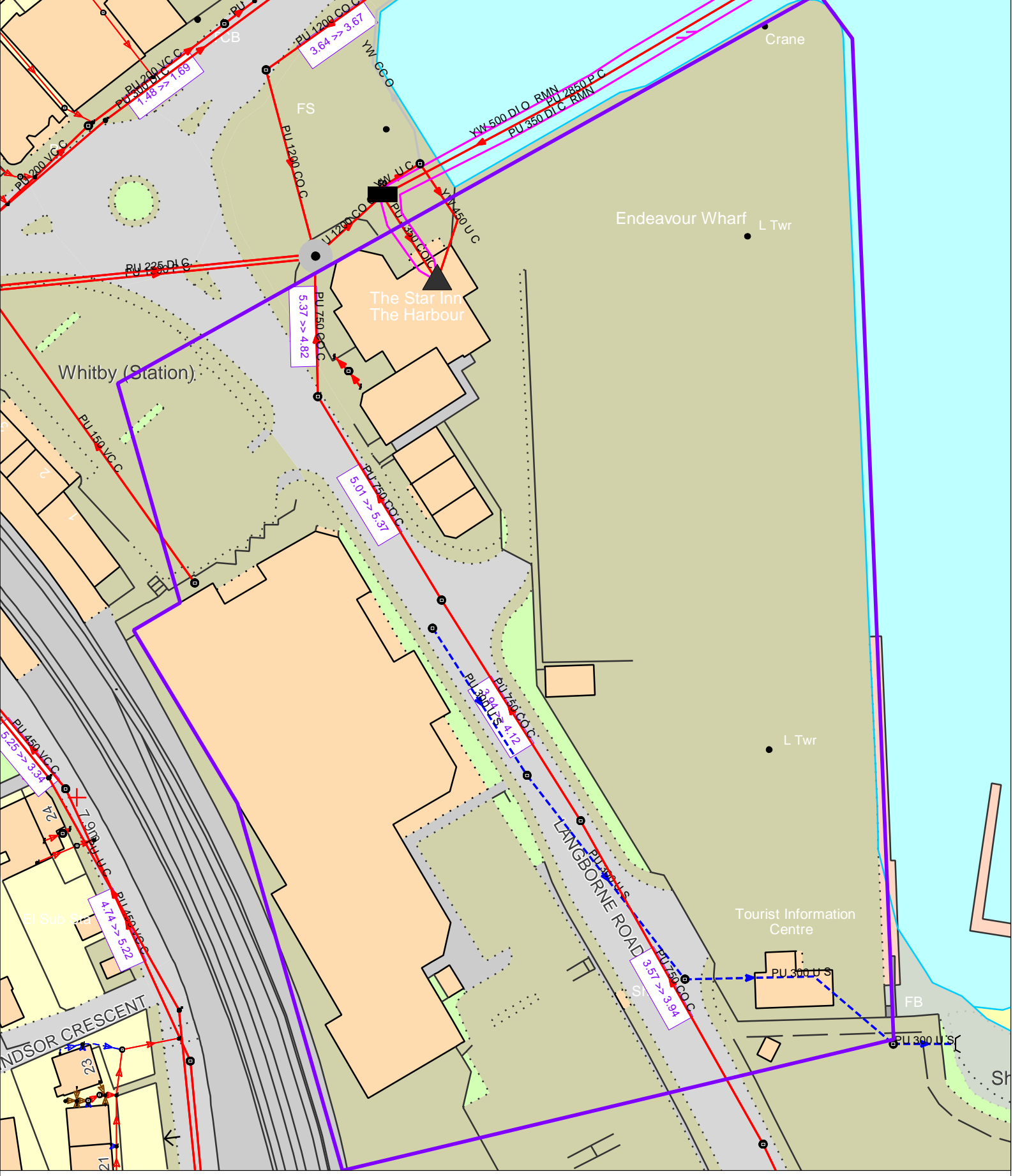
Suitability	S2
Enjoy Design Ltd	The Old Brewery High Court Leeds LS2 7ES Tel: 0113 242 3622
www.enjoy-design.co.uk	
@EnjoyDesignLtd	
@enjoy_design_	
enjoy design ltd	

Client:	WILLMOTT DIXON CONSTRUCTION	Job No:	22,101
Project:	WHITBY MARITIME HUB		
Title:	PROPOSED APPLICATION BOUNDARY PLAN		
Date:	02/16/23	Scale:	As indicated @ A1
Drawing No:	WHIT ENJ - Z0 - 00 - DR - A - 90010	Drawn:	IMP
		Check:	RG
		Rev:	P02



Appendix C

Yorkshire Water Sewer Plans

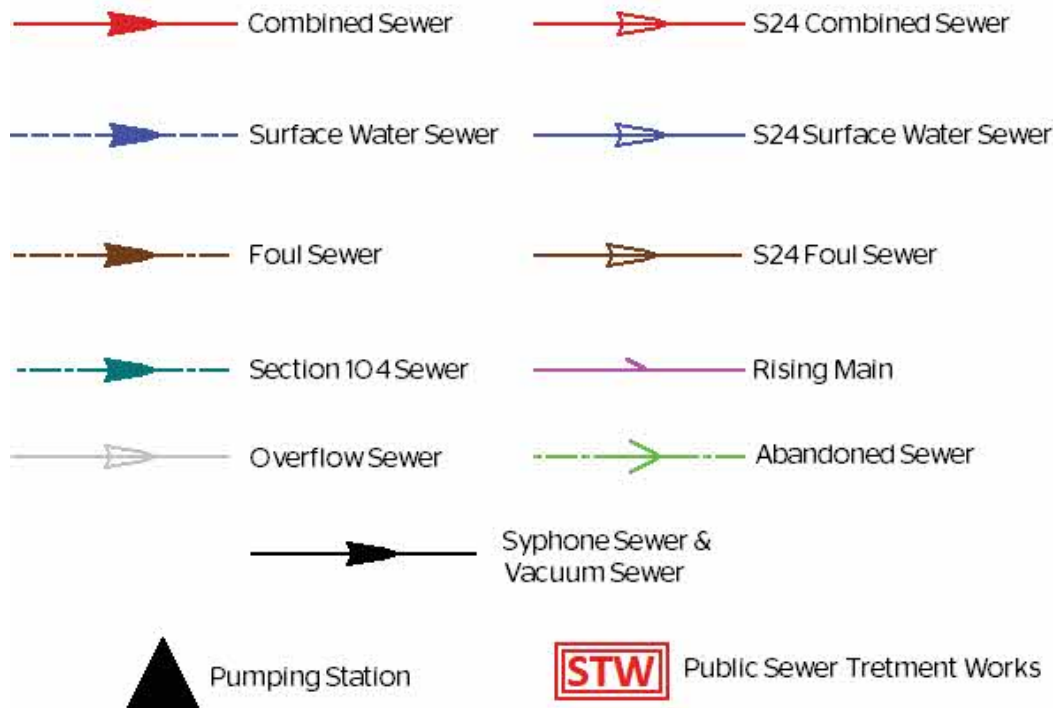


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Property Identifier

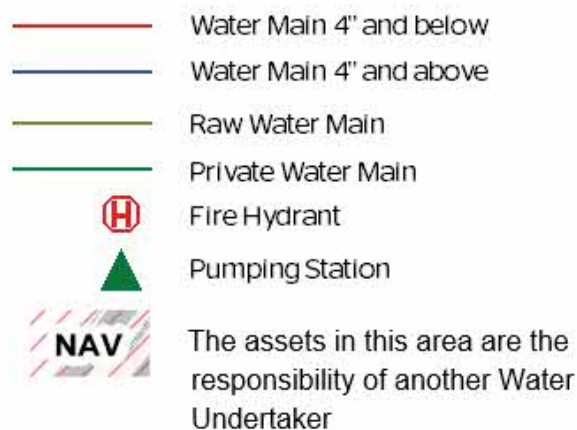


Sewer Legend



Please note that the direction of flow arrows may not always appear depending on the scale of the map.

Water Legend



Appendix D

JBA Flood Risk Overview Document

Endeavour Wharf Coastal Flood Risk Overview

Revised final

30/01/2024

Prepared for:
Willmott Dixon

www.jbaconsulting.com

Document Status

Issue date	30/01/2024
Issued to	Peter Thorpe
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Revision	P03
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Contract

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JBA Project Code	2023s1508

This report describes work commissioned by Willmott Dixon, by instructions dated 10th November 2023 and 19th December 2023. The Client's representative for the contract was Peter Thorpe of Willmott Dixon. Thomasin Shorrock, Ian Gaskell, Florian Bellafont, Dylan Natrass and Duncan Faulkner of JBA Consulting carried out this work.

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between 13 November and 20 December 2023 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

Amendments were made to this revised version of the report as requested by the client, and re-issued on 30 January 2024.

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Abbreviations

AEP	Annual Exceedance Probability
CFBD	Coastal Flood Boundary Dataset
DTM	Digital Terrain Model
mAODN	Metres Above Ordnance Datum Newlyn
NPPF	The National Planning Policy Framework
UKCP18	United Kingdom Climate Projections 2018

Definitions

Functional Floodplain: The land where water has to flow or be stored in times of flood.

1 Site location and proposed development

The site is located within the Esk and Coast Management Catchment. The site sits on the left bank of the River Esk in the town of Whitby, approximately 600m upstream of Whitby Sea Front, where the River Esk drains in to the North Sea. Whitby is the largest town within the Esk catchment, which is predominantly rural and flows through the North Yorkshire Moors National Park.

The proposed development is a Maritime Hub with Water Compatible tenant uses, with the application and extended application boundary covering an area of ~2,900m². The ownership boundary covers the larger Endeavour Wharf area extending to the south of the Whitby Tourist information Centre and Harbour Master Office (Figure 1-1).

The development is considered over a 75-year design life as the proposal is considered to be non-residential. The National Planning Policy Framework (NPPF) states that the lifetime of a non-residential development depends on the characteristics of that development but a period of at least 75-years is likely to form a starting point for assessment. In addition, a 100-year development lifespan is also considered.

Based on the Environment Agency Digital Terrain Model (DTM) 1m Light Detection and Ranging (LIDAR) dataset, the average bottom elevation of the site is 3.50 metres above Ordnance Datum Newlyn (mAODN), with a minimum and maximum elevation of 3.21 and 3.86mAODN, respectively.

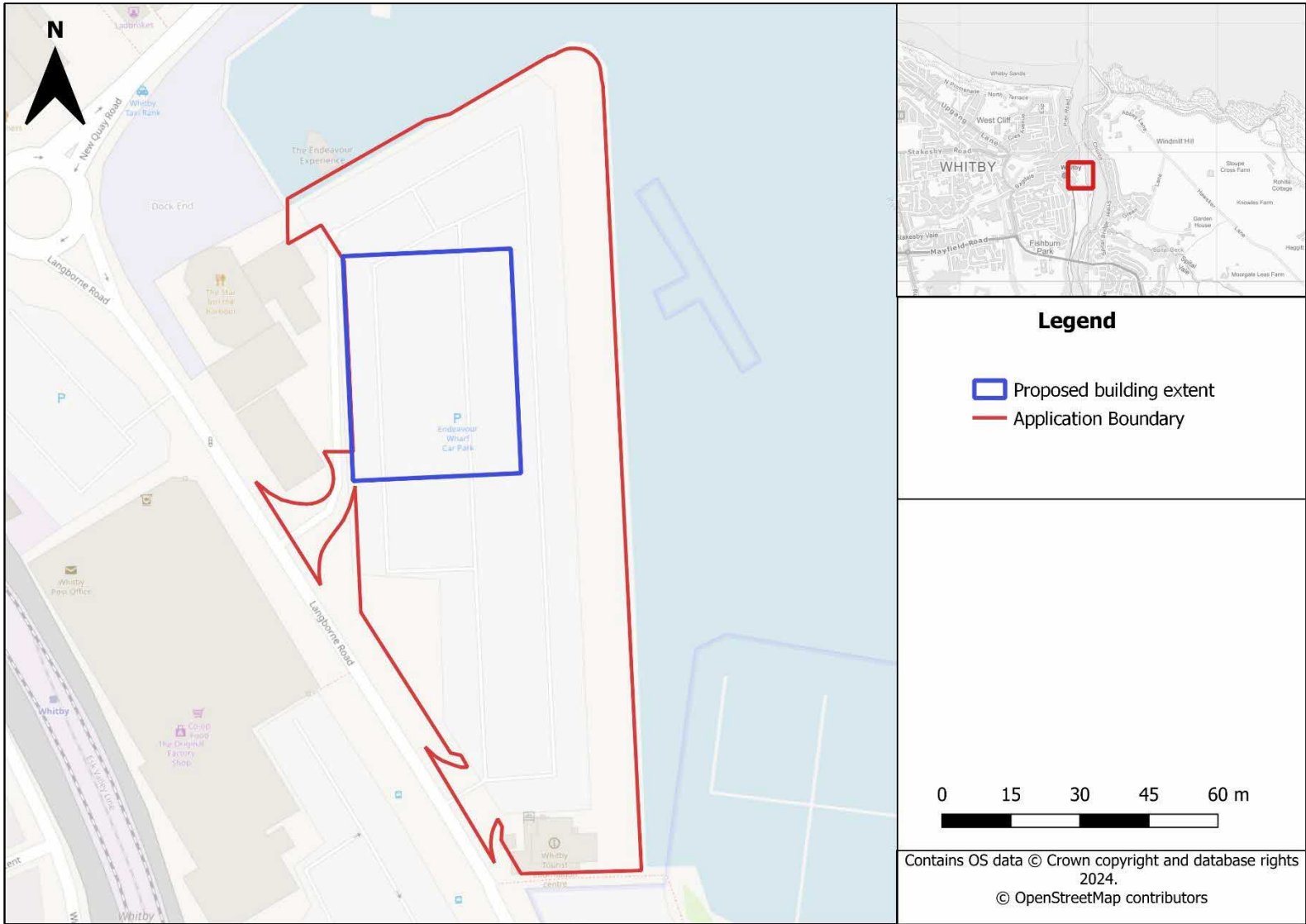
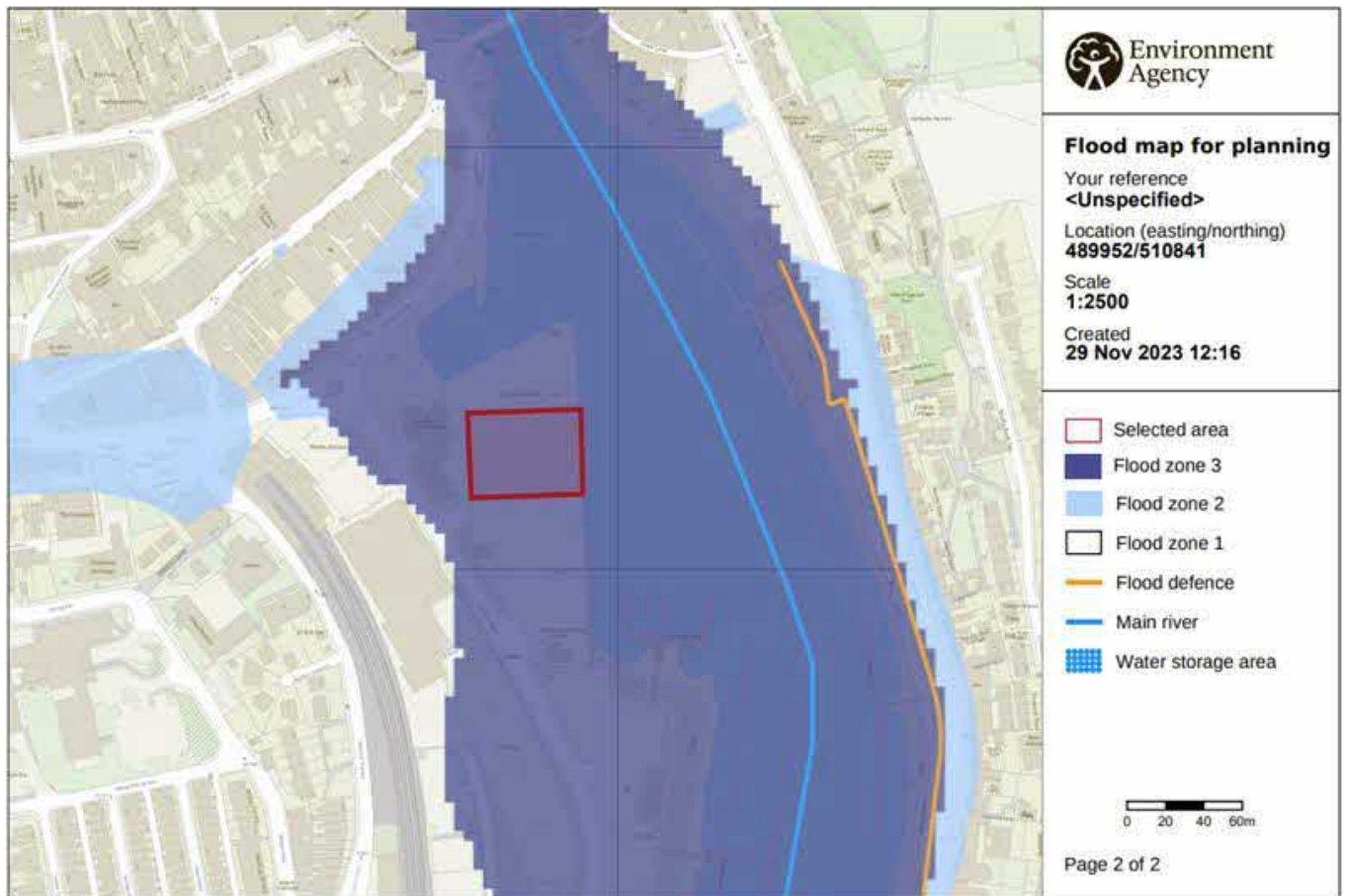


Figure 1-1: Site boundary

2 Sources of flood risk

2.1 Environment Agency Flood Map for Planning

The proposed development site is entirely located in Flood Zone 3 on the Environment Agency Flood Map for Planning (Figure 2-1). There are no formal flood defences acknowledged. Flood Zone 3 means the site is classified as having a high probability of flooding. This means in any year land has a 0.5% or more chance of flooding from the sea and a 1% or more chance of flooding from fluvial sources.



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Figure 2-1: Environment Agency Flood Map for Planning – Flood Zones

2.2 Existing flood inundation model and outputs

JBA Consulting completed a flood risk mapping study of the lower River Esk for the Environment Agency in 2020¹. The primary aim of the project was to improve the understanding of fluvial and tidal flood risk within the River Esk catchment, using linked ESTRY (1D) and TUFLOW (2D) hydraulic model.

The development site is considered to be dominated by tidal flood risk. Since the 2020 flood modelling was undertaken new tidal extreme water levels have been released, along with

¹ Esk & Tributaries Hydraulic Modelling Study. JBA Consulting. Environment Agency. 2020.

newer sea level rise guidance. Due to these new datasets, the Esk tidal model outputs were not considered as part of this site overview and a separate tidal modelling exercise was undertaken (section 2.3).

The 2020 fluvial flood risk was assessed for different Annual Exceedance Probability (AEP) events, but only the 1% AEP results are presented in this report for present-day and climate change epochs. The effects of climate change were simulated by applying different anticipated potential change factors to the river inflow hydrographs. These have been reviewed against current guidance. Defended case results are considered here for a 14.5-hour storm duration, which gives the maximum flood extent for the lower catchment (where the site is located).

No joint probability analysis between downstream tidal water levels and river inflows was considered as part of the 2020 modelling. For the present study, a joint probability analysis was carried out, as described in section 2.4.

2.3 Coastal flood risk

2.3.1 Estimated tidal flood levels and mapping

To investigate flood risk to the site from extreme tidal water levels, a projection modelling approach was undertaken using the latest coastal extreme water levels, sea level rise guidance, and site-specific topography. The following datasets were used:

- Extreme sea levels from the Coastal Flood Boundary Dataset (CFBD) using the chainage point 3718

- Sea Level Rise estimates using the United Kingdom Climate Projections 2018 (UKCP18) guidance using Representation Concentration Pathway (RCP) 8.5, and the Higher Central (70th percentile) and Upper End (95th percentile) emissions scenarios.

- Environment Agency DTM 1m LIDAR composite 2022 dataset.

The analysis was undertaken using the 3.3%, 0.5% and 0.1% AEP events which represent Flood Zone 3b (classified as functional floodplain), Flood Zone 3 and Flood Zone 2 respectively. The CFBD extreme sea levels were uplifted from a 2017 base year to present day (2024 epoch), and a 75-year and 100-year future climate change (2099 and 2124 epochs) scenarios. The UKCP18 RCP 8.5 Higher Central (70th percentile) and Upper End (95th percentile) sea level rise uplifts, using grid square 395, are detailed in Table 2-1 and the uplifted CFBD water levels used in the projection modelling detailed in Table 2-2.

Based on government guidance^[2], the estimated tidal flood level at the site should be based on the following:

tidal flood with a 1 in 200 annual probability (0.5% AEP) plus an allowance for climate change

Using the assumed 75-year design life of the development, the key tidal flood level for design purposes corresponds to the 0.5% AEP RCP 8.5 Higher Central 2099 epoch level of 4.83mAODN (bold value in Table 2-2). The RCP 8.5 Higher Central allowance was considered for design purposes, and Upper End allowance for sensitivity, based on the guidance detailed in the Flood and coastal risk projects, schemes and strategies: climate change allowances³.

Table 2-1: UKCP18 Sea level rise uplift values

Year	Higher Central 70 th percentile uplift (m)	Upper End 95 th percentile uplift (m)
2017 to 2024	-	0.04
2017 to 2099	0.72	0.96
2017 to 2124	1.02	1.39

Table 2-2: Uplifted extreme water levels – design tidal water level in bold

Annual Exceedance Probability Event (%)	2017 epoch (mAOD)	2024 epoch (mAOD)	2099 epoch (mAOD)		2124 epoch (mAOD)	
			70 th	95 th	70 th	95 th
3.3	3.82	3.86	4.54	4.78	4.84	5.21
0.5	4.11	4.15	4.83	5.07	5.13	5.50
0.1	4.37	4.41	5.09	5.33	5.39	5.76

Note; the 2020 Esk flood model results, detailed in section 2.2, were assessed to check if there is any water level change between the Esk mouth and the Endeavour Wharf site location as tidal waters propagate into the Estuary. No significant change was identified and therefore the CFBD extreme sea levels were used without additional uplift for location.

Figures of the projection modelling are provided separately to this document. The mapped results for the 0.5% AEP event for the 2024 epoch (which relates to Flood Zone 3) and 2099 epoch (75-year design life) are displayed in Figure 2-2 and Figure 2-3 respectively. The Extended Application, Application and Ownership boundaries are represented in the figures. The Application Boundary is considered as the site extent in the analysis below.

2 <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#standing-advice-for-vulnerable-developments>

3 Flood and coastal risk projects, schemes and strategies: climate change allowances <https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances#sea-level-allowances>

The results show that the entire site extent would be inundated during both a 0.5% AEP present-day and 2099 epoch Higher Central extreme water level event. During the present-day event flood depths range from 0.30 to 0.94m, with an average value of 0.65m. While under sea level rise conditions in 2099, flood depths are more significant and range from 0.98 to 1.62m, with an average value of 1.33m. Under Upper End climate change conditions (not shown), flood depths in the 2099 epoch range from 1.22 to 1.83m, with an average value of 1.57m (0.24m deeper on average than the Higher Central equivalent).

The 3.3% AEP event in 2024 (broadly equivalent to Flood Zone 3b, classed as functional flood plain) is shown in Figure 2-4. The site extent is flooded, almost entirely, with flood depths ranging from 0.01 to 0.65m, with an average flood depth of 0.36m.

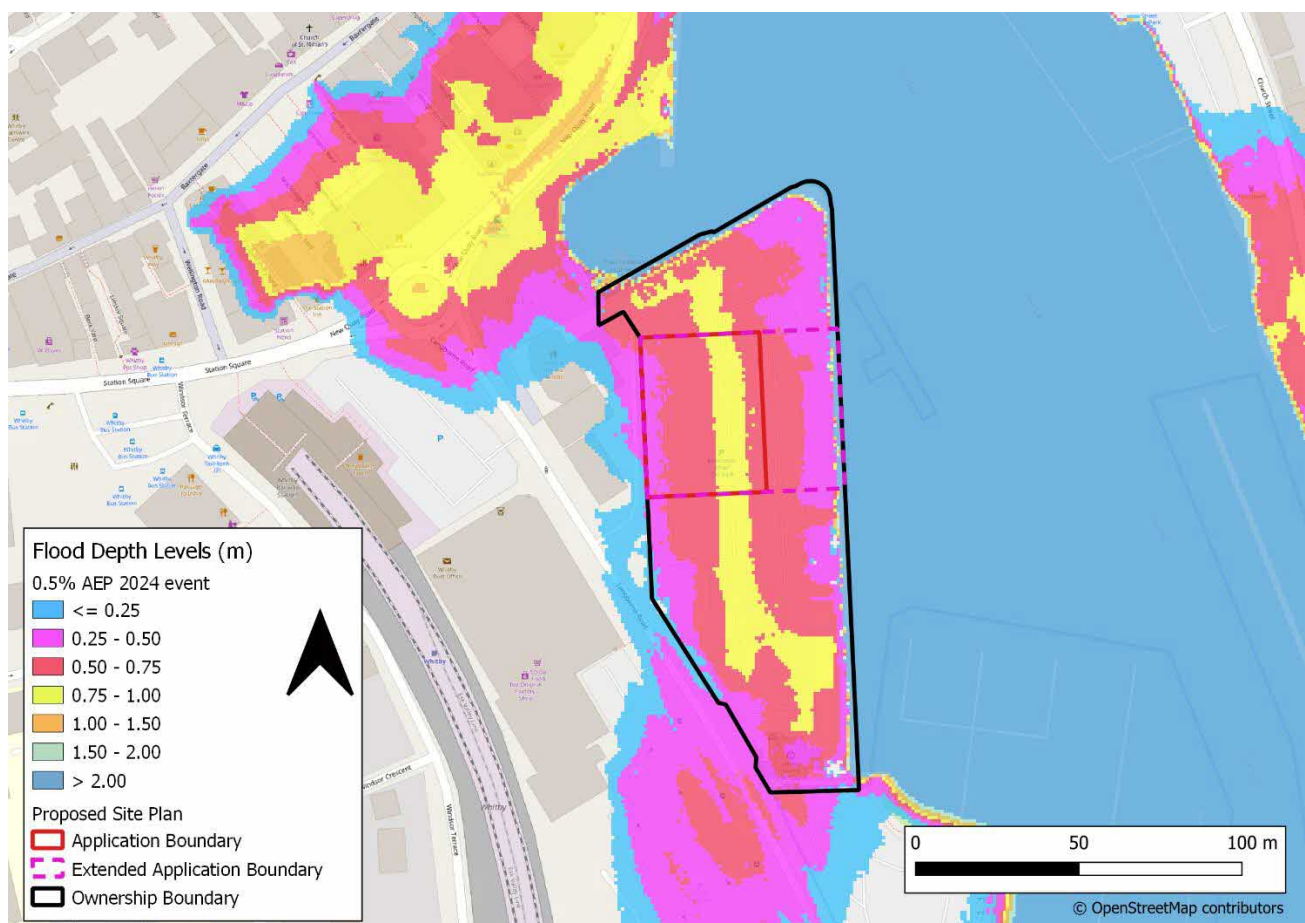


Figure 2-2: 0.5% AEP event (present-day) 2024 epoch – Flood depths

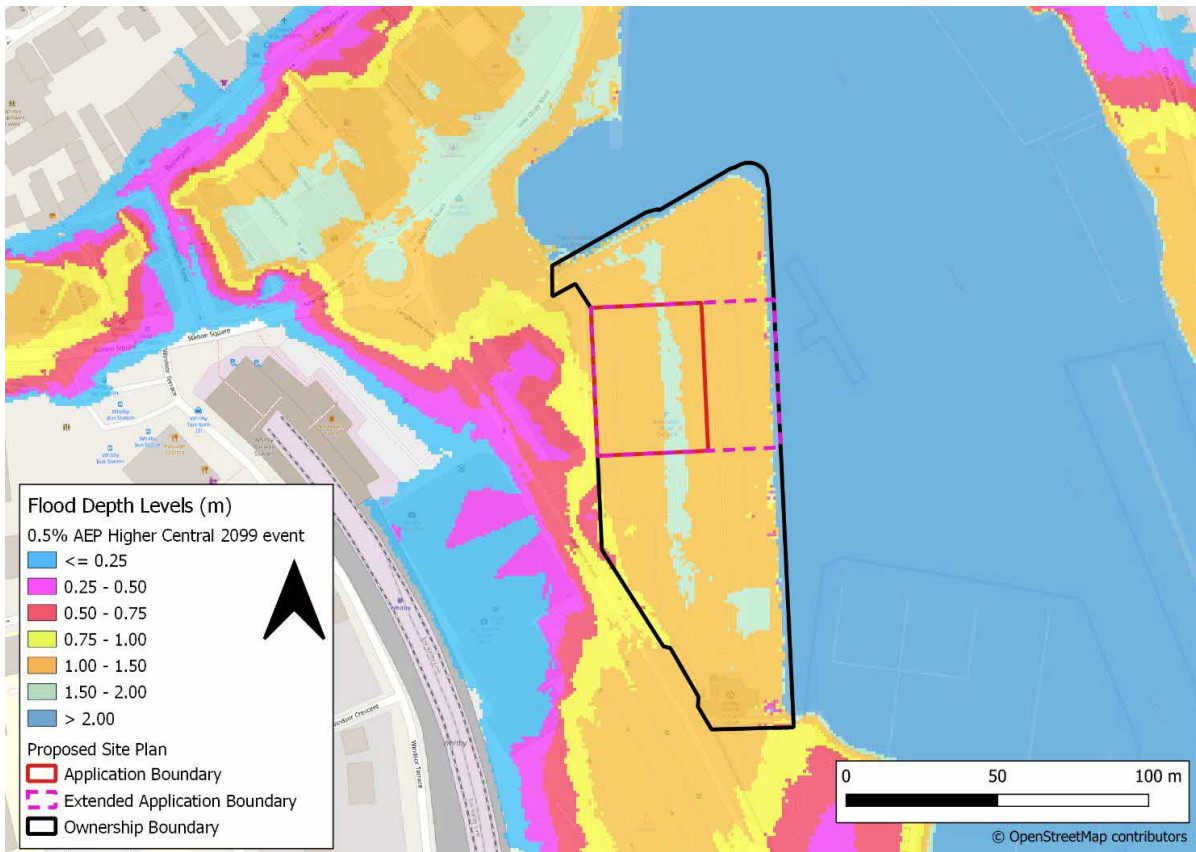


Figure 2-3: 0.5% AEP event Higher Central 2099 epoch – Flood depths

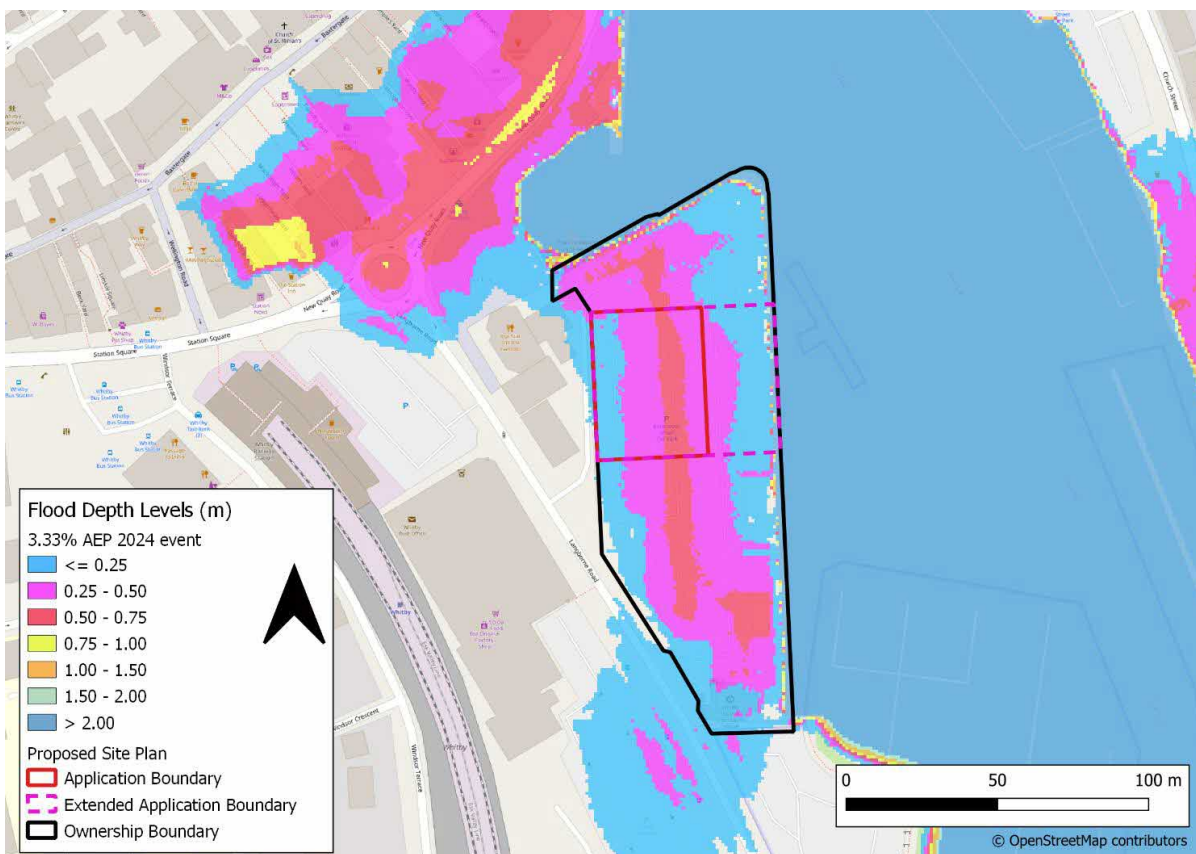


Figure 2-4: 3.3% AEP event (present-day) 2024 epoch – Flood depths

2.3.2 Estimated tidal flood durations

To estimate flood durations at the site, design tide curves were generated following Environment Agency guidance. This process used information from three principal sources:

Extreme still water sea-level estimates - Uplifted 2018 CFB dataset (Table 2-2)

Design astronomical tide - Class A Tide Gauge Network using a Meah High Water Springs at Whitby

Design surge shape - Surge shape from the 2018 CFB dataset at Whitby.

To generate the tidal profile, the peak of the design surge profile was aligned to coincide with the low tide level before the maximum astronomical tidal peak level. The tidal profile was then scaled to peak at the extreme sea-level for each of the AEPs considered, as shown in Figure 2-5. The tide profile has a double-peak shape, resulting in high water levels for two consecutive tidal cycles during extreme events.

Flood duration was determined when the water level exceeds the average site's elevation. Based on the LIDAR dataset, the average bottom elevation of the site is 3.50mAODN. Figure 2-6 shows the tidal profiles and the associated flood durations for the first and second tidal peaks, and Table 2-3 details the flood duration for the second peak – longest flood duration.

During a 0.5% AEP present-day extreme water level event, the flood duration is expected to be 2.75h and 3.25h for the first and second tide peaks, respectively. During a 0.5% AEP event under Higher Central climate change conditions in the 2099 epoch, the flood duration is expected to be 4.25h and 4.75h for the first and second tide peaks, respectively (Figure 2-6).

It is expected that the site would drain very quickly as the tidal water levels recede below the site elevation, with no raised defences to hold flood waters back.

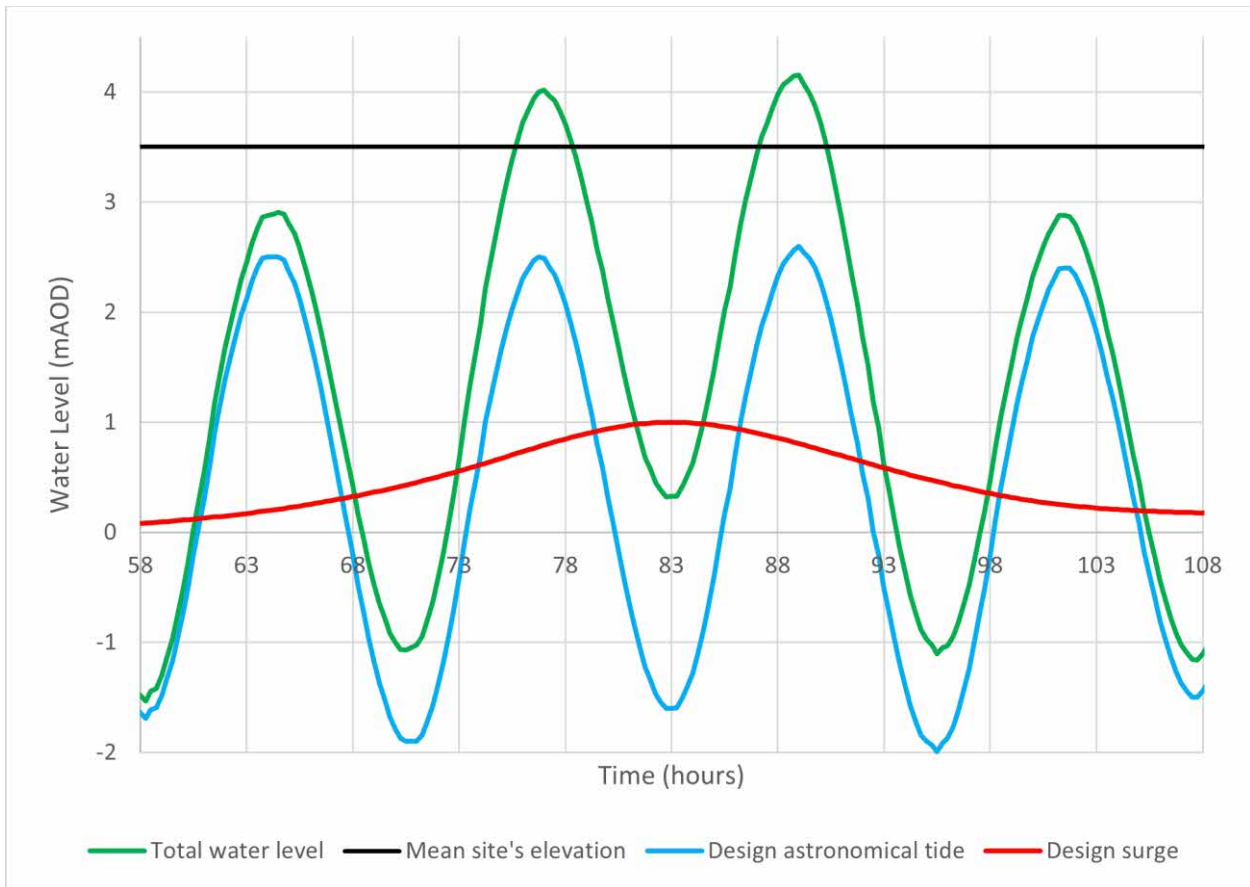


Figure 2-5: 0.5% AEP event (present-day) 2024 epoch – Tide profile

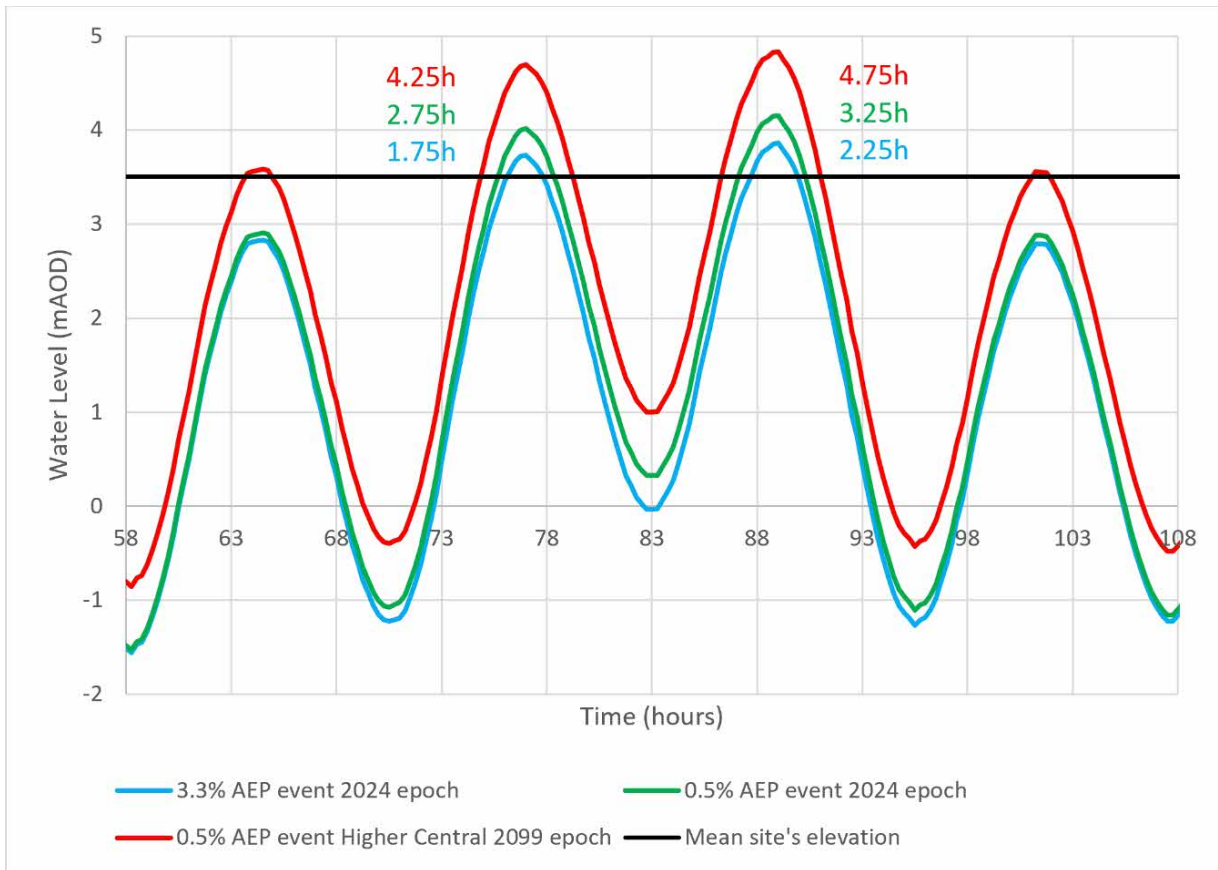


Figure 2-6: Flood durations for the first and second tidal peaks

Table 2-3: Flood duration (hours) – second tidal peak

Annual Exceedance Probability Event (%)	2024 epoch (mAOD)	2099 epoch (mAOD)		2124 epoch (mAOD)	
		70 th	95 th	70 th	95 th
3.3	2.25	4.25	4.75	4.75	5.50
0.5	3.25	4.75	5.25	5.25	6.00
0.1	4.00	5.00	5.50	6.00	6.50

2.3.3 Wave action flood risk considerations

While extreme water levels are one of the main drivers of flood inundation in coastal areas, a significant proportion of flooding, especially along the open coast, can be attributed to the overtopping of defences from wave action (Figure 2-7). However, Endeavour Wharf, located roughly 1km upstream of the River Esk mouth, is sheltered from incoming sea and swell waves. Therefore, the threat of wave action from the North Sea is not considered an important flood risk factor at the site, and only extreme tidal water levels are considered.

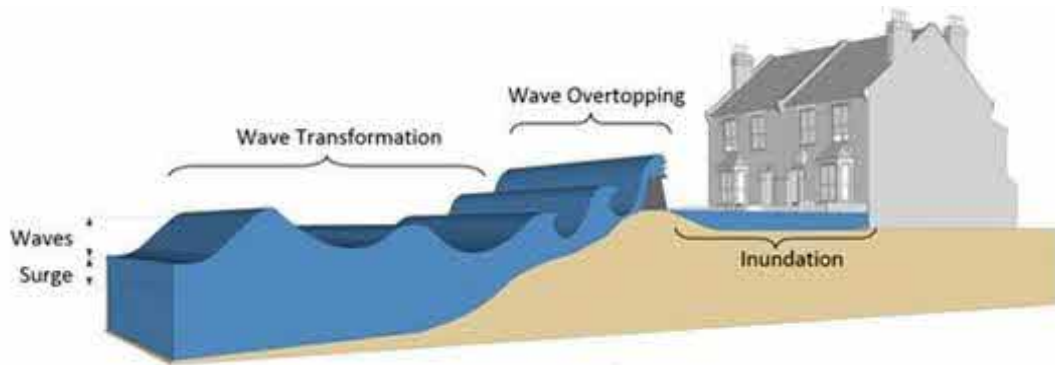


Figure 2-7: Components of sea level variation that combine to cause coastal flooding

2.4 Fluvial flood risk - river flooding

2.4.1 Joint probability analysis

The site location suggests that the site flood risk will be dominated by tidal extreme water levels. The existing 2020 River Esk catchment fluvial outputs were used to confirm this is the case.

A joint probability analysis was carried out for the present study to check the validity of the assumption made in the 2020 work about the combination of probabilities used for the fluvial and tidal boundary conditions of the model. The 2020 model assumed that a tidal boundary representing mean high water spring tides could be combined with a fluvial inflow of probability $p\%$ to give flood levels of $p\%$ throughout the model domain. This assumption could be appropriate as long as there is no significant statistical dependence between tide levels and river flows. Dependence can arise due to tide surges which are driven by the same atmospheric processes as some types of river floods.

The analysis used river flow data for the Esk at Briggsath, obtained from the National River Flow Archive and tide surge data recorded at Whitby, from the National Oceanographic Database. Tide surge is the difference between recorded tide level and the atmospheric tide level. The overlapping period for these two data series runs from 1980 to 2022. Data were analysed as daily mean values, calculated over a water day which runs from 09:00. Missing values of tide surge (mostly in 1988-89) were set to zero, which is the mean tide surge, because the software requires complete time series of all variables.

The Environment Agency's Multivariate Event Modeller (MEM) software was used for the analysis⁴. The results showed very low dependence between extreme river flows and extreme tide surges (Figure 2-8). Dependence in extremes is measured by the variable χ , the value of which was estimated to be 0.01, indicating virtually no dependence. This is quite a common finding for river catchments draining to the east coast of England.

⁴ <https://github.com/jbaconsulting/Multivariate-Event-Modeller>

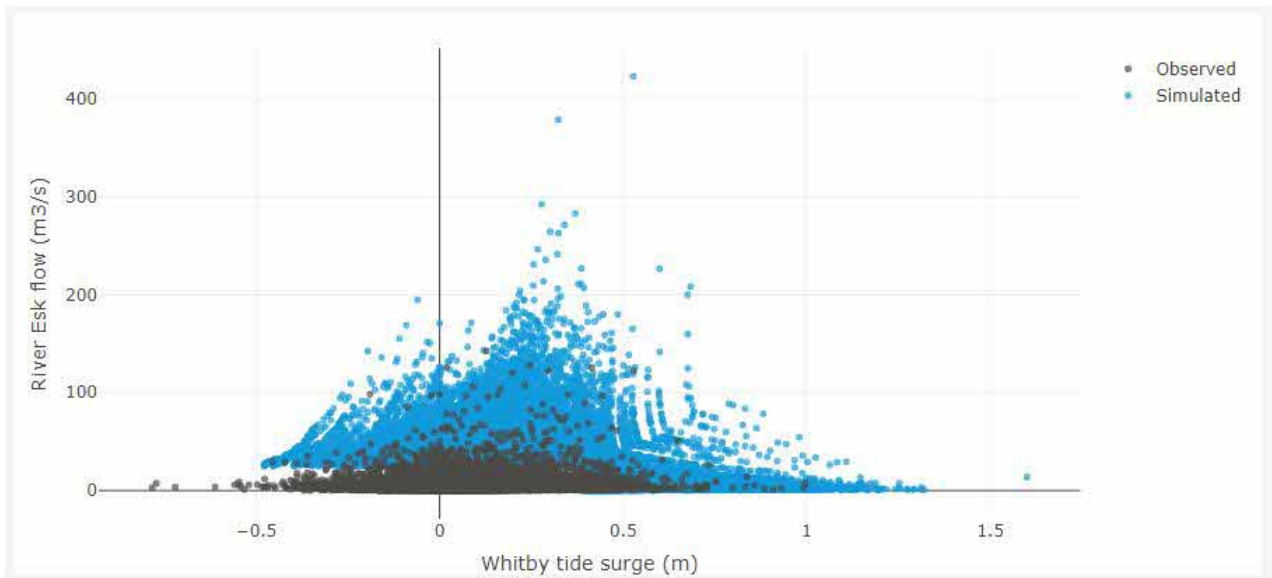


Figure 2-8: Output from the MEM software showing observed and simulated pairs of river flow and tide surge

The statistical model fitted using the MEM software indicated that a flood with combined probability of approximately 1% can arise from combining a river flood flow of annual exceedance probability (AEP) 1% with a tidal surge of zero. This is what the 2020 model does, by using the mean high water spring tide as a boundary condition, with no allowance for surge.

In conclusion, the 2020 model uses an appropriate combination of tidal and fluvial probabilities.

2.4.2 Estimated fluvial flood levels and mapping

Based on the Flood Risk Assessment Standing Advice, the estimated fluvial flood level at the site should be based on the following:

river flood with a 1 in 100 annual probability (1% AEP) plus an allowance for the impact of future climate change.

The 2020 model used allowances for climate change taken from the Environment Agency's guidance, current at the time, which provided allowances at a river basin district level. For the Humber river basin district, allowances for peak river flows in the 2080s epoch were of +20%, +30% and +50%, representing the central, higher central and upper projections respectively. The percentiles represent (some of) the uncertainty in future impacts of climate change.

The current guidance⁵ provides allowances at a finer spatial resolution. For the Esk and Coast Management Catchment, the allowances for peak river flows in the 2080s are +16%, +23% and +39%, for the central, higher central and upper projections respectively. These are rather lower than the previous allowances and so the outputs of the 2020 model can be

⁵ [Flood risk assessments: climate change allowances - GOV.UK \(www.gov.uk\)](http://www.gov.uk)

used to provide a conservative estimate of future fluvial flood hazard at the site. If it is found that the tidal flood levels are higher, then there is no need to refine the fluvial estimates using the lower allowances for peak river flows.

The 2020 outputs used to assess fluvial flood risk to the site were as follows:

Scenario: Defended

Storm duration: 14.5h

Event AEP: 1%

Epochs:

- Present-day
- 2080 - climate change allowance: higher central (+30% change factor) - for design purposes
- 2080 - climate change allowance: upper (+50% change factor) - for sensitivity testing

The maximum fluvial water levels at the study site are detailed in Table 2-4. During a 1% AEP climate change scenario with higher central allowance the peak level is 4.31mAODN. The map results for the 1% AEP event for the present-day and 2080 upper-end epochs are displayed in Figure 2-9 and Figure 2-10, respectively.

The results show that the site extent would be largely inundated during a 1% AEP present-day extreme fluvial water level event. The average and maximum flood depths are 0.18m and 0.38m, respectively. Figure 2-10 shows that the entire site would be inundated during a 1% AEP event in the 2080s, under the upper-end scenario, with flood depths ranging from 0.72 to 1.28m and an average value of 1.04m. Flood depths for the higher central scenario in the 2080s are in between the two scenarios plotted on the maps.

Table 2-4: Flood extreme water levels – design fluvial water level in bold

Epoch	1% AEP event - Water level (mAODN)
Present-day	3.77
Climate change for 2080s: higher central	4.31
Climate change for 2808s: upper	4.67

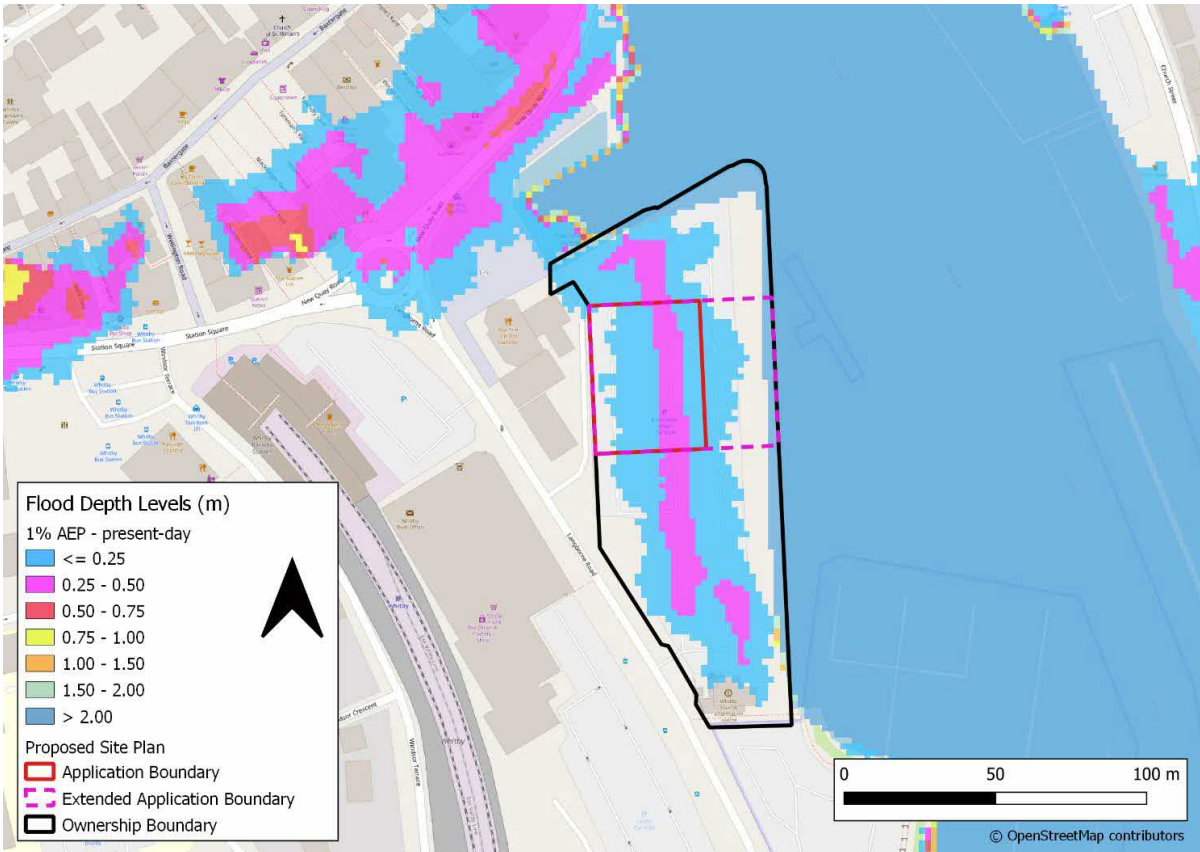


Figure 2-9: 1% AEP present-day – Fluvial flood depths

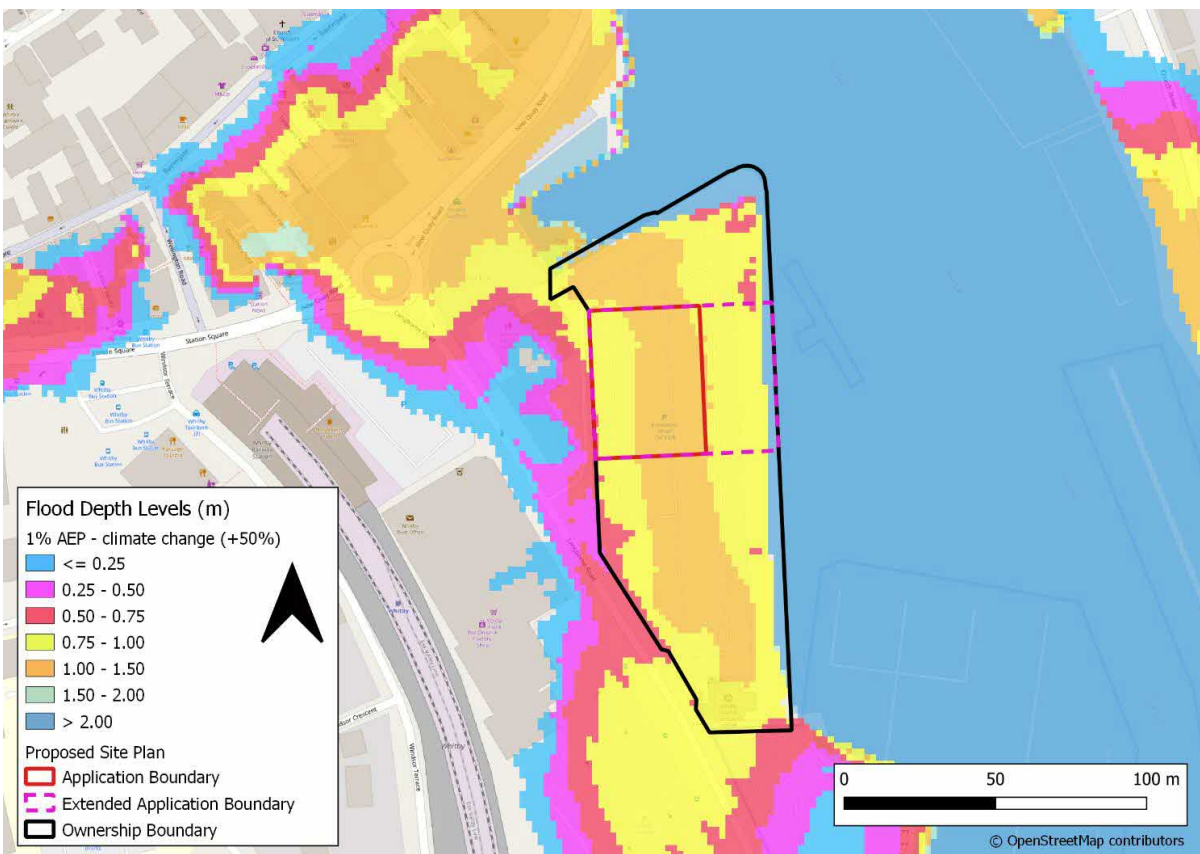


Figure 2-10: 1% AEP 2080s upper-end scenario – Fluvial flood depths

2.4.3 Estimated fluvial flood duration

Modelled hydrographs were extracted from the two closest modelled river cross-sections, located immediately upstream and downstream of Endeavor Wharf. The maximum difference between the upstream and downstream cross-section hydrographs is 0.01m, therefore, the maximum of the two hydrographs is presented below.

Flood duration was determined when the fluvial water level exceeds the average site elevation of 3.50mAODN. The fluvial hydrographs at the site location and associated flood durations are shown in Figure 2-11 for a 1% AEP event, under present-day and future epochs.

Table 2-5 shows a 1% AEP fluvial flood duration under design climate change conditions (higher central allowance) is 12 hours.

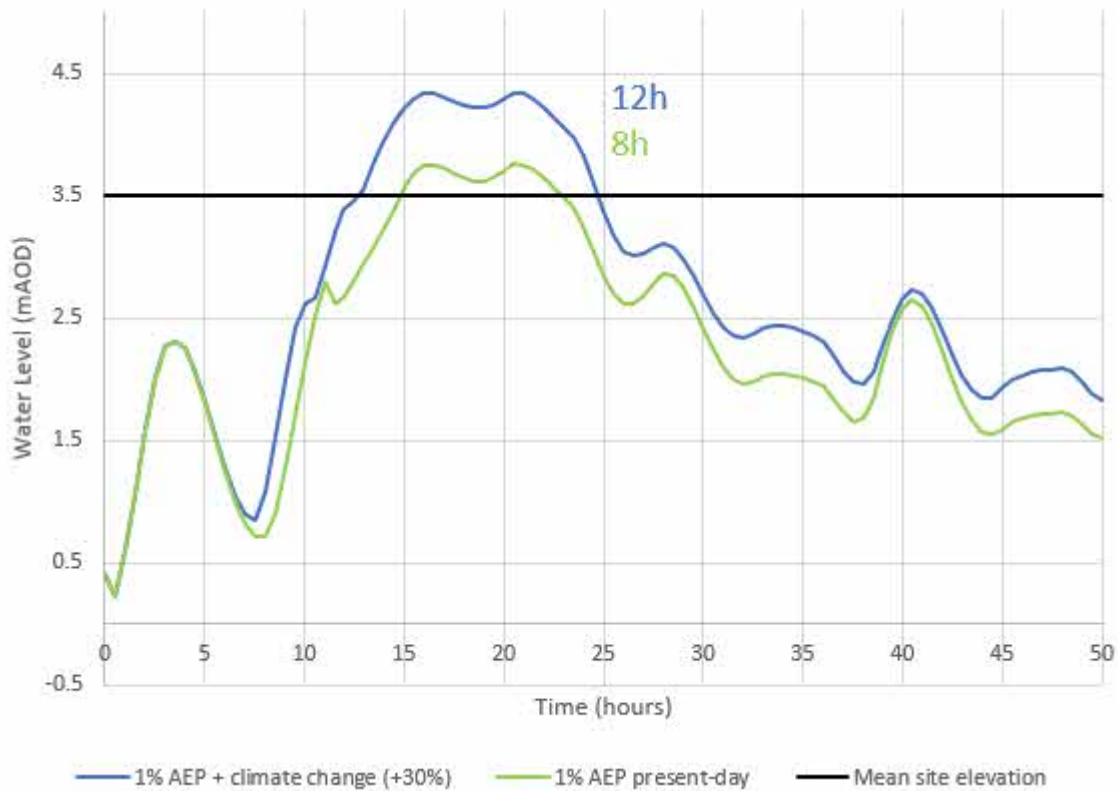


Figure 2-11: Fluvial flood duration based on modelled hydrograph at the site :1% AEP event, present-day and 2080s higher central epochs

Table 2-5: Flood duration (hours)

Epoch	Flood duration (hour)
Present-day	8
Climate change by 2080s, higher central (+30% peak flow)	12
Climate change by 2080s, upper end (+50% peak flow)	14

2.5 Estimated flood level and flood duration for design purposes

2.5.1 Estimated flood level

The estimated design water levels for consideration based at the site, based on the Flood Risk Assessment Standing Advice and Flood and coastal risk projects, schemes and strategies: climate change allowances, are:

River flood: 4.31mAODN: 1% AEP plus climate change allowance for the 2080s (+30% change factor which is slightly higher than the current guidance for the higher central allowance)

Tidal flood: 4.83mAODN: 0.5% AEP event plus climate change allowance for 2099 (RCP 8.5 Higher Central)

Tidal flood events lead to higher water levels at the site, and an estimated flood level of 4.83mAOD is used to determine the finished floor levels (section 33.2).

2.5.2 Estimated flood duration

A comparison between tidal and fluvial water level time series is shown in Figure 2-12. The tidal time series was aligned with the fluvial maximum water level to facilitate the comparison.

Considering the topographic features of the site and its surrounding area (a relatively flat wharf with no raised defences), flood water is expected to quickly drain back to the river during a flood event once the water level becomes lower than the site's elevation.

Therefore, the water level time series in Figure 2-12 are representative of the water level expected at the site.

The maximum water level is higher for a design tidal event than a fluvial one. However, the flood duration and depth differs depending on the flood sources and should be considered when developing emergency plans including access and egress. Tidal flood events are characterised by two peaks of roughly 4.5h each, whereas fluvial flood events are characterised by a single, longer peak of 12h.

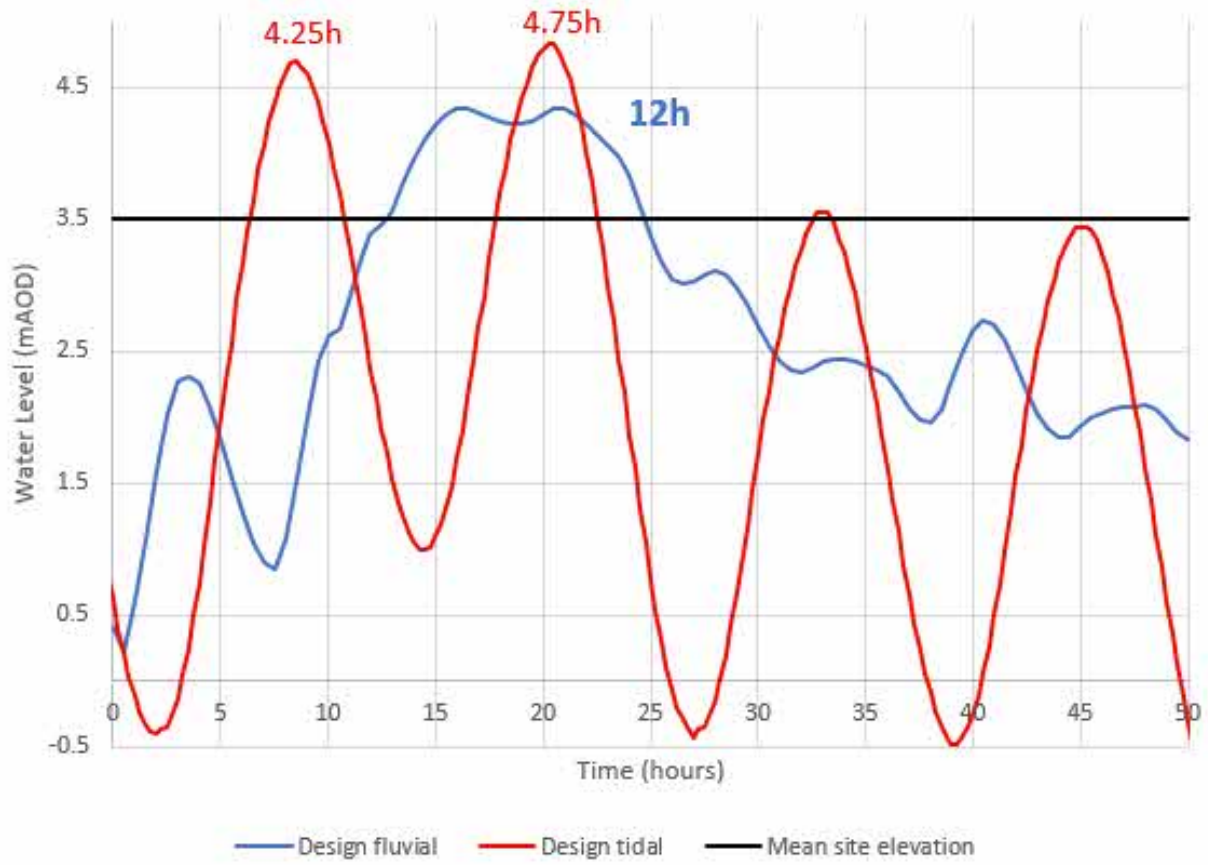


Figure 2-12: Design fluvial and tidal water level time series – flood duration

3 Considerations for development at Endeavor Wharf

3.1 Flood Zone Classification

The site lies within coastal Flood Zone 3 (in any year land has a 0.5% or more chance of flooding from the sea).

Considering the tidal projection modelling, the site is also inundated in the 3.3% AEP present day tidal flood event, indicating it could be classified as sited within tidal Flood Zone 3b.

3.2 Finished floor levels

Based on government guidance, the occupied floor levels (upper levels in this instance) should be 300mm above the highest of the levels below:

average ground level of the site: 3.5m AODN

adjacent road level (Langborne Road) to the building (ranges from 3.30m AODN at the roundabout joining New Quay Road and 4.40m AODN west of the site center)

estimated river or sea flood level: 4.83m AODN (estimated sea flood level)

Based on the above levels, the finished floor levels should be above 5.13m AODN ($4.83 + 0.3 = 5.13$).

Any floors below this level should be designed with resilience in mind. It is noted that the Ground Floor (predominantly storage and workshop spaces) is to be fully flood resilient and will be evacuated in the event of a flood, as set out in the Flood Risk Assessment.

Construction materials that have low permeability should be used up to at least the same height as finished floor levels.

3.3 Access and Egress

Detail on safe access, egress and evacuation is included in the Flood Risk Assessment.

3.4 Development type

Considering the level of flood risk to the site as outlined in this overview, the recommended development type for the site is "Water-compatible development" as outlined in Annex 3 of the NPPF.

3.5 Wave overtopping

The impact of wave overtopping on flood risk at the site was not considered in this assessment due to tidal levels being identified as the most dominant control on flooding.

Despite this, there remains the possibility that wave risk and winds uplifting water levels could have an impact at the site, although unlikely.

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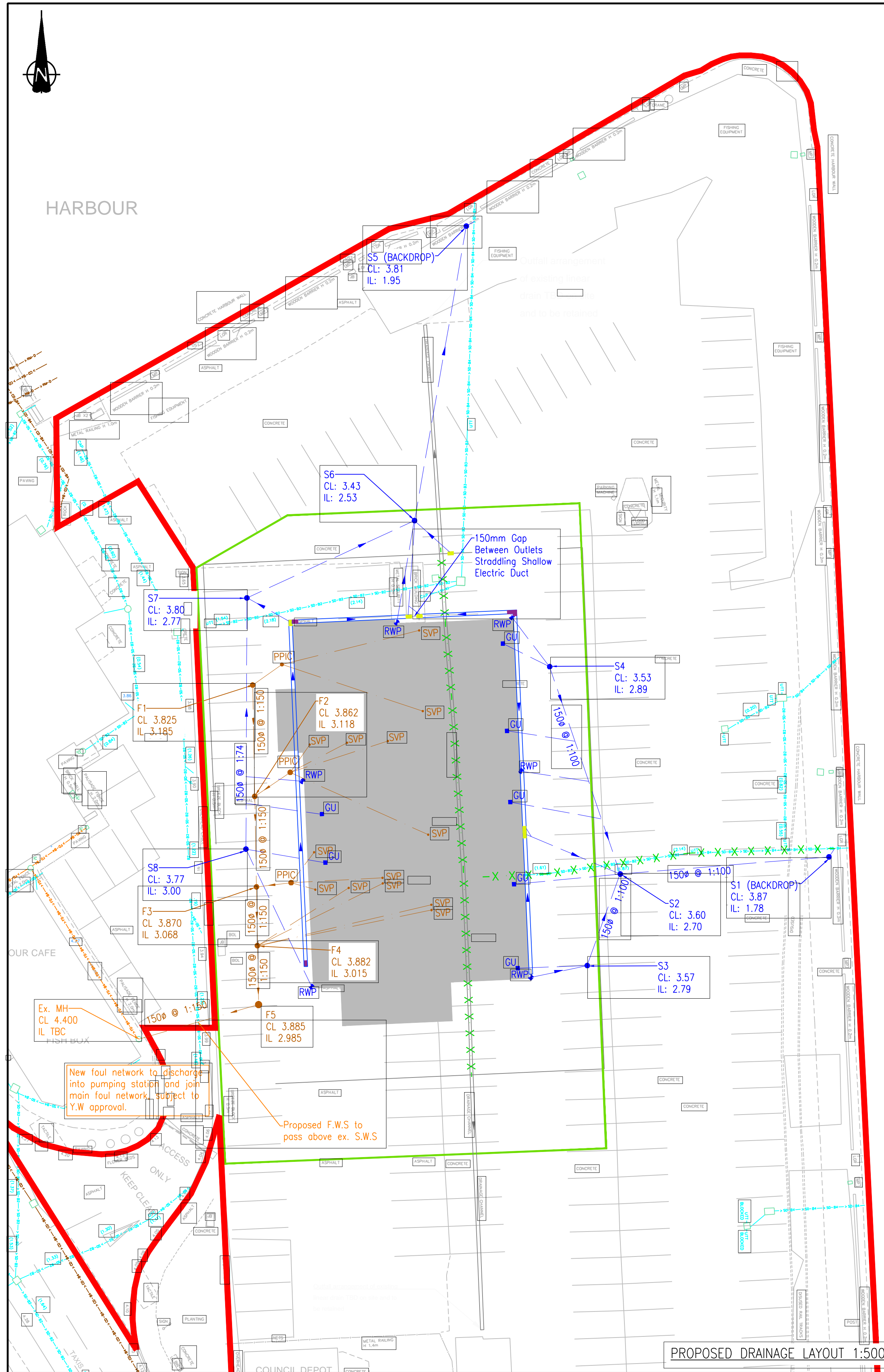
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Appendix E
Proposed Drainage Plan

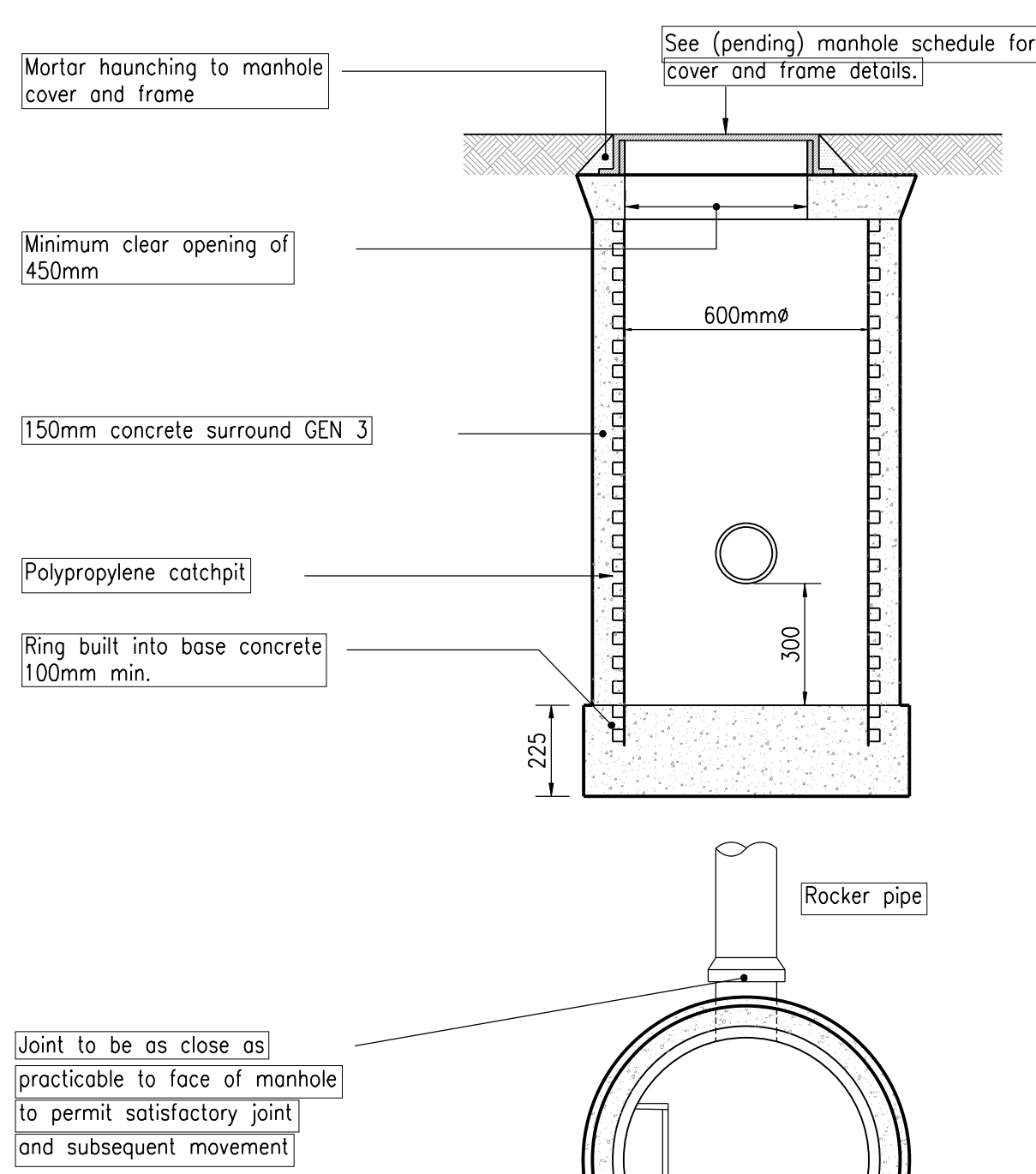


PROPOSED DRAINAGE LAYOUT 1:500

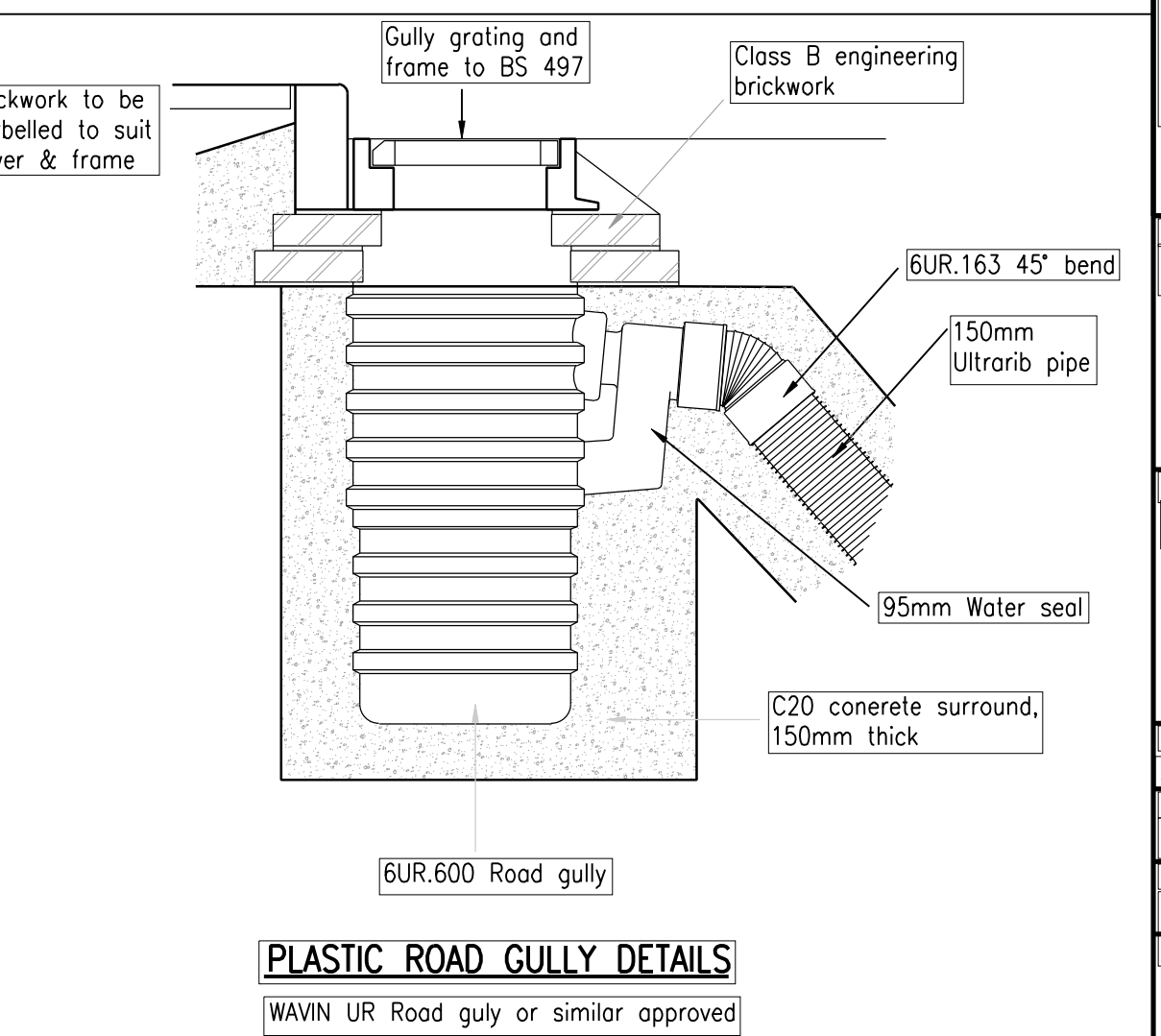
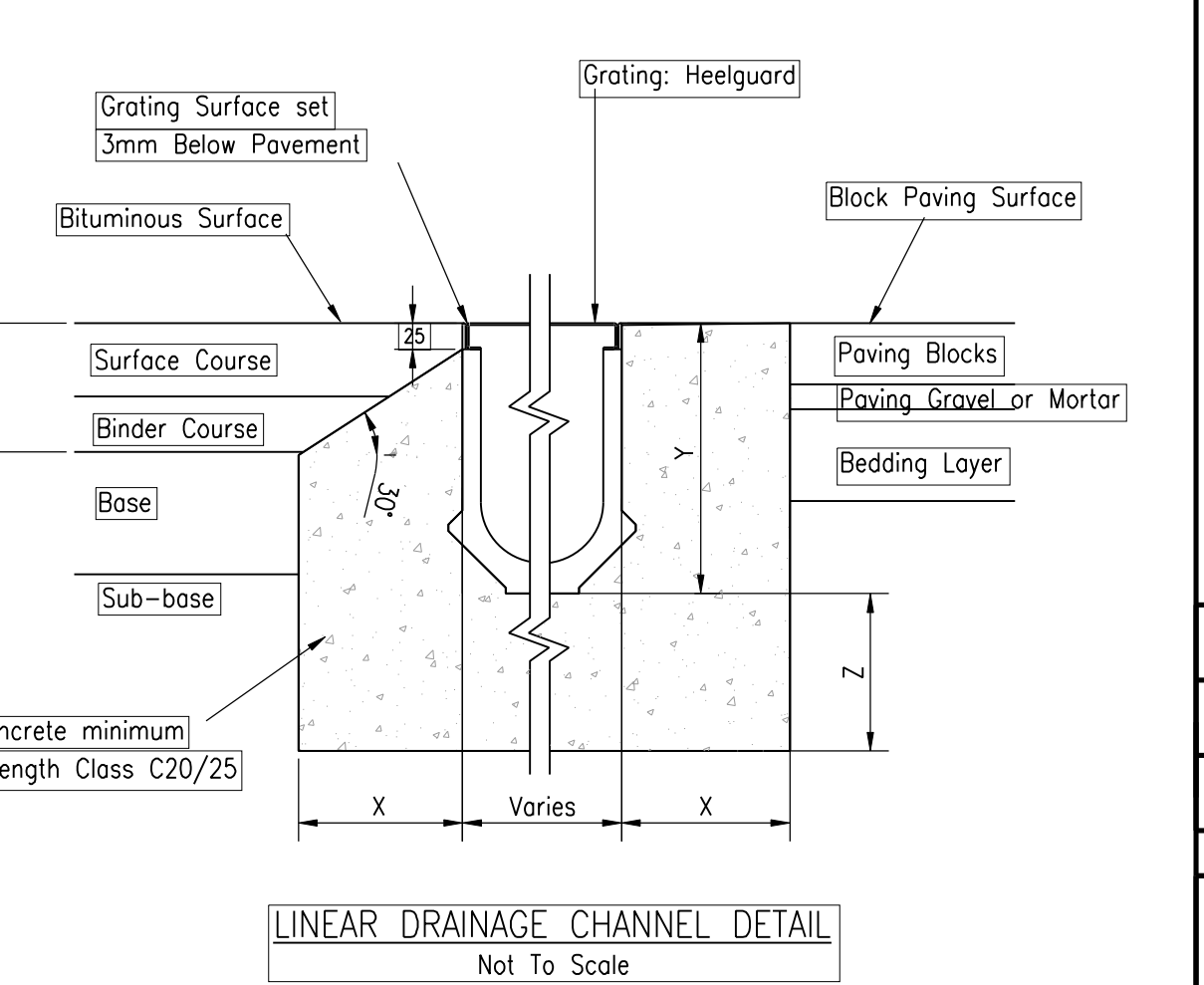
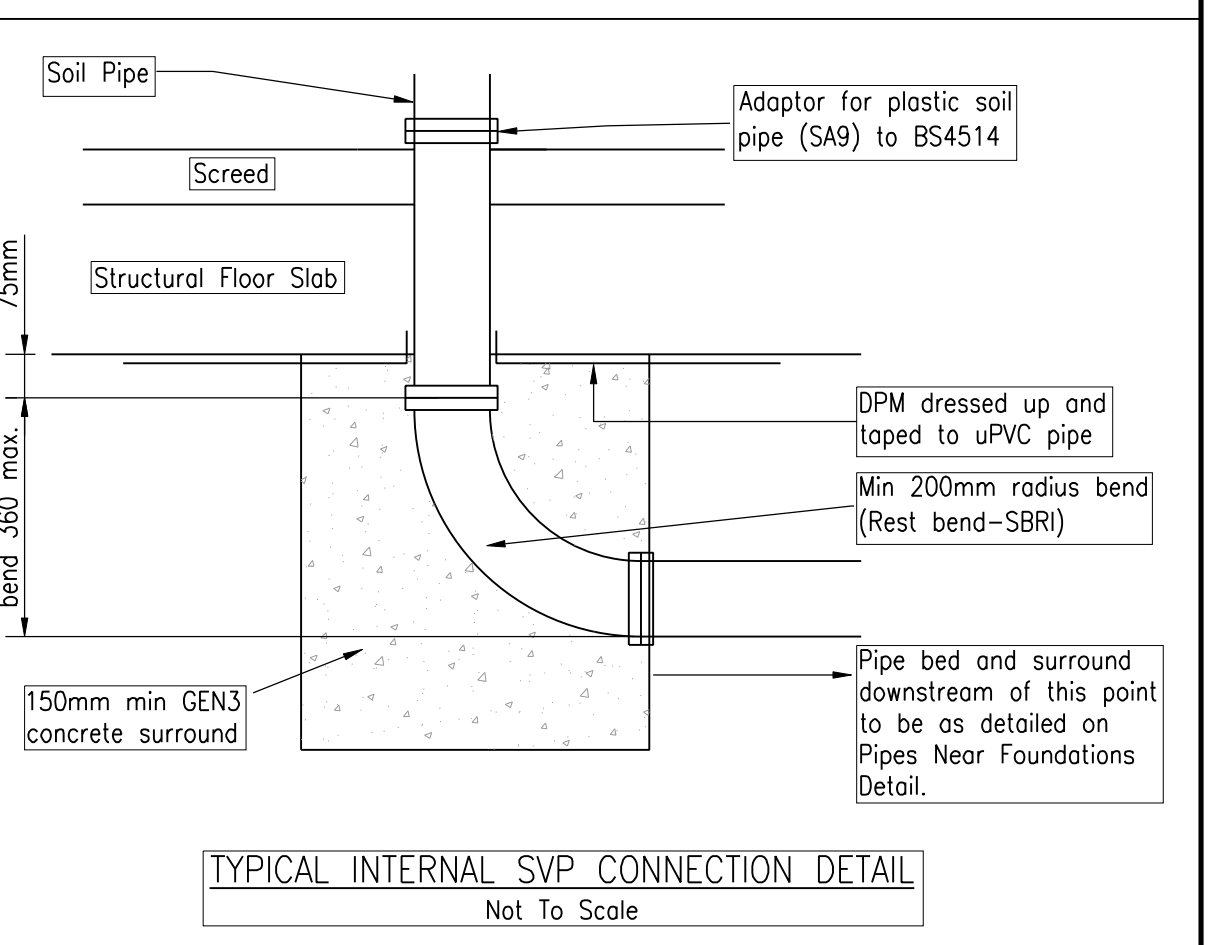
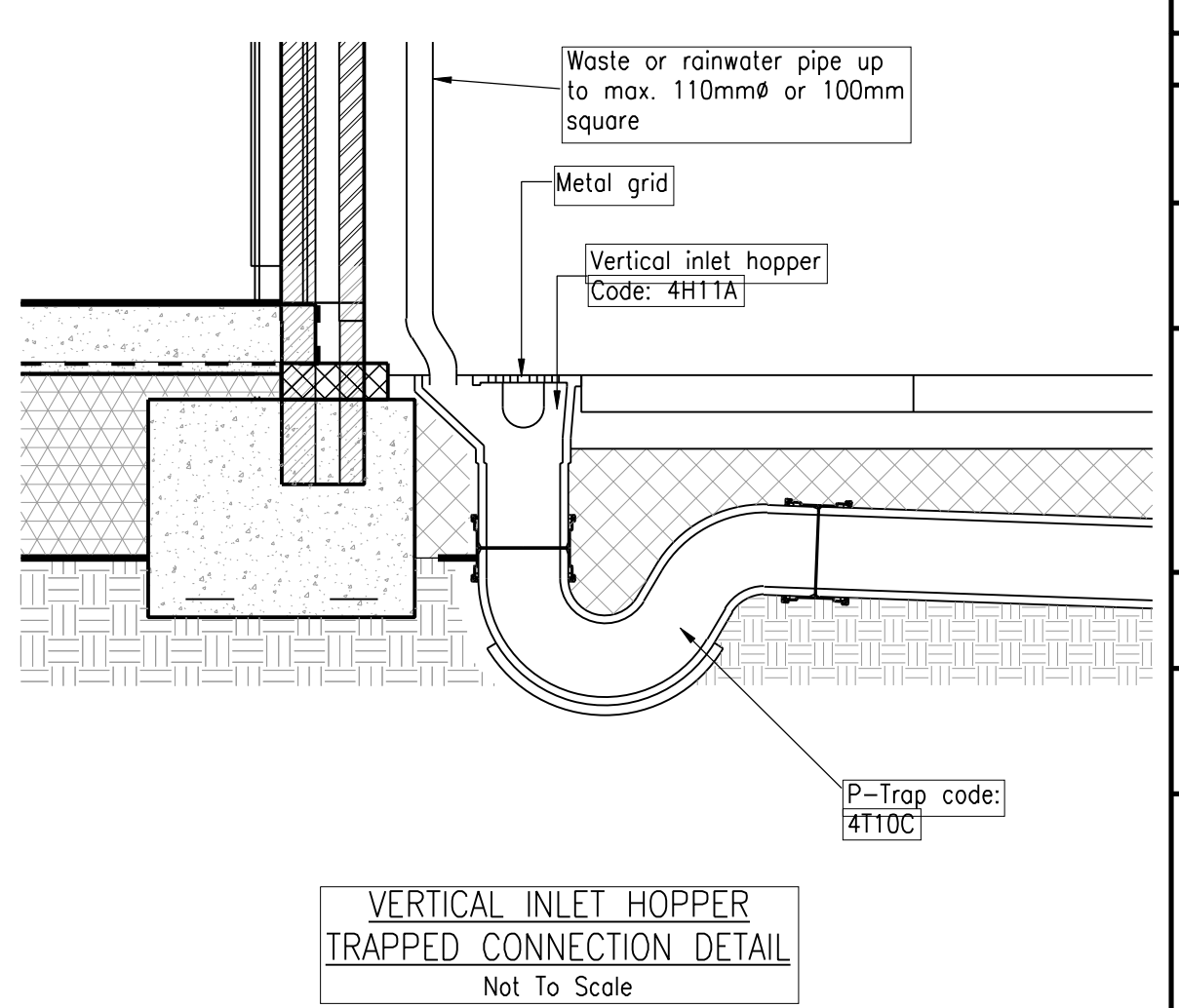
LOCATION OF RAIN WATER DOWN PIPES AND INTERNAL DRAINAGE POP-UPS TO BE CONFIRMED BY ARCHITECT AND DESIGNED BY OTHERS.

DRAINAGE SHOWN ON THIS DRAWING IS SUBJECT TO:
 - APPROVALS FROM ALL RELEVANT AUTHORITIES TO DISCHARGE AND CONNECT TO ADOPTED SEWERS.
 - EXTENT OF ADOPTED HIGHWAYS.
 - EXISTING SERVICES AND EASEMENTS.
 - HIGHWAY APPROVAL.

PLASTIC CATCH PIT DETAIL



TYPICAL DETAIL OF INTERNAL BACKDROP FOR CONCRETE RING MANHOLE
Not To Scale



PLASTIC ROAD GULLY DETAILS
WAVIN UR Road gully or similar approved

Do not scale from this drawing.
SAFETY HEALTH AND ENVIRONMENTAL INFORMATION
 IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.
 RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM DID-152982-10.

CONSTRUCTION
 - WORKING IN A LIVE SEWERAGE SYSTEM
 - EXISTING SERVICES
 - DISRUPTION TO DRAINAGE
 - PUBLIC INTERFACE
 - WORKING ADJACENT TO TIDAL WATERCOURSE

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

- NOTES**
- Based on received information from Enjoy Design:
 - WHHT-20J-00-DR-A-900030 P13 PROPOSED SITE PLAN
 - 20231130_22.101.A Proposed Drainage Drops FOR COMMENT
 - Proposed pipe saddle connections are to be connected invert to invert.
 - All proposed pipe work to be laid with 150mm of Type Z Surround, in accordance with DMRB F Series.
 - Petrol Interceptor unable to be specified due to lock of depth within existing concrete base shown on GPR records.

KEY

	Site Boundary - dropped conservation kerbs to be laid along perimeter
	Proposed Surface Water Sewer
	Proposed Foul Sewer
	Existing Surface Water Sewer
	Existing Foul Water Sewer
	Existing Combined Sewer
	Existing Linear Drainage
	Existing Manhole
	Grouted Network
	Proposed Linear Drainage
	LD Access Cover
	LD Outfall Unit
	Channel Kerb
	Proposed Building Footprint

Rev.	Date	Description	Drawn	Chkd	Appd
P04	18/01/24	REVISED POST CLIENT FEEDBACK	SKB	SKK	JMM
P03	14/02/23	DRAINAGE NOTE ADDED. SEE CLOUDED.	SKB	SKK	JMM
P02	11/02/23	REVISED TO LATEST ARCHITECTS LAYOUT. BUILDING FOOTPRINT AND BACK DROP DETAILED ADDED	FM	SKT	JMM

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WILLMOTT DIXON

Project Title:
WHITBY MARITIME HUB

Drawing Title:
INDICATIVE DRAINAGE LAYOUT

Scale of A1:	Status:
AS SHOWN	RIBA Stage 3
Drawn:	Checked:
SB/PM	SKT
Approved:	JMM
Date:	Date:
01/12/23	01/12/23
Date:	Date:
	01/12/23

Drawing No.: **WHIT-FHT-Z1-ZZ-DR-C-02001** P04

Appendix F

Draft Flood Evacuation Plan

Whitby Maritime Hub Flood Warning & Evacuation Plan

Managed Facilities

Document Control

This plan is owned, maintained and updated by North Yorkshire Council and the operator of the Whitby Maritime Hub. All stakeholders are to inform the above of any changes in circumstances that may materially affect plan content.

The plan will be reviewed:

- On first occupation;
- Every 3 years thereafter;
- As a result of lessons learnt;
- Following change of ownership or modification of the premises; or
- Following change to the Flood Warning process.

Plan Produced by: _____ Approved by: _____

Version Control

Version No:	Comment	Checked by:	Approved by:	Date:

Disclaimer

North Yorkshire Council, as far as it can ascertain, acknowledges that this Flood Warning & Evacuation Plan (FWEP) template is suitable for the purposes set out within the national Planning Policy Framework. This plan is however the sole responsibility of the signatories and/or their representatives.

North Yorkshire Council cannot accept responsibility for any omission or error contained in any such plan, or for loss, damage, or inconvenience, which may result from the plans' implementation. Any subsequent approval does not does not impute any approval of the plans from the Environment Agency or any of the emergency services.

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Introduction

This Flood Warning & Evacuation Plan (FWEP) has been produced by North Yorkshire Council in respect of the premises at Endeavour Wharf from which we operate the Whitby Maritime Hub.

Endeavour Wharf is susceptible to both tidal and fluvial flooding when certain environmental conditions are in play. This includes tide height, atmospheric pressure, wind and sea direction and increased rainfall.

The FWEP adopts a practicable approach to meeting the requirements of the National Planning Policy Framework and PPS 25.

North Yorkshire Council own the FWEP, and are responsible for its implementation, dissemination and annual review.

The FWEP captures a summary of the site's flood risk and provides all relevant information, contact details and procedures to prepare for, respond to and recover from a flood event.

North Yorkshire Council have given due regard to the safety of occupants and staff, available best practice, relevant legislation and advice provided by the Resilience and Emergencies Team of North Yorkshire Council.

Objectives

In the production of this FWEP North Yorkshire Council have identified the following key objectives:

- To establish robust procedures to close the building before entry, evacuate or move occupants to a place of safety;
- To establish clear procedures for the implementation of this plan;
- To ensure a safe and controlled evacuation where this is deemed the most appropriate action;
- To establish an evacuation route;
- Reduce the risk of life and prevent loss to the premises and business; and
- To inform occupants of the content of this plan.

All staff are to be familiar with these arrangements and testing will be conducted on an annual basis by the organisations responsible officer.

Flood Risk

A full Flood Risk Assessment has been prepared by Fairhust Group LLP dated January 2024.

A copy of the document is embedded and included within this FWEP.



DID.152982.04 -
Flood Risk Assessment

Evacuation

Evacuation should not be necessary in most circumstances. The Harbour Master will use the EA Flood Warning system to make a decision to close the building before occupation in most circumstances.

If a flood occurs during occupation (unlikely), the decision to evacuate will be made by the North Yorkshire Council Harbour Master having due regard to the advice/warnings and instructions of the emergency services.

The decision to evacuate will be made to allow sufficient time to conduct the evacuation before flooding occurs. Flood waters contain hidden dangers and will impede if not prevent a safe evacuation.

- Occupants will be told to not attend or leave the building.
- Occupants leaving the building will evacuate out of the main entrance onto Langbourne Road and urged to return home or move to higher ground.
- In advance of an evacuation furniture and equipment will be moved to the upper levels of the building by building occupants.
- Trained Harbour staff will assist with moving furniture and equipment and the evacuation of the building.
- It is not envisaged that any means of securing safety within the building will be used.
- During a flood, a suitably qualified and experienced team member will be deployed to intercept persons at the entrance to Langbourne Road. Advise them for safety reasons the wharf is now closed and they must leave immediately. Where possible, guide them away from flood water.

Warning & informing

North Yorkshire Council is signed up to Flood Warnings Direct (FWD) from the Environment Agency and to Weather Alerts from the Meteorological Office.

These warnings will be used as the basis for the implementation of the FWEP, together with visual observations from the Harbour Master on the site.

A copy of this FWEP will be accessible to all occupants and visitors to the building.

Familiarisation

The successful implementation of this plan is dependent on all relevant staff and occupants being familiar with its content and to have rehearsed, where possible, the procedures contained within the FWEP.

This plan will be practised / rehearsed once yearly.



Recovery


The decision to implement post flood recovery plans will be made by the North Yorkshire Council Harbour Master once the risk has subsided having due regard to the advice/warnings and instructions of the emergency services.

Re-occupation will not be allowed until :

- Statutory services (water, electric, comms) have been restored by utilities companies.
- Decontamination and cleaning has been completed
- Furniture and equipment has been relocated from safe storage on upper floors.

Annex A – Flood Warning Activation Procedures

Warnings		EA Recommended Actions	North Yorkshire Council		
			Actions [Detail the actions you will take at each stage of the activation]	Communications [How will you communicate activation of the FWEP, internally and to external organisations]	Responsible Person [Record who in your organisation is responsible for each of the prescribed actions / decisions]
	<p>What it means: Flooding is possible. Be prepared.</p> <p>When it's used: Two hours to two days in advance of flooding.</p>	<p>Be prepared to act on your FWEP. Prepare a flood kit of essential items.</p> <p>Monitor local water levels and the flood forecast on our website.</p>	<p>Consider the likelihood of flooding. Provide warnings to occupants. Advise working from home as an alternative.</p>	<p>Verbal Email</p>	<p>Harbourmaster</p>
	<p>What it means: Flooding is expected. Immediate action required.</p> <p>When it's used: ½ an hour to one day in advance of flooding.</p>	<p>Move family, pets and valuables to a safe place.</p> <p>Turn off gas, electricity and water supplies if safe to do so.</p> <p>Put flood protection equipment in place.</p>	<p>Prepare to close the building. Notify occupants of impending flood. Advise working from home as an alternative. Relocate all furniture and equipment to</p>	<p>Verbal Email Telephone</p>	<p>Harbourmaster</p>

			higher levels of the building. Turn off utilities Deploy flood protection measures.		
	<p>What it means: Severe flooding. Danger to life.</p> <p>When it's used: When flooding poses a significant threat to life..</p>	<p>Stay in a safe place with a means of escape.</p> <p>Be ready should you need to evacuate from your home.</p> <p>Co-operate with the emergency services. Call 999 if you are in immediate danger.</p>	<p>Close the building. Issue PPE for harbour staff. Close Endeavour Wharf to traffic and pedestrians.</p>	<p>Verbal Email Telephone Social media</p>	<p>Harbourmaster</p>
<p>EA Flood Warnings No longer in force</p>	<p>What it means: No further flooding is currently expected in your area.</p> <p>When it's used: When river or sea conditions begin to return to normal.</p>	<p>Be careful. Flood water may still be around for several days.</p> <p>If you've been flooded, ring your insurance company as soon as possible.</p>	<p>Implement flood recovery plan</p>	<p>Verbal Email Telephone</p>	<p>Harbourmaster</p>

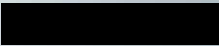
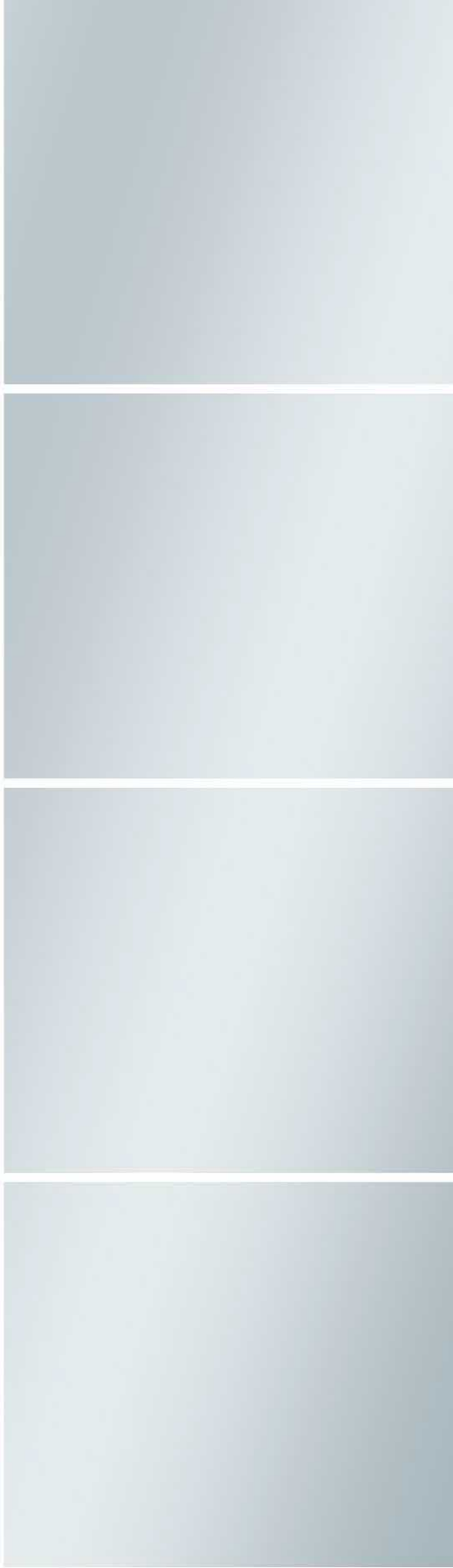
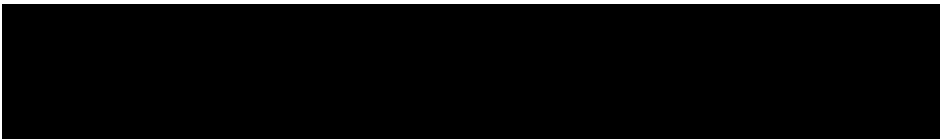
<p>Meteorological Office Weather Warnings</p>	<p>Warnings of heavy rainfall. Warnings of severe winter weather e.g. hail, snow, freezing rain.</p>	<p>Consider the impact of this type of weather – e.g. this could lead to surface water flooding, ground water flooding, increased river and sea levels.</p>	<p>Consider the likelihood of flooding. Provide warnings to occupants.</p>	<p>Verbal Email</p>	<p>Harbourmaster</p>
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SIGN UP TO FLOOD WARNINGS DIRECT

<https://www.gov.uk/sign-up-for-flood-warnings>

Additional Guidance

Gov.UK:	<u>Prepare for a Flood</u>
Gov.UK:	<u>Preparing for Emergencies</u>
Environment Agency:	<u>Flood Warnings Direct</u>
Meteorological Office:	<u>Weather Warnings</u>
North Yorkshire Council:	<u>Flood & Water Management</u>



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