



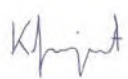
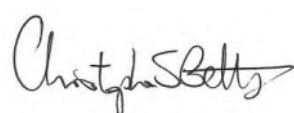
Flood Consequence Assessment – Office Building Proposed Change of Use

Former Orb Works - Stephenson Street, Newport,
NP19 0RB

On Behalf of

Starburst (UK) Ltd

Quality Management

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Appendices

Appendix 1 Topographical Survey

1 Introduction

1.1 Background

This Flood Consequence Assessment (FCA) has been prepared by Hydrogeo at the request of Starburst Ltd to support a planning application for the proposed change of use development at the Former Orb Works, Stephenson Street, Newport, NP19 0RB.

The proposed development is for the change of use from existing offices to a wedding / events venue.

This FCA has been carried out in accordance with guidance contained in Technical Advice Note 15 Development and Flood Risk (TAN15) and the Flood Map for Planning (FMfP). This FCA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.

1.2 Technical Advice Note 15 (TAN15)

One of the key aims of TAN15 is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall.

A risk-based approach is adopted at stages of the planning process, applying a source pathway receptor model to planning and flood risk. To demonstrate this, an FCA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all sources;

- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate; and
- satisfy the justification test, including the acceptability of consequences.

The revised TAN15 is supported by the new FMfP, which includes climate change information to show how this will affect flood risk extents over the next century. It shows the potential extent of flooding assuming no defences are in place.

1.3 Report Structure

This FCA has the following report structure:

- Section 2 details the sources of information that have been consulted;
- Section 3 describes the location area and the existing and proposed development;
- Section 4 outlines the flood risk to the existing and proposed development;
- Section 5 outlines the mitigation measures used to reduce the flood risk;
- Section 6 justifies the location of the development; and
- Section 7 presents a summary and conclusions.

2 Sources of Information

2.1 Discussion with Regulators

Consultation and discussions with the relevant regulators have been undertaken during this FCA including Natural Resources Wales, the Local Planning Authority (LPA) and the Sewerage Undertakers.

2.1.1 Natural Resources Wales

The Flood and Water Management Act 2010 gives Natural Resources Wales a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. Natural Resources Wales is the statutory consultee with regards to flood risk and planning.

Natural Resources Wales Flood Risk Standing Advice and TAN15 have been consulted and reviewed during this FCA. Information regarding the current flood risk at the application site and local flood defences has been obtained from Natural Resources Wales.

The Newport 5 V8.0 (2022) and Caldicot and Wentlooge 5 V1 (2016) coastal models have both been reviewed as part of this assessment to ensure that the most precautionary representation of tidal flood risk at the site is applied.

The Caldicot and Wentlooge coastal modelling includes climate change scenarios extending to approximately 2115, reflecting the application of national sea-level rise allowances over the next century.

A comparison of model outputs indicates that, at the application site, the Caldicot and Wentlooge model produces marginally higher tidal water levels than the Newport 5 dataset. In accordance with the precautionary principles embedded within TAN15, the higher modelled water levels have therefore been adopted where differences occur.

This approach ensures that the assessment reflects the most robust and conservative estimate of flood risk over the lifetime of the development.

2.1.2 Newport City Council

Newport City Council is the LPA and therefore, has responsibilities for 'local flood risk', which includes surface runoff, groundwater and ordinary watercourses. Planning

guidance written by the Newport City Council regarding flood risk was consulted to assess the mitigation policies in place.

The Newport City Council Strategic Flood Consequence Assessment (SFCA) and the Newport City Council Preliminary Flood Risk Assessment (PFRA) which cover the site have been reviewed.

2.1.3 Welsh Water/Dŵr Cymru

Welsh Water/Dŵr Cymru is responsible for the disposal of waste water and supply of clean water for this area. All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding from the public sewerage system, and this is shown on the DG5 Flood Register.

3 Location & Development Description

3.1 Site Location

The site is located at the Former Orb Works, Stephenson Street, Newport, NP19 0RB (see Figure 3.1). The National Grid Reference (NGR) of the approximate centre of the site is 332403, 186343.

Figure 3.1 Site location.



3.2 Existing Development

The site currently comprises a building which was previously used as offices in 2020 within the former Orb Steelworks. The offices are raised on stilts with a finished floor level of 11 metres Above Ordnance Datum (mAOD) and connect to the flood defences via a raised exit bridge (see Figures 3.2 and 3.3).

Figure 3.2 The existing site showing the stilts.



Figure 3.3 The existing site showing the exit bridge.



3.3 Proposed Development

The proposed development is for the change of use from existing offices to a wedding / events venue with a finished floor level of 11mAOD.

3.4 Ground Levels

A topographical survey of the site has recently been undertaken (see Appendix 1). The minimum ground level is 6.92mAOD to the south of the site and the maximum ground

level 7.69mAOD to the west of the site. The ground levels to the north and northwest of the site, adjacent to the River Usk, are higher and have a maximum ground level of 10.18 metres Above Ordnance Datum (mAOD) to the northwest.

3.5 Catchment Hydrology/Drainage

The River Usk is located the north of the site and is tidally influenced at this location. There is a small pond located approximately 290m to the south west of the site and a further pond is located approximately 465m to the south of the site. A drain is located 330m to the east of the site.

3.6 Ground Conditions

The British Geological Survey (BGS) map indicates that the superficial deposits consist of Tidal Flat Deposits (Holocene). The bedrock underlying the site consists of the Mercia Mudstone Group (Triassic). The Mercia Mudstone Group is classified as a non-aquifer (negligible permeability). Non aquifers are formations which are generally regarded as containing insignificant quantities of groundwater.

4 Flood Risk

4.1 Sources of Flooding

All sources of flooding have been considered, these are; fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

4.2 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within TAN15 recommends that the effects of climate change are incorporated into FCA. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the CL-03-16 - Climate change allowances for Planning purposes.

The 9th of January 2014 Welsh Government letter to all Chief Planning Officers (CPO) in Wales and CL-03-16 - Climate change allowances for Planning purposes clarifies and refers to the Natural Resources Wales recommendations that the lifetime of development for residential development is 100 years, and for other development it is considered to be 75 years.

As per Natural Resources Wales advice a lifetime of 75 years (i.e. 2100) has been adopted within this FCA. Table 4.1 show the peak river flow allowances for this river catchment, the design fluvial flood event for the site is the 1 in 100 year (+25%) event.

Projections of relative mean sea level rise for each epoch (period of time) is provided for the Welsh coastline in Table 2. These projections are consistent with the latest global predictions for sea level rise. The design tidal event for the site is the 1 in 200 year in 2101 event (i.e. lifetime of 75 years).

Table 4.1 Peak river flow allowances.

River Catchment	Allowance Category	Total Potential Change Anticipated by the 2020s	Total Potential Change Anticipated by the 2050s	Total Potential Change Anticipated by the 2080s
Severn	Upper end estimate	+25%	+40%	+70%
	Central estimate	+15%	+25%	+25%
	Lower end estimate	+0%	+5%	+5%

Table 4.2 Sea level rise by 2100 and 2120.

Local Authority Area	Allowance (percentile)	Mean Sea Level Rise (m) by 2100*	Mean Sea Level Rise (m) by 2120*
Newport	70th	0.85	1.01
	95th	1.11	1.33

4.3 Flood Map for Planning

The FMfP shows that the site is located within the following:

- Rivers: Flood Zone 1 (see Figure 4.1).
- Sea: Flood Zone 3 (see Figure 4.2).
- Surface water and small watercourses: Flood Zone 1 (see Figure 4.3).

Table 4.2 provides details of the FMfP Flood Zones. The FMfP adopts a precautionary approach to flood mapping and generally reflects flood extents assuming the absence of effective flood defences. The identification of the site within Flood Zone 3 for rivers and sea therefore represents a conservative assessment of potential flood extent including the effects of climate change.

Figure 4.1 Flood map for planning: rivers.

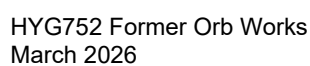


Table 4.2 Flood map for planning flood zones.

Flood Zone	Explanation
Rivers - Flood Zone 2	Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
Rivers - Flood Zone 3	Areas with more than 1% (1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
Sea - Flood Zone 2	Areas with 0.1% to 0.5% (1 in 1000 to 1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
Sea - Flood Zone 3	Areas with more than 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
Surface Water and Small Watercourses - Flood Zone 2	Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
Surface Water and Small Watercourses - Flood Zone 3	Areas with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.

4.4 Flood Risk Vulnerability

In TAN15 appropriate uses have been identified for the FMfP zones. The vulnerability of the proposed development has been assessed in accordance with TAN15.

Paragraph 9.2 of TAN15 defines ‘highly vulnerable’ development as:

“Development where the ability of occupants to decide on whether they wish to accept the risks to life and property associated with flooding, or be able to manage the consequences of such a risk, is limited.”

Paragraph 9.3 defines ‘less vulnerable’ development as:

“Development where the ability of occupants to decide if risks and consequences are acceptable is greater than that in the highly vulnerable category.”

The proposed development is for the change of use from existing offices to a wedding / events venue. The development does not include:

- Residential accommodation;
- Sleeping accommodation;
- Institutional care;
- Emergency services infrastructure;
- Critical infrastructure; or

- Industrial uses which would pose a pollution risk if flooded.

The use is characterised by short-duration visits by members of the public. Attendance is discretionary and not compulsory in nature. Occupants are therefore able to make informed decisions regarding attendance in the context of flood warnings or severe weather alerts.

The existing building is raised on stilts with a finished floor level of 11mAOD and connect to the flood defences via a raised exit bridge. The building remains flood free during all modelled events. In the unlikely event of a flood warning or emergency scenario, evacuation would be straightforward and rapid. There are no mobility-dependent residents, sleeping occupants, or individuals requiring assisted evacuation beyond normal public safety procedures applicable to commercial leisure uses.

The proposed development is therefore materially different from:

- Residential dwellings;
- Schools or compulsory education facilities;
- Nurseries providing full-time childcare;
- Hospitals or care facilities; or
- Emergency response infrastructure.

Having regard to the definitions contained within paragraphs 9.2 and 9.3 of TAN15, the proposed development is properly classified as 'less vulnerable' development.

The ability of occupants to decide whether to attend the premises, combined with the absence of sleeping accommodation, institutional care, or critical infrastructure functions, means that the development does not meet the threshold for 'highly vulnerable' development as defined by national policy.

Accordingly, the development should be assessed under the policy framework applicable to 'less vulnerable' development within Flood Zone 3, with acceptability determined through a site-specific assessment of flood consequences.

The proposed development will not change the vulnerability of the site to flooding or introduce a 'highly vulnerable' use into the floodplain. TAN15 states that 'less vulnerable' uses are appropriate at this location.

The proposed development complies with paragraph 10.23 of TAN15, the proposed development will help regenerate the area and help achieve a key economic objective.

4.5 Historic Flooding

The Natural Resources Wales records show that the site has not historically flooded (see **Error! Reference source not found.**4). The British Hydrological Society “Chronology of British Hydrological Event” has no information on flooding within the vicinity of the site. No other historical records of flooding for the site have been recorded. Therefore, it has been concluded that the site has not historically flooded.

Figure 4.4 Natural Resources Wales historic flood map.



4.6 Existing and Planned Flood Defence Measures

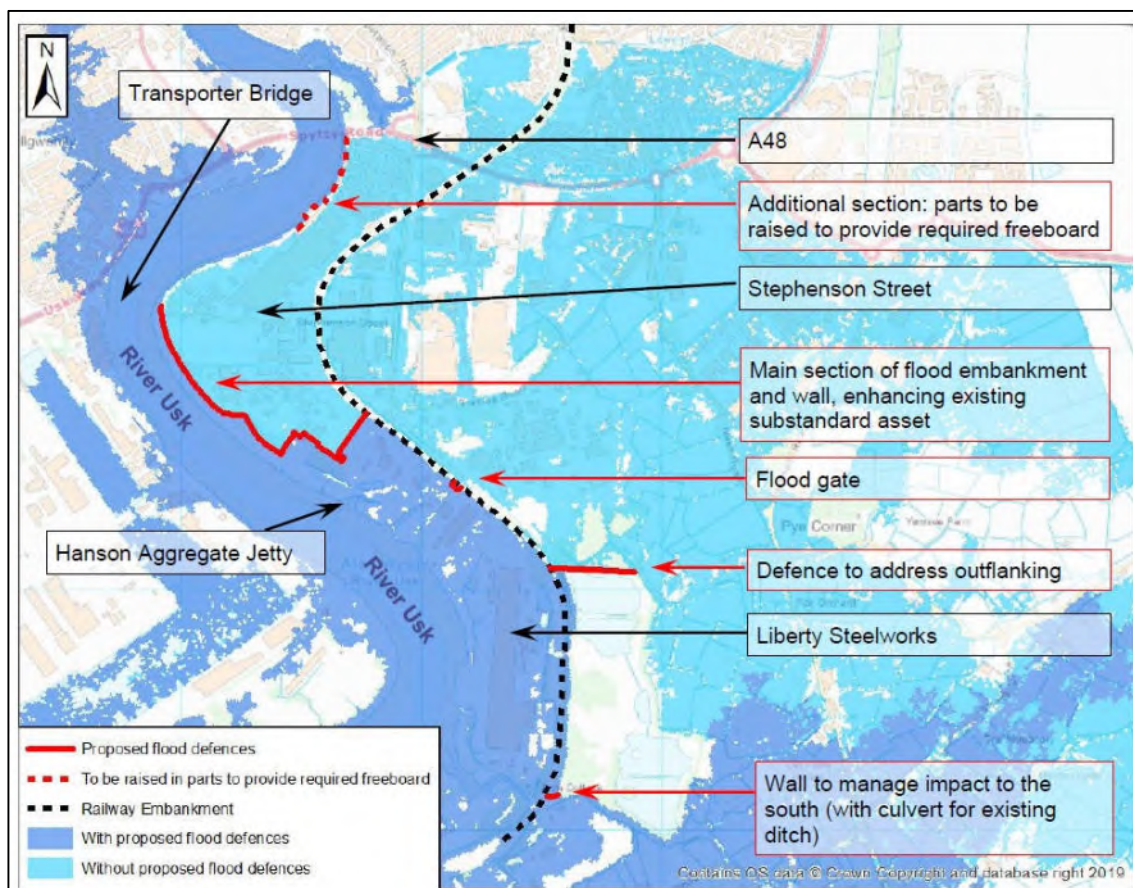
A wider flood defence scheme (Stephenson Street Flood Defence Scheme) has been constructed by Natural Resources Wales for Newport, mainly encompassing the area to the south of Stephenson Street (to the south of the site) which was particularly vulnerable due to an inadequate flood embankment, as shown in Figure 4.5.

The FCA for this scheme was prepared in March 2021 by ARUP (ref: 246344-00) Newport Council planning portal (ref: 21/0718). The flood defence scheme involved the construction and upgrading to sections of embankment in a number of areas along the River Usk, including from the Transporter Bridge down to Usk Mouth Power Station.

The lower sections of the embankment near the Former Orb Works site has been upgraded as part of the proposals in order to bring these sections up the minimum 9.35mAOD of the rest of the embankment (see Appendix 3).

Following the proposed works the defences across Newport, including at the site, will provide a 1 in 200 year Standard of Protection (SoP) up to 2069.

Figure 4.5 Flood Defences Works and 1 in 200 Year in 2069 Flood Outline



4.7 Fluvial (river) Flooding

The River Usk is tidally influenced at this location and the site is not at risk of fluvial flooding (see Figure 4.1). Therefore, the risk of flooding from fluvial sources is considered to be **not significant**.

4.8 Tidal (coastal) Flooding

In an extreme event, which is highly unlikely, the River Usk may overtop its banks and inundate the site with floodwater. Tidal flooding from the River Usk poses the primary flood risk to the site.

Defended Scenarios

Table 4.6 shows the Natural Resources Wales defended data for the site. Model outputs are not available for the 2101 epoch, the 2115 epoch model outputs have been reduced by 0.011m per year between 2115 and 2101 based on a precautionary linear extrapolation of the 95th percentile sea level rise allowance has been applied.

The site is protected against tidal flooding by flood defence measures which provide a 1 in 200 year SoP up to 2069. Figure 46 shows that the site will not be inundated with floodwater for all events up to and including the defended 1 in 200 year in 2069 event. The site will be flood free during the defended 1 in 200 year in 2069 event.

It is only during flood events of a greater magnitude and when climate change is taken into account that the site may be inundated with floodwater, as shown in Figures 4.7 to 4.10. Flood hazard ratings under the defended scenario reflect the slow-onset and backwater-driven mechanism of flooding at this location.

The maximum defended modelled tidal water level presented in Table 4.6 (9.89mAOD during the defended 1 in 1000 year in 2115 event) remains below the finished floor level of the building (11.00mAOD). The raised exit bridge soffit level is a minimum of 10.80mAOD, which remains above the maximum defended 1 in 1000 year in 2115 modelled water level of 9.89mAOD.

Table 4.6 Natural Resources Wales defended model results.

Parameter	200			1000		
	2026	2101	2115	2026	2101	2115
Water Depth (m)	Null	<2.06	<2.21	<1.30	<2.42	<2.60
Water Level (mAOD)	Null	9.12	9.17	8.53	9.74	9.89
Water Velocity (m/s)	Null	<1.35	<1.35	<0.70	<0.90	<0.90
Hazard Rating	Null	<2.25	<2.25	<1.75	<2.90	<2.90

Figure 4.6 Chance of flooding in 2119 with and without scheme

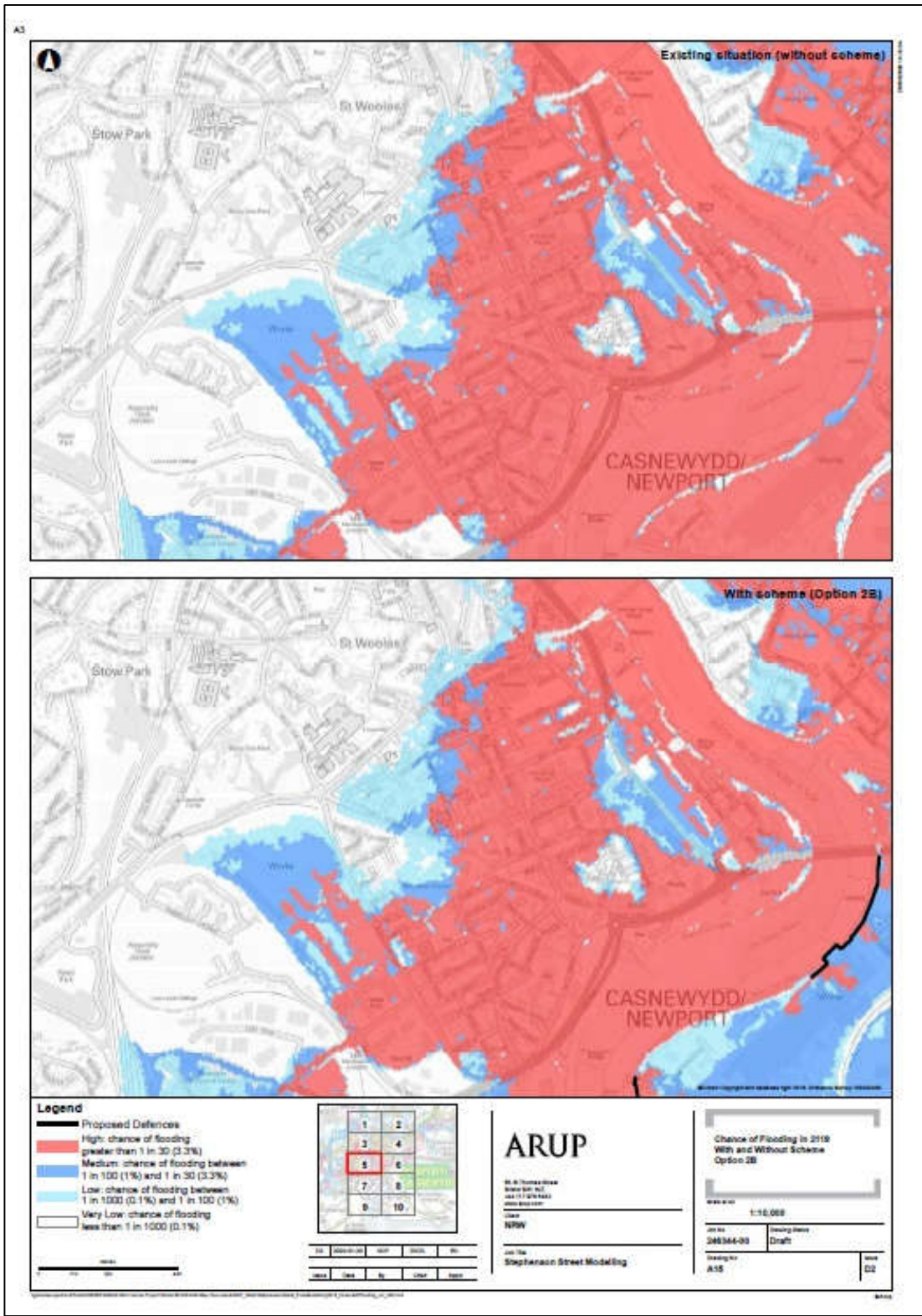


Figure 4.7 Natural Resources Wales defended modelled 1 in 1000 year flood outline.

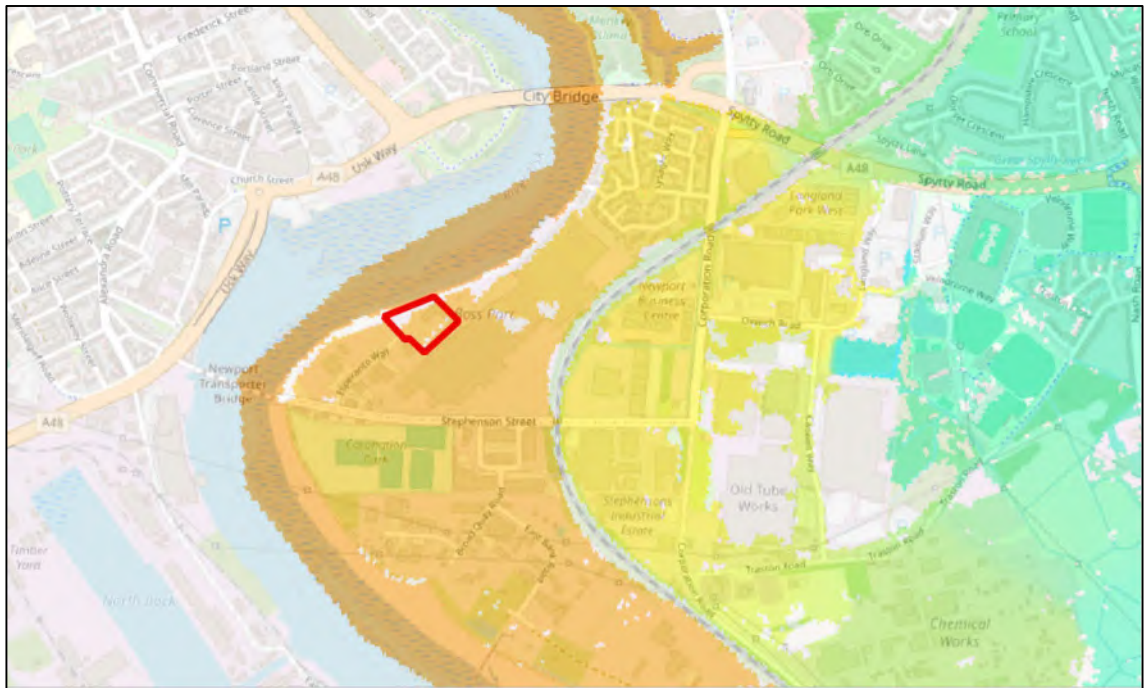
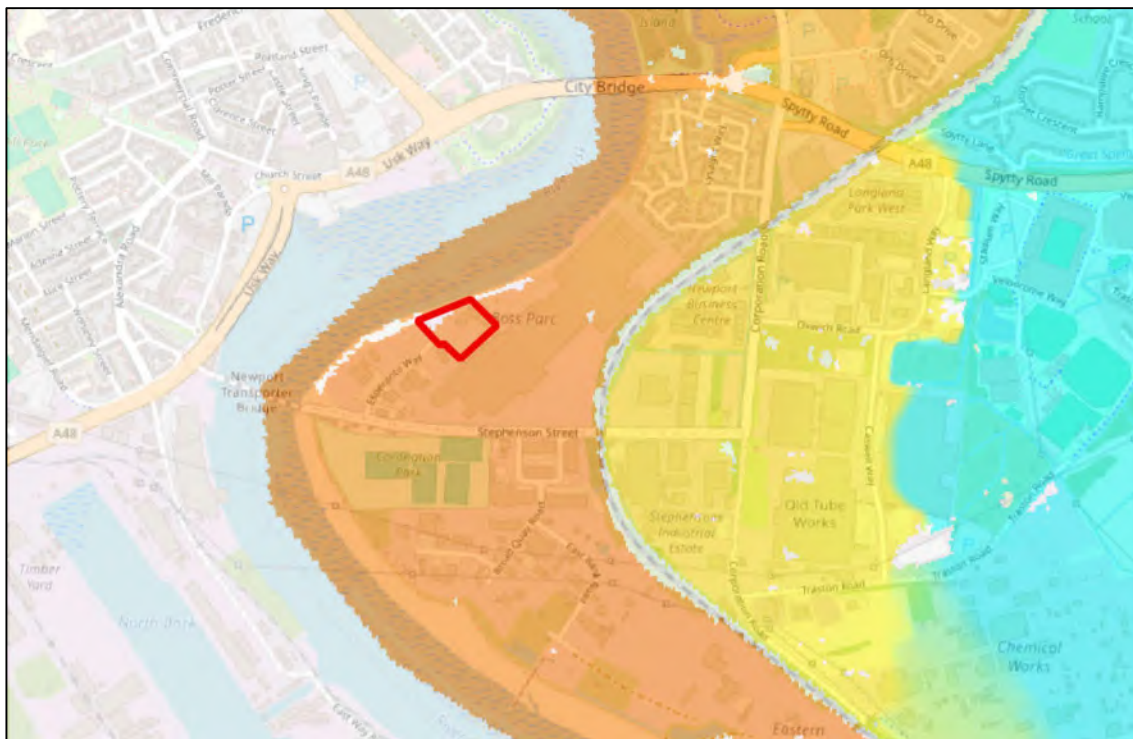


Figure 4.8 Natural Resources Wales defended modelled 1 in 200 year in 2115 flood outline.



Figure 4.9 Natural Resources Wales defended modelled 1 in 1000 year in 2115 flood outline.



Undefended Scenarios

Considerable investment has been made in the provision of the flood defences to protect this stretch of river from tidal flooding. However, the flood defences can only protect up to a point, they may malfunction, can be breached and have a finite structure life. Therefore, there is a residual risk of tidal flooding.

Table 4.7 and Figures 4.10 to 4.13 shows the Natural Resources Wales undefended data for the site. Model outputs are not available for the 2101 epoch, the 2115 epoch model outputs have been reduced by 0.011m per year between 2115 and 2101 based on a precautionary linear extrapolation of the 95th percentile sea level rise allowance has been applied. Flood hazard ratings under the defended scenario reflect the slow-onset and backwater-driven mechanism of flooding at this location.

The maximum undefended modelled tidal water level presented in Table 4.7 (10.43mAOD) during the undefended 1 in 1000 year in 2115 event remains below the finished floor level of the building (11.00mAOD). The raised exit bridge soffit level is a minimum of

10.80mAOD, which remains above the maximum undefended 1 in 1000 year in 2115 modelled water level of 10.43mAOD.

Table 4.7 Natural Resources Wales undefended model results.

Parameter	200			1000		
	2026	2101	2115	2026	2101	2115
Water Depth (m)	<1.15	<2.30	<2.45	<1.51	2.92	<3.07
Water Level (mAOD)	8.53	9.64	9.79	8.75	10.28	10.43
Water Velocity (m/s)	<0.39	<0.50	<0.50	<0.70	<0.87	<0.87
Hazard Rating	<1.75	<2.75	<2.75	<1.80	<2.85	<2.85

Figure 4.10 Natural Resources Wales undefended modelled 1 in 200 year flood outline.

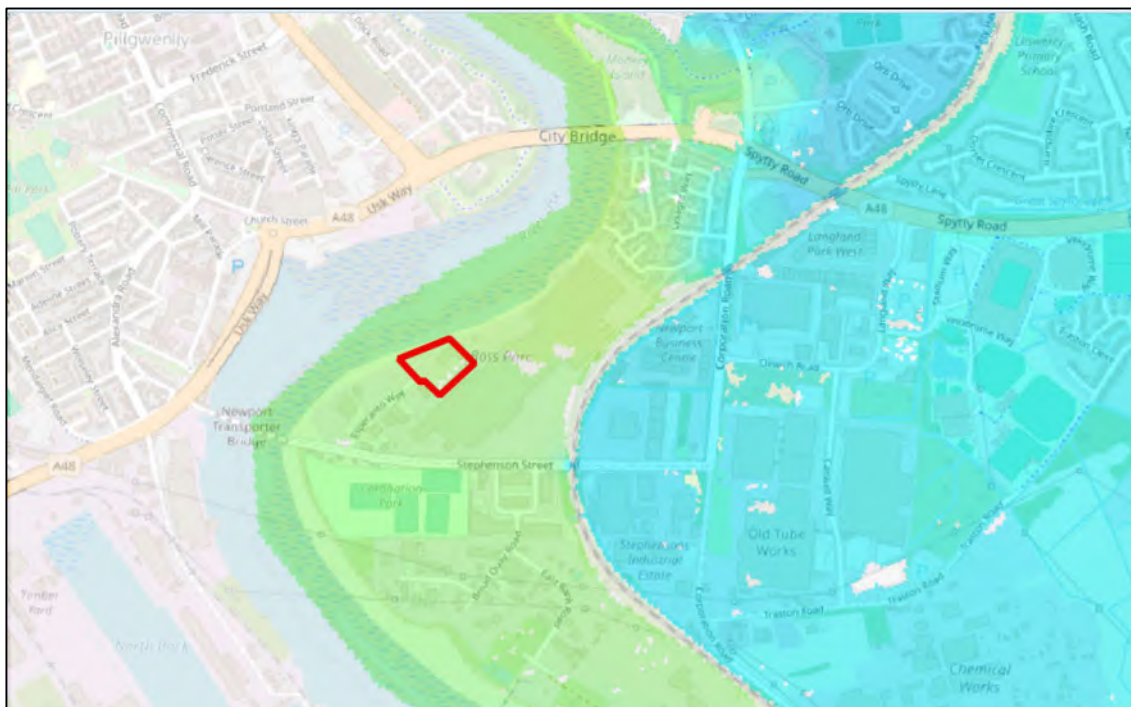


Figure 4.11 Natural Resources Wales undefended modelled 1 in 1000 year flood outline.

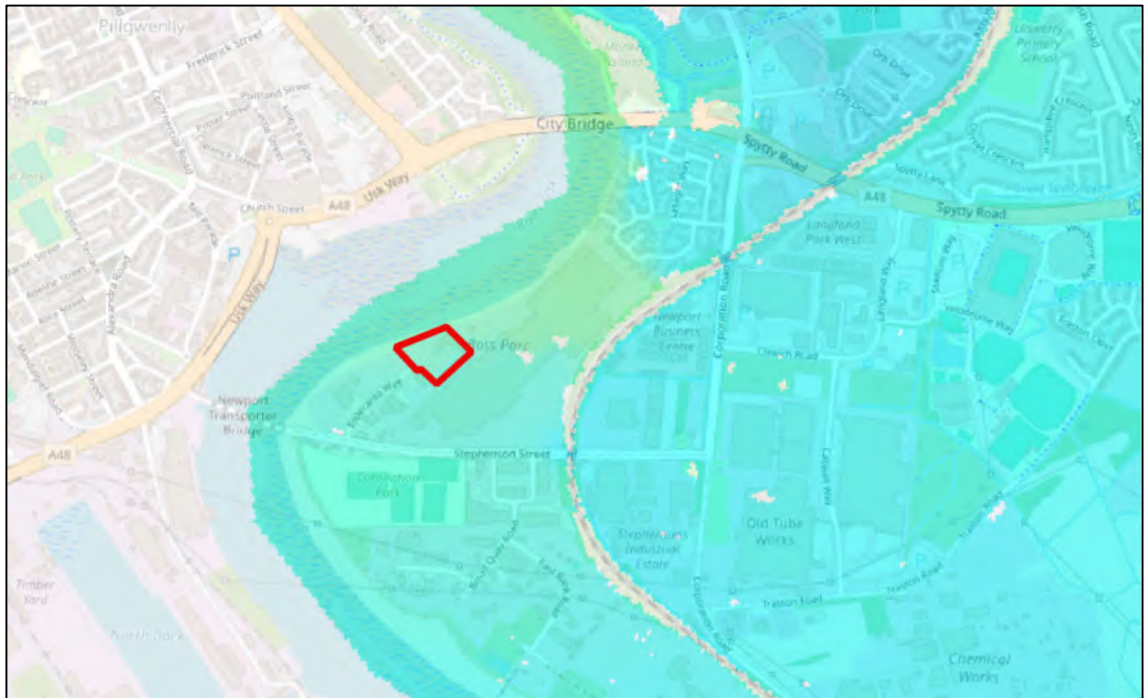


Figure 4.12 Natural Resources Wales undefended modelled 1 in 200 year in 2115 flood outline.



Figure 4.13 Natural Resources Wales undefended modelled 1 in 1000 year in 2115 flood outline.



Breach Scenarios

Table 4.8 and Figures 4.14 to 4.17 shows the Natural Resources Wales breach data for the site. Figure 4.14 shows that the site will not be inundated with floodwater for all events up to and including the breach 1 in 200 year event. The site will be flood free during the breach 1 in 200 year event.

Model outputs are not available for the 2101 epoch, the 2115 epoch model outputs have been reduced by 0.011m per year between 2115 and 2101 based on a precautionary linear extrapolation of the 95th percentile sea level rise allowance has been applied. Flood hazard ratings under the defended scenario reflect the slow-onset and backwater-driven mechanism of flooding at this location.

The maximum breach modelled tidal water level presented in Table 4.8 (9.90mAOD during the undefended 1 in 1000 year in 2115 event remains below the finished floor level of the building (11.00mAOD).

The raised exit bridge soffit level is a minimum of 10.80mAOD, which remains above the maximum undefended 1 in 1000 year in 2115 modelled water level of 9.90mAOD.

Table 4.8 Natural Resources Wales breach model results.

Parameter	200			1000		
	2026	2101	2115	2101	2101	2115
Water Depth (m)	Null	<2.05	<2.20	<1.42	<2.46	<2.61
Water Level (mAOD)	Null	9.39	9.54	8.72	9.75	9.90
Water Velocity (m/s)	Null	<1.30	<1.30	<0.70	<1.00	<1.00
Hazard Rating	Null	<2.75	<2.53	<1.80	<2.75	<2.75

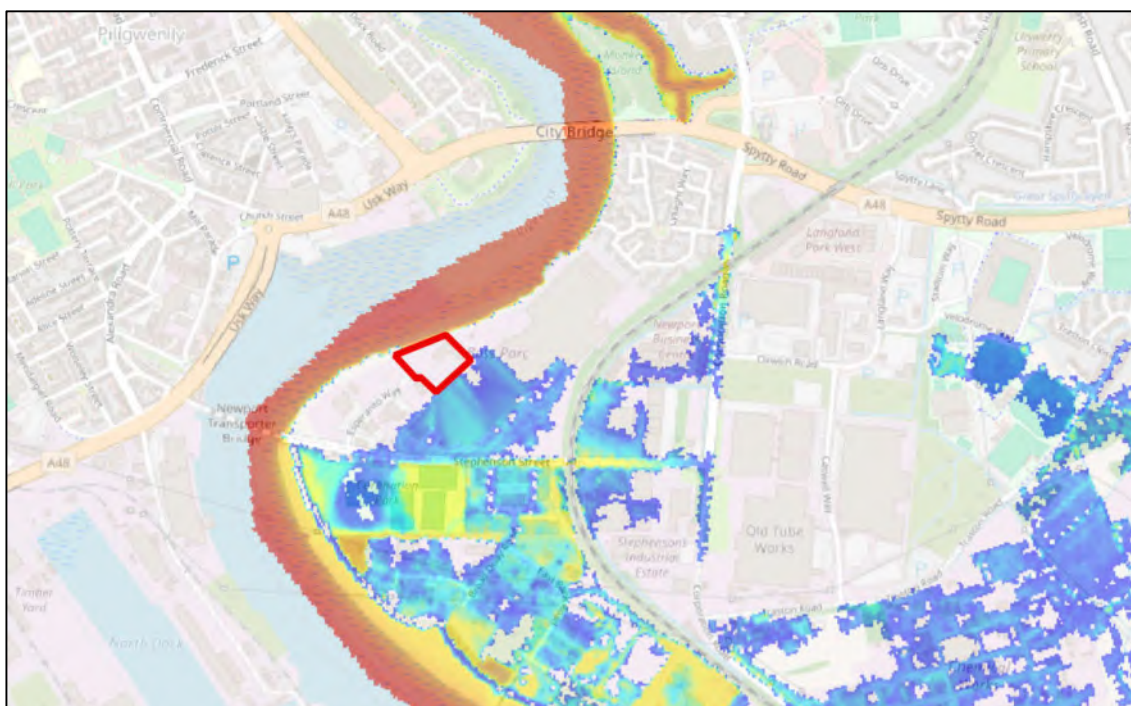
Figure 4.14 Natural Resources Wales breach modelled 1 in 200 year flood outline.

Figure 4.15 Natural Resources Wales breach modelled 1 in 200 year in 2115 flood outline.

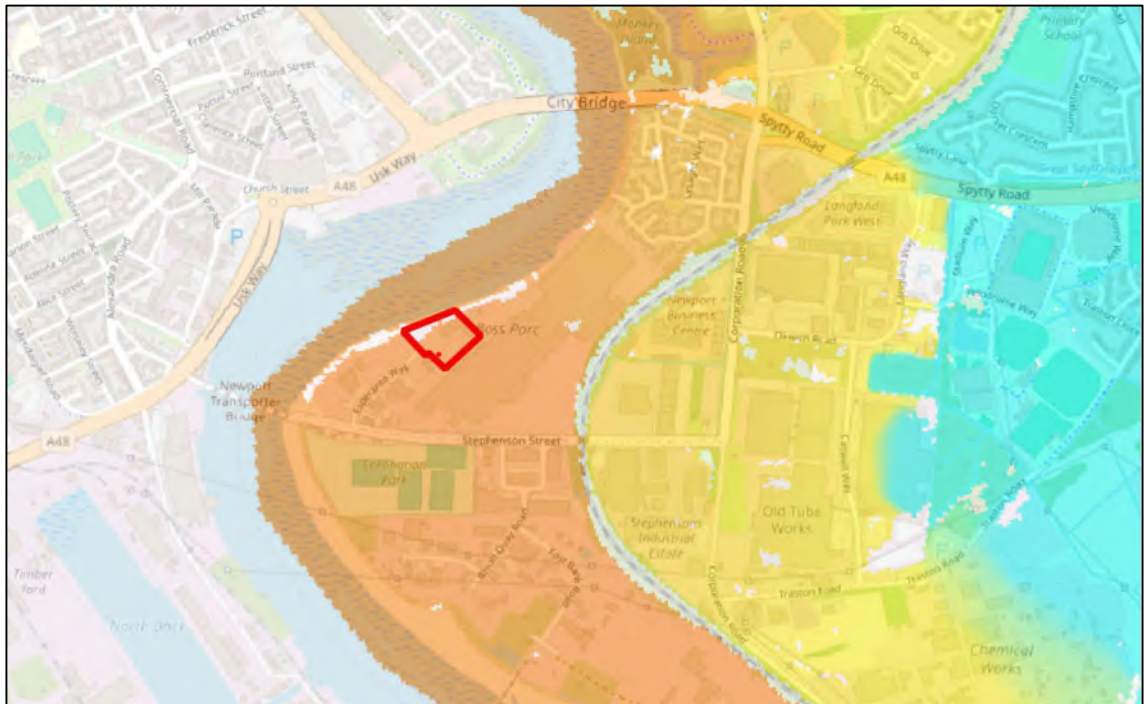


Figure 4.16 Natural Resources Wales breach modelled 1 in 1000 year flood outline.

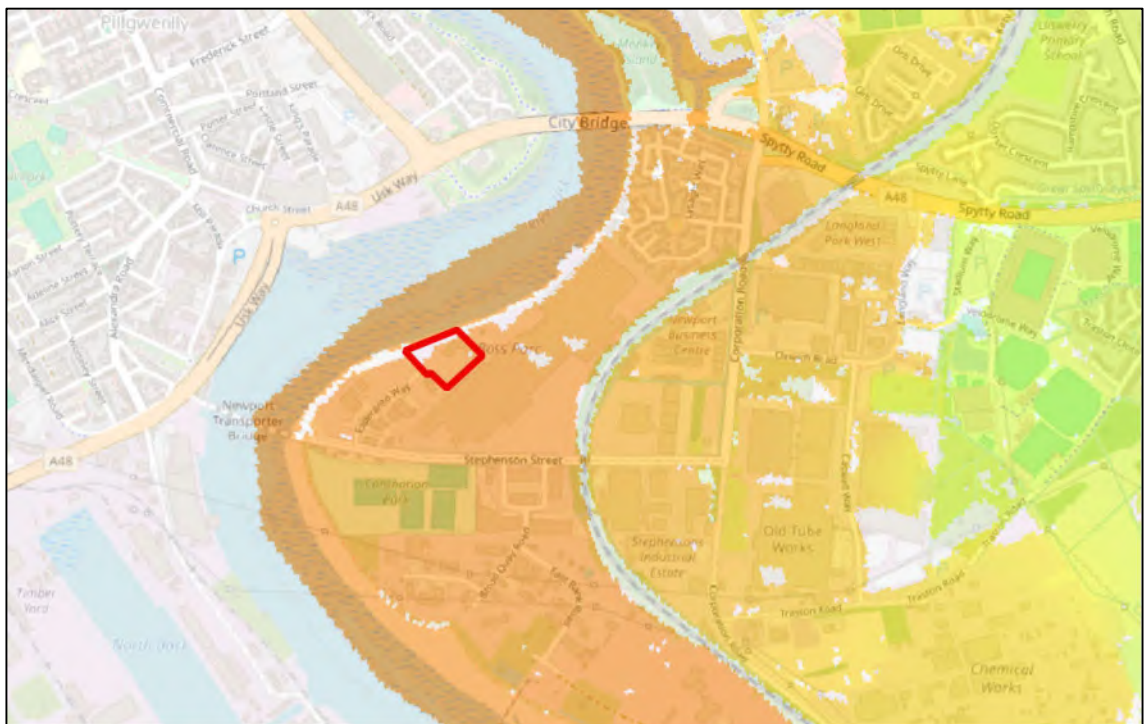
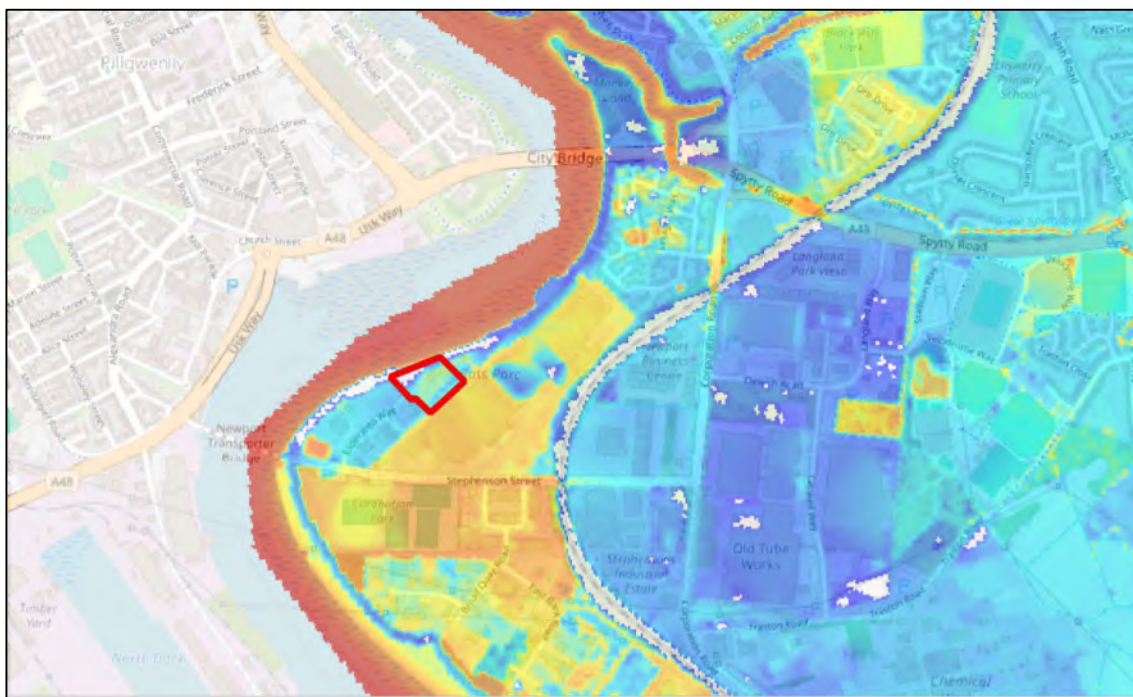


Figure 4.17 Natural Resources Wales breach modelled 1 in 1000 year in 2115 flood outline.



Summary

While modelling indicates that extreme future tidal scenarios may result in substantial flood depths at the site, these scenarios represent rare exceedance events at the upper bound of precautionary modelling.

Flooding at this location is characterised by:

- A slow-onset, tide-locked mechanism;
- Low to moderate flow velocities;
- Forecast-led events with advance warning through Natural Resources Wales;
- Absence of rapid flash flooding characteristics.

The existing building is raised on stilts with a finished floor level of 11mAOD and connects to the flood defences via a raised exit bridge with a minimum soffit level of 10.80mAODc which remains above the maximum modelled water levels therefore, the building and exit bridge will not be inundated with floodwater for all defended, undefended and breach modelled scenarios.

In the unlikely event of a flood warning or emergency scenario, evacuation would be straightforward and rapid. There are no mobility-dependent residents, sleeping occupants, or individuals requiring assisted evacuation beyond normal public safety procedures applicable to commercial leisure uses. The ability of site management to implement a Flood Warning & Evacuation Plan materially reduces potential risk to life in extreme scenarios.

Accordingly, when assessed in terms of flood depth, velocity, rate of onset, duration, access and vulnerability in accordance with TAN15, the consequences of tidal flooding are considered manageable and acceptable for the lifetime of the development.

Given the scale and nature of the proposed development and the size and location of the tidal flooding sources it has been concluded that tidal flooding poses a moderate residual risk, low probability. Therefore, the risk of tidal flooding is considered to be of **medium significance**. The risk from the River Usk will be further mitigated by using a number of risk management measures to manage and reduce the overall flood risk at the site (see Section 5.0).

4.9 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Given the nature of the soils in the area and the lack of historical data on groundwater flooding within this area there is a very low risk of groundwater flooding. Also no below surface infrastructure and buildings are located or are proposed for the site. Therefore, the risk of groundwater flooding is considered to be **not significant**.

4.10 Surface Water (pluvial) Flooding

Surface water flooding tends to occur sporadically in both location and time such surface water. The site is not situated on and adjacent to areas of permeability and areas with geology which may result in surface water flooding.

The FMfP shows that the located within Flood Zone 1 with less than a 1 in 1000 (0.1%) chance of flooding from surface water and/or small watercourse in a given year, including the effects of climate change (see Figure 4.3). Therefore, the risk of flooding from surface water flooding is considered to be **not significant**.

4.11 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development.

Any existing sewers located within the vicinity of the will inevitably have a limited capacity so in rare and extreme conditions there would be surcharges, which may in turn cause flooding. Flood flows could also be generated by burst water mains but these would tend to be of a restricted and much lower volume than weather generated events and so can be discounted for the purposes of this assessment.

Given the design parameters normally used for drainage design in recent times and allowing for some deterioration in the performance of the installed systems, which are likely to have been in place for many years, an appropriate flood risk probability from this source could be assumed to have a return period in the order of 1 in 10 to 1 in 20 years.

The provision of adequate level difference between the ground levels and the invert levels of sewers would reduce the annual probability from this source to 1 in 100 years. The risk of sewer flooding is considered to be **not significant**.

4.12 Flooding from Artificial Drainage Systems/Infrastructure Failure

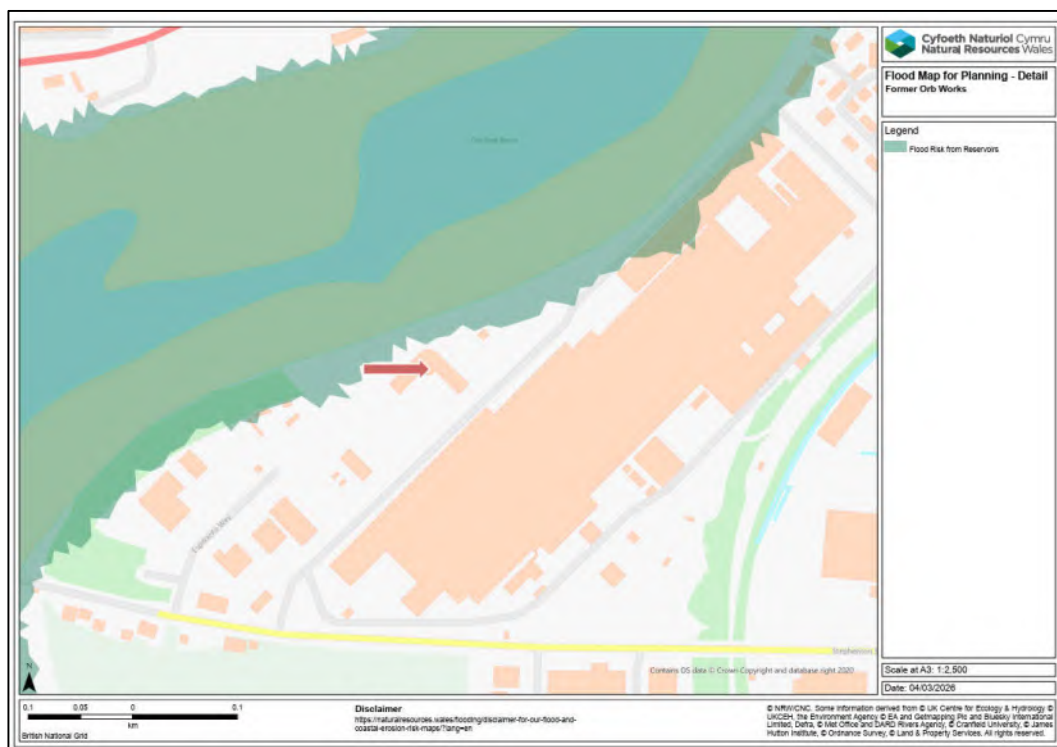
Reservoirs are located within the vicinity of the site. The Natural Resources Wales Reservoir flood map shows that the site is at risk of reservoir flooding (see **Error! Not a valid bookmark self-reference.**). This map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. The Natural Resources Wales Reservoir flood map has been prepared for emergency planning purposes and for this reason they reflect a worst-case scenario. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

Reservoir flooding is extremely unlikely; reservoirs in the UK have a very good safety record. There has been no loss of life in the UK from reservoir flooding since 1925. Since

then reservoir safety legislation has been introduced to make sure reservoirs are well maintained.

The hazard is well managed through effective legislation and it is unlikely that the impact zone downstream of these reservoirs should not allow the proposed development. The risk of flooding from reservoir flooding is considered to be **not significant**.

Figure 4.18 Natural Resources Wales reservoir flood map.



4.13 Effect of the Development on Flood Risk

The building is existing, on stilts with a finished floor level of 11mAOD and the proposed development will have no impact on the movement of floodwater across the site. The building remains flood free during all modelled events.

The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. There will be no increase in the floodwater levels due to the proposed development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk. Therefore, the site is compliant with TAN15 and will not increase flood risk elsewhere.

4.14 Summary of Site Specific Flood Risk

A summary of the sources of flooding and a review of the risk posed by each source at the site is shown in Table 4.7.

The site is unlikely to flood except during rare and extreme conditions. The primary, but unlikely, flood risk to the site is from tidal flooding from the River Usk however, the site is protected against flooding by existing flood defence measures and the site has not historically flooded.

The FMfP shows that the site is located within Flood Zone 3 with more than a 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change. The FMfP Flood Zone 3 classification reflects a precautionary undefended scenario, consistent with national mapping methodology.

The existing and proposed development is classified as 'less vulnerable'. The proposed development will not change the vulnerability of the site to flooding or introduce a 'highly vulnerable' use into the floodplain. TAN15 states that 'less vulnerable' uses are appropriate at this location.

While modelling indicates that extreme future tidal scenarios may result in substantial flood depths at the site, these scenarios represent rare exceedance events at the upper bound of precautionary modelling.

Flooding at this location is characterised by:

- A slow-onset, tide-locked mechanism;
- Low to moderate flow velocities;
- Forecast-led events with advance warning through Natural Resources Wales;
- Absence of rapid flash flooding characteristics.

The existing building is raised on stilts with a finished floor level of 11mAOD and connects to the flood defences via a raised exit bridge with a minimum soffit level of 10.80mAODc which remains above the maximum modelled water levels therefore, the building and exit bridge will not be inundated with floodwater for all defended, undefended and breach modelled scenarios.

In the unlikely event of a flood warning or emergency scenario, evacuation would be straightforward and rapid. There are no mobility-dependent residents, sleeping occupants, or individuals requiring assisted evacuation beyond normal public safety procedures applicable to commercial leisure uses. The ability of site management to implement a Flood Warning & Evacuation Plan materially reduces potential risk to life in extreme scenarios.

Accordingly, when assessed in terms of flood depth, velocity, rate of onset, duration, access and vulnerability in accordance with TAN15, the consequences of tidal flooding are considered manageable and acceptable for the lifetime of the development.

Given the scale and nature of the proposed development and the size and location of the tidal flooding sources it has been concluded that tidal flooding poses a moderate residual risk, low probability. Therefore, the risk of tidal flooding is considered to be of **medium significance**. The risk from the River Usk will be further mitigated by using a number of risk management measures to manage and reduce the overall flood risk at the site (see Section 5.0).

The proposed development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. The site proposals have been shown to be in accordance with TAN15.

Table 4.7 Risk posed by flooding sources.

Sources of Flooding	Potential Flood Risk	Potential Source	Probability/Significance
Fluvial (river) Flooding	No	None Reported	Not significant
Tidal (coastal) Flooding	Yes	River Usk	Medium
Groundwater Flooding	No	None Reported	Not significant
Surface Water (pluvial) Flooding	No	None Reported	Not significant
Sewer Flooding	No	None Reported	Not significant
Flooding from Artificial Drainage Systems/Infrastructure Failure	Yes	Reservoirs	Not significant

5 Risk Management

5.1 Introduction

In this flood 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 use of flood mitigation measures.

A number of techniques and mitigation strategies to manage and reduce the overall flood risk in the area will be used. This will ensure the development will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally; and;
- Minimal disruption to natural heritage.

5.2 Ground and Finished Floor Levels

The existing ground levels and finished floor levels will be maintained. The existing offices are located on stilts with a finished floor level of 11mAOD. The building remains flood free during all modelled events. In order to provide further mitigation against flooding, it is recommended that the proposed development signs up to receive flood warnings from Natural Resources Wales and implements a Flood Warning & Evacuation Plan to a safe area away from the site during times of flood.

5.3 Flood Warning & Evacuation Plan

A site specific Flood Warning & Evacuation Plan (FWEP) will be implemented for the site. The FWEP will be proportionate to the nature of the proposed development and will focus on safe management of visitors during forecast flood events.

The site will be registered with the Natural Resources Wales Flood Warning Service (Floodline) to receive advance warnings of tidal flood events. Flood warnings associated with fluvial and tidal flooding are typically issued with significant lead time, reflecting the slow-onset nature of extreme these events.

The FWEP will include:

- Clear roles and responsibilities for site management;

- Defined triggers for evacuation following Flood Alerts or Flood Warnings;
- Procedures for notifying visitors and managing orderly evacuation;
- Identification of safe destinations outside the floodplain.
- The FWEP will be reviewed periodically to ensure it remains effective and up to date.

The FWEP will therefore reduce the vulnerability of the proposed development to flooding and highlights the mechanisms of flooding at the site.

If required, visitors to the site will be made aware of the Natural Resources Wales Floodline telephone number and the Flood Warning Codes and their meaning. The owner of the site will carry out the role of Flood Warden for the site and ensure they have an understanding of the flood mechanisms of the site and will ensure that the safety of the visitors will not be compromised.

Natural Resources Wales uses Flood Warnings Codes. They can be issued in any order, usually ending with an 'all clear'. They are issued by Natural Resources Wales through their website and Floodline Warning Direct. The flood warning will be passed onto the visitors of the site verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

In order for the following evacuation procedures to be effective:

- The site will register contact details with the Natural Resources Wales Flood Warning Service (Floodline 0345 988 1188) in order to receive Flood Warnings/Alerts.
- The flood warning will be passed onto the visitors of the site verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

The following flood evacuation procedures have been developed for the site, to ensure that the site is safe during a flood.

Flood Alert

'Flooding of low-lying land and roads is expected. Be aware, be prepared, watch out!'. The Natural Resources Wales will issue a Flood Alert status when flooding is possible, based upon weather and river/sea conditions.

Be prepared to act on your flood plan. At this stage visitors should make themselves aware of the Flood Plan and evacuation routes. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast.

Contact Natural Resources Wales Floodline on 0345 988 1188 to get more information, periodically, listen to and watch for weather and flood warnings on local radio and television stations.

Flood Warning

‘Flooding of homes and businesses is expected. Act now!’. The Flood Warning alert will be issued when water levels are rising and further rain is expected. The site will be evacuated. Move family, pets and valuables to a safe place.

Water, electricity and gas supplies should be located and switched off before evacuating. Contact Natural Resources Wales Floodline on 0345 988 1188 to get more information, periodically, listen to and watch for weather and flood warnings on local radio and television stations.

Severe Flood Warning

‘Severe Flooding is expected. There is extreme danger life and property. Act now!’. If the site has not already been evacuated it will be evacuated immediately. Co-operate with the emergency services and call 999 if immediately in danger.

Contact Natural Resources Wales Floodline on 0345 988 1188 to get more information, periodically, listen to and watch for weather and flood warnings on local radio and television stations.

Warning No Longer in Force

‘Flood Watches or Flood Warnings are no longer in force for this area’. Visitors should contact the LPA to check that it is safe to return to the site. Please be careful water may be around for several days. If there is any doubt that appliances may be water damaged they must be checked before switching the power or gas back on. Contact your insurance company as soon as possible to get their approval before arranging any clean-up or repairs.

5.4 Safe Access and Egress Route

Access routes should be such that occupants can safely access and exit their properties in design flood conditions. These routes must also provide the emergency services with access to the development during a flood event and enable flood defence authorities to carry out any necessary duties during the period of flood.

The relative ground levels at the site are higher than adjacent land closer to the River Usk, with lower-lying areas generally confined to the northern boundary. Hydraulic modelling indicates that flooding initially affects these lower marginal areas before any potential encroachment toward the built footprint under higher magnitude scenarios.

The majority of the building remains unaffected during design events and is only exposed under rare exceedance scenarios at the upper bound of precautionary modelling. Accordingly, flooding at the site is limited to infrequent and extreme events over the lifetime of the development.

Safe access and egress routes, including emergency access can be maintained for vehicles and/or by foot. The likelihood of a rapid water level rise and possible rapid inundation of urban areas posing a risk to life is considered to be minimal with a significant forecast lead time through Natural Resources Wales flood warning service.

The site is located within a low risk area where the onset of flooding is very gradual (many hours) as per Flood Risk Assessment Guidance for New Development Phase 2, R&D Technical Report FD2320/TR2.

Given that the site is located within a flood warning area, site users would be aware of the flood risk and should have more than sufficient time to evacuate the site before flooding of the access road would be expected. Therefore, the lead time of the flooding will provide site users with more than ample time to evacuate the site and seek safe refuge outside the floodplain. In the event of a Flood Warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected.

A Flood Warning is likely to be issued well in advance (1 to 2 days) of flooding occurring. A safe access and egress via the south of the site will be available during all flood scenarios. Therefore, safe access and egress from the site will be possible in accordance with TAN15 and Natural Resources Wales guidance.

5.5 Residual Risk

Notwithstanding the implementation of the above measures, residual tidal flood risk remains associated with rare and extreme events, including defence overtopping or breach scenarios. These risks are considered to be low probability but potentially high consequence and have been assessed on a conservative basis within this FCA.

The combination of a defended coastal setting, conservative modelling, flood warning registration, evacuation planning and the absence of physical works ensures that residual

flood risk to the proposed development is managed to an acceptable level for the nature and scale of the development, in accordance with TAN15.

6 Justifying the Location of the Development

6.1 Assessment Framework

TAN15 seeks to direct development away from areas at highest flood risk, while recognising that development within Flood Zone 3 may, in certain circumstances, be acceptable where the consequences of flooding are demonstrated to be manageable and acceptable through a site-specific assessment.

Where development is proposed within Flood Zone 3, TAN15 requires consideration of flood consequences having regard to indicators including flood depth, velocity, rate of onset, duration, access and egress arrangements, and the vulnerability of receptors. These indicators are intended to inform decision-making and are not applied as absolute thresholds.

6.2 Application to the Proposed Development

This FCA has considered the indicators set out in Section 11 of TAN15 in relation to tidal flooding, which represent the relevant source of flood risk affecting the site. The assessment has had regard to flood depth, velocity, rate of onset, duration, warning time, access and egress arrangements, and the vulnerability of receptors.

The proposed development comprises a change of use of an existing building, with no increase in building footprint, no alteration to ground levels, and no encroachment into the floodplain. The proposal therefore does not modify baseline floodplain storage, flood routing, or hydraulic conveyance and will not increase flood risk elsewhere.

The site lies within Flood Zone 3 on the FMfP. The FMfP adopts a precautionary approach and generally reflects flood extents assuming the absence of effective flood defences. The site is also located within an area protected by existing flood defences associated with the River Usk and tidal control infrastructure. While residual risk remains in extreme exceedance or breach scenarios, this designation provides important context regarding the flood mechanisms affecting the site under present-day conditions.

Flooding at this location is characterised by a tide-influenced and backwater-driven mechanism rather than rapid fluvial response. Events are forecast-led and subject to advance warning through Natural Resources Wales flood warning services. This slow-onset characteristic materially reduces risk to life by allowing managed evacuation prior to inundation.

6.3 Assessment of Flood Consequences in Accordance with TAN15

Flood consequences have been assessed having regard to the indicators set out in Section 11 of TAN15.

Flood Depth

Extreme tidal climate change scenarios may generate notable depths in parts of the site; however, these represent rare exceedance events at the upper bound of precautionary modelling.

The existing building is raised on stilts with a finished floor level of 11mAOD and connect to the flood defences via a raised exit bridge. The building remains flood free during all modelled events.

Flood Velocity

Modelled velocities are generally low to moderate and consistent with a backwater or tide-locking mechanism rather than high-energy fluvial flow. Hazard ratings are correspondingly moderate.

Rate of Onset and Duration

Flooding is influenced by tidal conditions and develops gradually. Significant forecast lead time is available through Natural Resources Wales flood warning services, enabling pre-emptive site management actions.

Access and Egress

Safe access and egress can be maintained during defended design events. A site-specific Flood Warning & Evacuation Plan provides for orderly evacuation in advance of extreme exceedance scenarios. The development does not introduce sleeping accommodation or overnight occupation.

Vulnerability

The proposed development is classified as ‘less vulnerable’ under paragraphs 9.2 and 9.3 of TAN15. The use does not comprise residential accommodation, institutional care, essential infrastructure or emergency services. Occupation is discretionary.

Taking these factors together, and having regard to the scale and nature of the proposal, the consequences of flooding are considered manageable and acceptable in planning terms for the lifetime of the development.

The proposal represents the sustainable reuse of an existing commercial unit within an established business park. It does not increase flood risk elsewhere and does not introduce a ‘highly vulnerable’ use into Flood Zone 3. The development is therefore consistent with the requirements of TAN15 in relation to the acceptability of flood consequences.

6.4 Risk Management Measures

Taking account of:

- the defended setting;
- the slow-onset nature of flooding at the site;
- the availability of flood forecasting and warning;
- the provision of evacuation and access arrangements;
- the absence of physical works or increased flood risk elsewhere; and
- the conservative nature of the flood modelling,
- the consequences of flooding associated with the proposed development have been assessed against the criteria set out in Section 11 of TAN15.

The proposed development will not change the vulnerability of the site to flooding or introduce a ‘highly vulnerable’ use into the floodplain. TAN15 states that ‘less vulnerable’ uses are appropriate at this location. The proposed development complies with paragraph 10.23 of TAN15, the proposed development will help regenerate the area and help achieve a key economic objective.

On this basis, it is concluded that, notwithstanding the ‘less vulnerable’ classification of the use, the flood consequences associated with the Proposed Development are acceptable in planning terms, subject to the implementation of the flood risk management measures identified within this FCA.

7 Summary and Conclusions

7.1 Introduction

This report presents an FCA in accordance with TAN15 for the proposed development at the Former Orb Works, Stephenson Street, Newport, NP19 0RB.

7.2 Flood Risk

The site is unlikely to flood except during rare and extreme conditions. The primary, but unlikely, flood risk to the site is from tidal flooding from the River Usk however, the site is protected against flooding by existing flood defence measures and the site has not historically flooded.

The FMfP shows that the site is located within Flood Zone 3 with more than a 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change. The FMfP Flood Zone 3 classification reflects a precautionary undefended scenario, consistent with national mapping methodology.

The existing and proposed development is classified as 'less vulnerable'. The proposed development will not change the vulnerability of the site to flooding or introduce a 'highly vulnerable' use into the floodplain. TAN15 states that 'less vulnerable' uses are appropriate at this location.

While modelling indicates that extreme future tidal scenarios may result in substantial flood depths at the site, these scenarios represent rare exceedance events at the upper bound of precautionary modelling.

Flooding at this location is characterised by:

- A slow-onset, tide-locked mechanism;
- Low to moderate flow velocities;
- Forecast-led events with advance warning through Natural Resources Wales;
- Absence of rapid flash flooding characteristics.

The existing building is raised on stilts with a finished floor level of 11mAOD and connects to the flood defences via a raised exit bridge with a minimum soffit level of 10.80mAODc which remains above the maximum modelled water levels therefore, the building and exit

bridge will not be inundated with floodwater for all defended, undefended and breach modelled scenarios.

In the unlikely event of a flood warning or emergency scenario, evacuation would be straightforward and rapid. There are no mobility-dependent residents, sleeping occupants, or individuals requiring assisted evacuation beyond normal public safety procedures applicable to commercial leisure uses. The ability of site management to implement a Flood Warning & Evacuation Plan materially reduces potential risk to life in extreme scenarios.

Accordingly, when assessed in terms of flood depth, velocity, rate of onset, duration, access and vulnerability in accordance with TAN15, the consequences of tidal flooding are considered manageable and acceptable for the lifetime of the development.

Given the scale and nature of the proposed development and the size and location of the tidal flooding sources it has been concluded that tidal flooding poses a moderate residual risk, low probability. Therefore, the risk of tidal flooding is considered to be of **medium significance**. The risk from the River Usk will be further mitigated by using a number of risk management measures to manage and reduce the overall flood risk at the site.

The proposed development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. The site proposals have been shown to be in accordance with TAN15.

7.3 Risk Management

The flood risk at the site will be reduced by the following risk management measures:

Ground and Finished Floor Levels: The existing ground levels and finished floor levels will be maintained. The existing offices are located on stilts with a finished floor level of 11mAOD. The building remains flood free during all modelled events. In order to provide further mitigation against flooding, it is recommended that the proposed development signs up to receive flood warnings from Natural Resources Wales and implements a Flood Warning & Evacuation Plan to a safe area away from the site during times of flood.

Flood Warning & Evacuation Plan: A site specific Flood Warning & Evacuation Plan will be implemented for the site. The FWEP will be proportionate to the nature of the proposed development and will focus on safe management of visitors during forecast flood events.

The site will be registered with the Natural Resources Wales Flood Warning Service (Floodline) to receive advance warnings of tidal flood events. Flood warnings associated

with fluvial and tidal flooding are typically issued with significant lead time, reflecting the slow-onset nature of extreme these events.

Safe Access and Egress Route: Safe access and egress routes, including emergency access can be maintained for vehicles and/or by foot. The likelihood of a rapid water level rise and possible rapid inundation of urban areas posing a risk to life is considered to be minimal with a significant forecast lead time through Natural Resources Wales flood warning service. The site is located within a low risk area where the onset of flooding is very gradual (many hours) as per Flood Risk Assessment Guidance for New Development Phase 2, R&D Technical Report FD2320/TR2.

Given that the site is located within a flood warning area, site users would be aware of the flood risk and should have more than sufficient time to evacuate the site before flooding of the access road would be expected. Therefore, the lead time of the flooding will provide site users with more than ample time to evacuate the site and seek safe refuge outside the floodplain. In the event of a Flood Warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected.

A Flood Warning is likely to be issued well in advance (1 to 2 days) of flooding occurring. A safe access and egress via the south of the site will be available during all flood scenarios. Therefore, safe access and egress from the site will be possible in accordance with TAN15 and Natural Resources Wales guidance.

7.4 Justifying the Location of the Development

The development proposals should be considered by the LPA to satisfy the acceptability of flood consequences as set out in TAN15.

7.5 Conclusion

In conclusion, the proposed commercial development would be expected to remain dry in all but the most rare and extreme conditions, the flood risk to the site can be considered to be limited, with a low or less annual probability of flooding from all sources. Providing the recommendations made in this FCA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable and the development would be in accordance with the requirements of TAN15 and the statutory development plan.

This FCA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of TAN15. The development should not therefore be precluded on the grounds of flood risk.

Appendices

Appendix 1

Topographical Survey

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This plan has been prepared in accordance with BS 5192, Part 1 in relation to scale and dimension. Tolerances permitted within the British Standard should be observed.

Dimensions and particulars should be checked on site. Any discrepancies should be reported to FMI Consultants (UK) Ltd before any work commences.



NOTES:

LEVELS AND CO-ORDINATE GRID ARE RELATED TO GPS SURVEY DATUM DERIVED FROM ORDNANCE SURVEY DATUM VIA OSTN15

ALTHOUGH O.S. CO-ORDINATES ARE SHOWN ON THIS PLAN THE GRID IS TO BE TREATED AS ARBITRARY.

NO SCALE FACTOR HAS BEEN APPLIED TO THE SURVEY THEREFORE THE CO-ORDINATES SHOWN ARE NOT TRUE O.S. CO-ORDINATES.

ISSUE	REVISION	DATE
A	SURVEY EXTENDED TO THE NORTH OF SITE	23/02/22

Job: **LEVEL SURVEY
ORB STEELWORKS
STEPHENSON STREET, NEWPORT**

Scale:	Date:	Drawn By:	Checked By:	Job Ref.
1:500	21/09/21	MW	NM	HG/OSW/001

Client: **Hydrogeo Ltd
Waddington House
Unit 4, Llanover Business Centre
Llanover, Abergavenny**



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