Kelvedon Road, Newport - Flood Consequences Assessment

October 2024

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This report describes work commissioned by Jon Moore on behalf of MVR Solutions Ltd by an instruction dated 13th of September 2024. George Williams of JBA Consulting carried out this work.

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Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
BGS	British Geological Survey
CFB	Coastal Flood Boundary
DTM	Digital Terrain Model
FAS	Flood Alleviation Scheme
FCA	Flood Consequence Assessment
FFL	Finished Floor Level
FMfP	Flood Map For Planning
FRM	Flood Risk Management
LiDAR	Light Detection And Ranging
mAOD	Metres Above Ordnance Datum
NGR	National Grid Reference
NRW	Natural Resources for Wales
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPW	Planning Policy Wales
RCP	Representative Concentration Pathway
TAN-15	Technical Advice Note 15: Development and Flood Risk
TUFLOW	Two-dimensional Unsteady FLOW (a hydraulic model)
UKCP	United Kingdon Climate Projections

1 Introduction

1.1 Terms of Reference

JBA Consulting were commissioned by MVR Solutions Ltd to prepare a Flood Consequences Assessment (FCA) to support a planning application for residential development and associated works on land located off Kelvedon Road, Newport. This FCA demonstrates the suitability of the proposed development in terms of flood risk.

1.2 FCA Requirements

This FCA follows the Welsh Government guidance on development and flood risk set out in the Technical Advice Note 15: Development and Flood Risk (TAN-15). Where appropriate, the following aspects of flood risk should be addressed in all planning applications over its expected lifetime in flood risk areas:

- The likely mechanism of flooding
- The likely source of flooding
- The depths of flooding through the site
- The speed of inundation at the site
- The rate of rise of flood water through the site
- Velocities of floodwater across the site
- Overland flow routes
- The effect of access and egress and infrastructure, for example. Public sewer outfalls
- Combined sewer outflows, surface water sewers and effluent discharge pipes from wastewater treatment works
- The impacts of the development in terms of flood risk on neighbouring properties and elsewhere on the floodplain.

2 Site Description

2.1 Site Summary

The proposed development site is located on disused brownfield land to the north of Kelvedon Road, Newport as shown in Figure 2-1. The site is approximately 0.255ha in area and has regreened due to the long period it's been undeveloped.

The area is predominantly residential with the exception of a small light industrial area immediately to the south of the site and a medical centre and pharmacy centre to the east. Table 2-1 below is a summary of the site.

Figure 2-1 Site Overview

Table 2-1 Site Summary

Site area (ha)	0.255
Existing land use	Disused brownfield land
Purpose of development	Circa 35 residential apartments and associated works
OS NGR	ST 32256 87730
Local Planning Authorities	Newport City Council
Lead Local Flood Authority	Newport City Council

2.2 Site Topography

A topographic survey of the site was carried out by John Vincent Surveys Ltd in September 2024, which included the entire site and some of the surrounding area. The topographic survey shows that the site has no general direction of fall with most levels on site ranging between 6.57mAOD to 7.04mAOD. The topographic high point of 8.99mAOD is associated with 'rubble tipping'. A copy of the topographic survey can be found in Appendix A.

The Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data has been used to provide a graphical representation of the site topography and wider area, as shown in Figure 2-2. The NRW LiDAR values closely match that of the site-specific topographic survey.

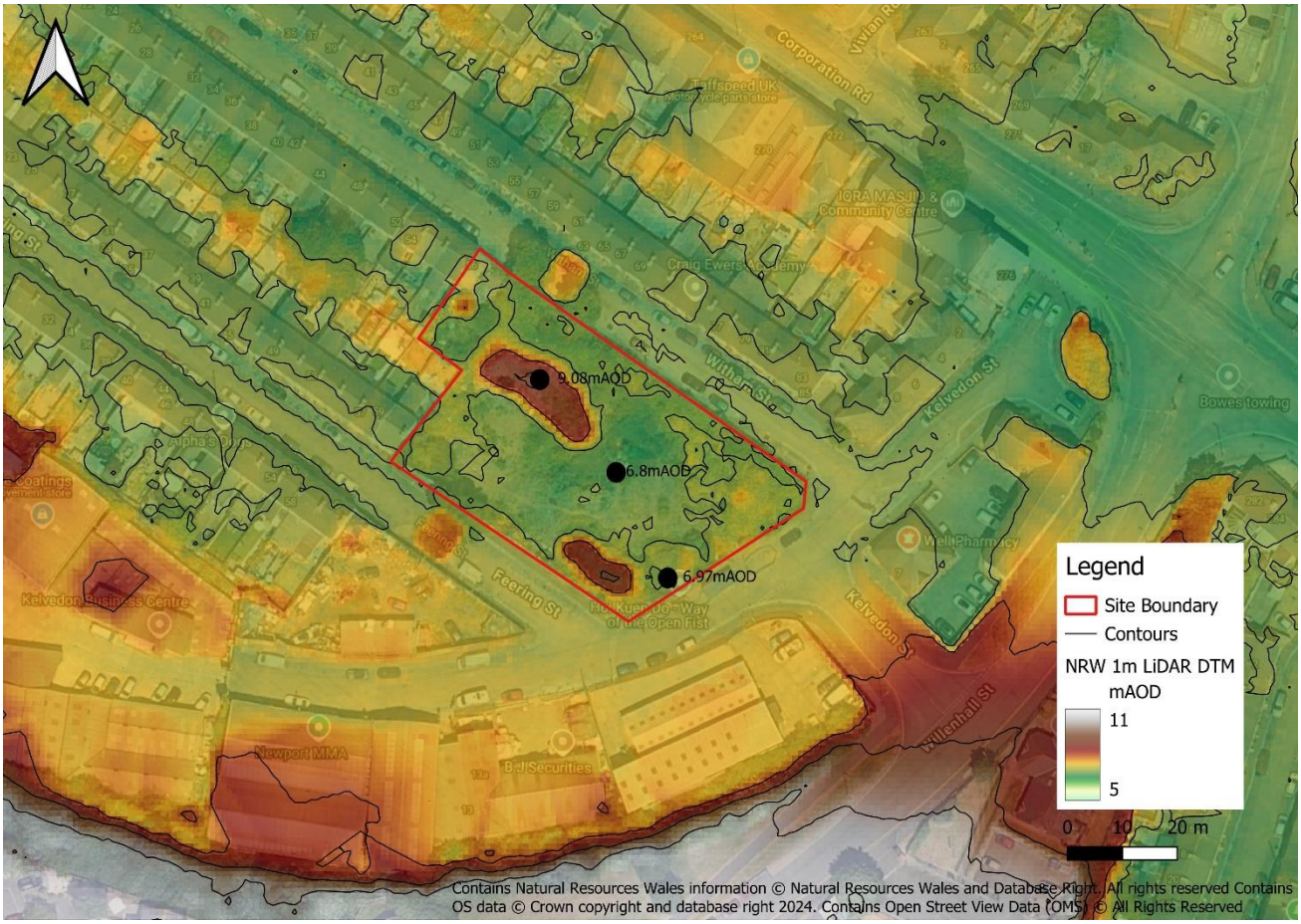


Figure 2-2 NRW 1m LiDAR DTM

2.3 Watercourses and Flood Defences

There are no watercourses that pass through the site, with the nearest Main River to the development being the River Usk. The River Usk is located approximately 250m to the southwest of the site at its nearest point, as shown in Figure 2-3.

The River Usk is a tidally influenced river, and the site is within the tidal reaches of the River Usk and the Bristol Channel. A series of NRW flood defences serve the eastern bank of the River Usk, providing flood protection to large areas of the city. Most recently (circa

2012) the NRW flood defences were upgraded in the Riverside area, through the Riverside Flood Alleviation Scheme (FAS). The Riverside FAS was designed to account for approximately 50 years of climate change and to be further raised to account for future sea level rise beyond this time if required. The area benefitting from these established flood defences along the River Usk and the location of these defences is shown below in Figure 2-3 and Figure 2-4.

The site is also located within the tidal floodplain of the Severn Estuary, which is located approximately 5km to the south of the site. The coastline between Newport and Caldicot is protected by extensive and significant coastal flood defences owned and maintained by NRW. The extent of these is indicated in Figure 2-4.

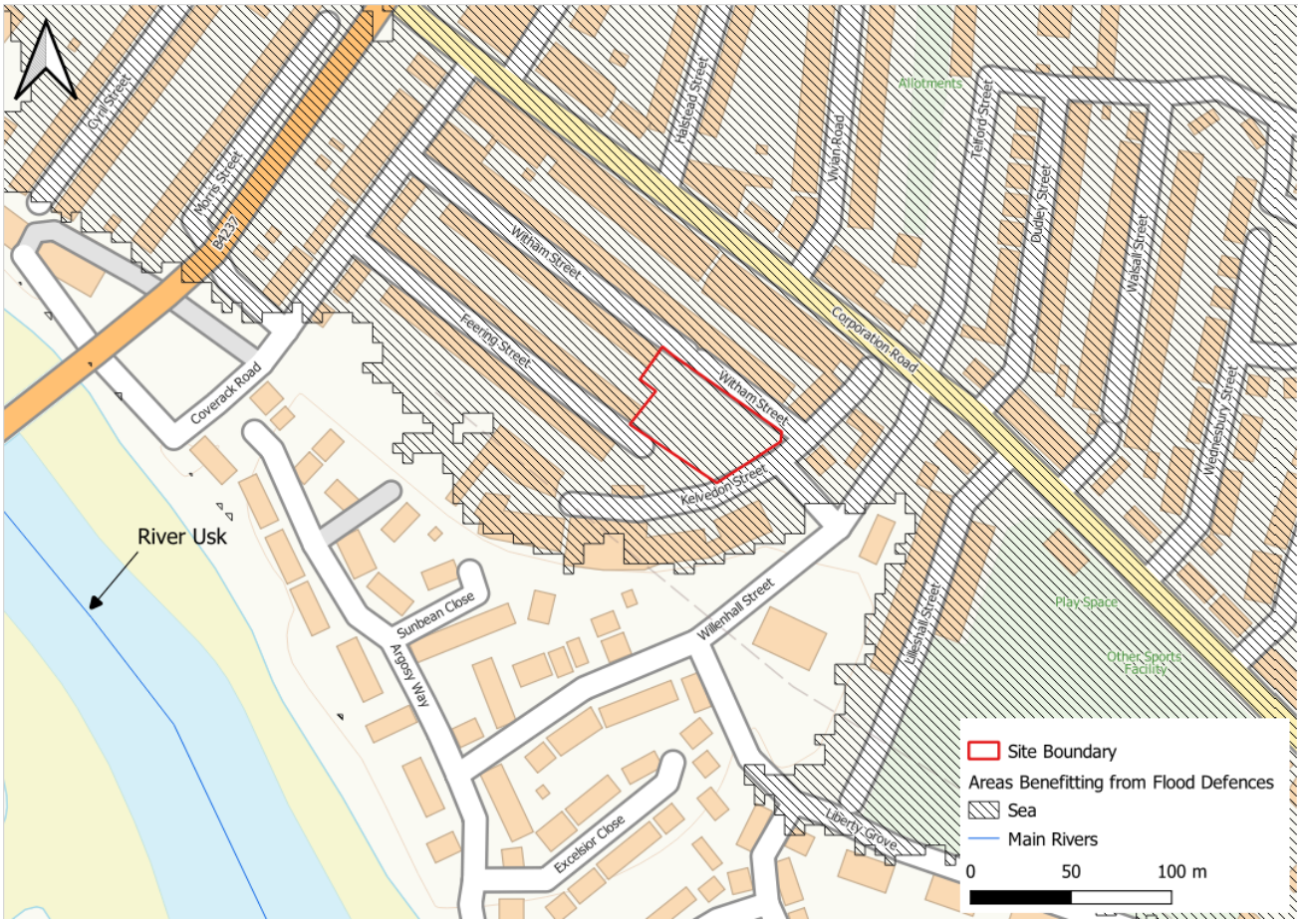


Figure 2-3 Watercourses and Flood Defence Location

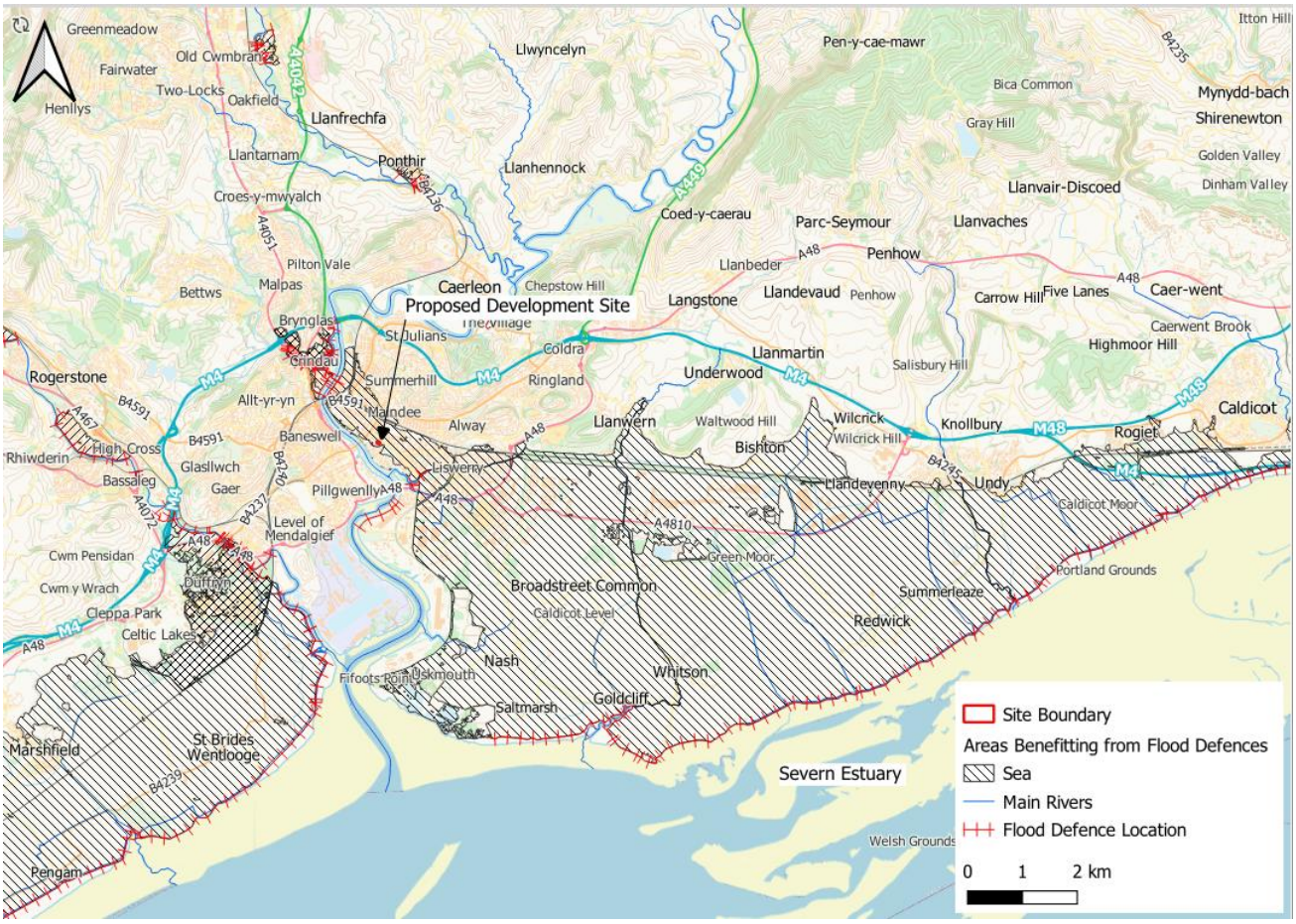


Figure 2-4 Watercourses and Flood Defences - Wider view.

2.4 Soils and Geology

The geology of the site has been assessed using the BGS GeoIndex[1]. The bedrock geology is shown to comprise of Mercia Mudstone bedrock with superficial deposits of Tidal Flat Deposits (TFD) comprised of clay, silt and sand.

The soils on site have been assessed on the Cranfield University Soilscapes Viewer[2] The underlying soils are shown to be freely draining acid soils.

2.5 Proposed Development

The development proposal is for 30 no apartments set within a three-storey building, car parking and associated landscaping. Figure 2-5 below provides an overview of the proposed development with a full size plan included within Appendix B.

Table 2-2 below provides a summary of the proposed FFLs for each element of the development proposals.

1 https://www.bgs.ac.uk/map-viewers/geoindex-onshore/

2 Soilscapes soil types viewer - Cranfield Environment Centre. Cranfield University (landis.org.uk)

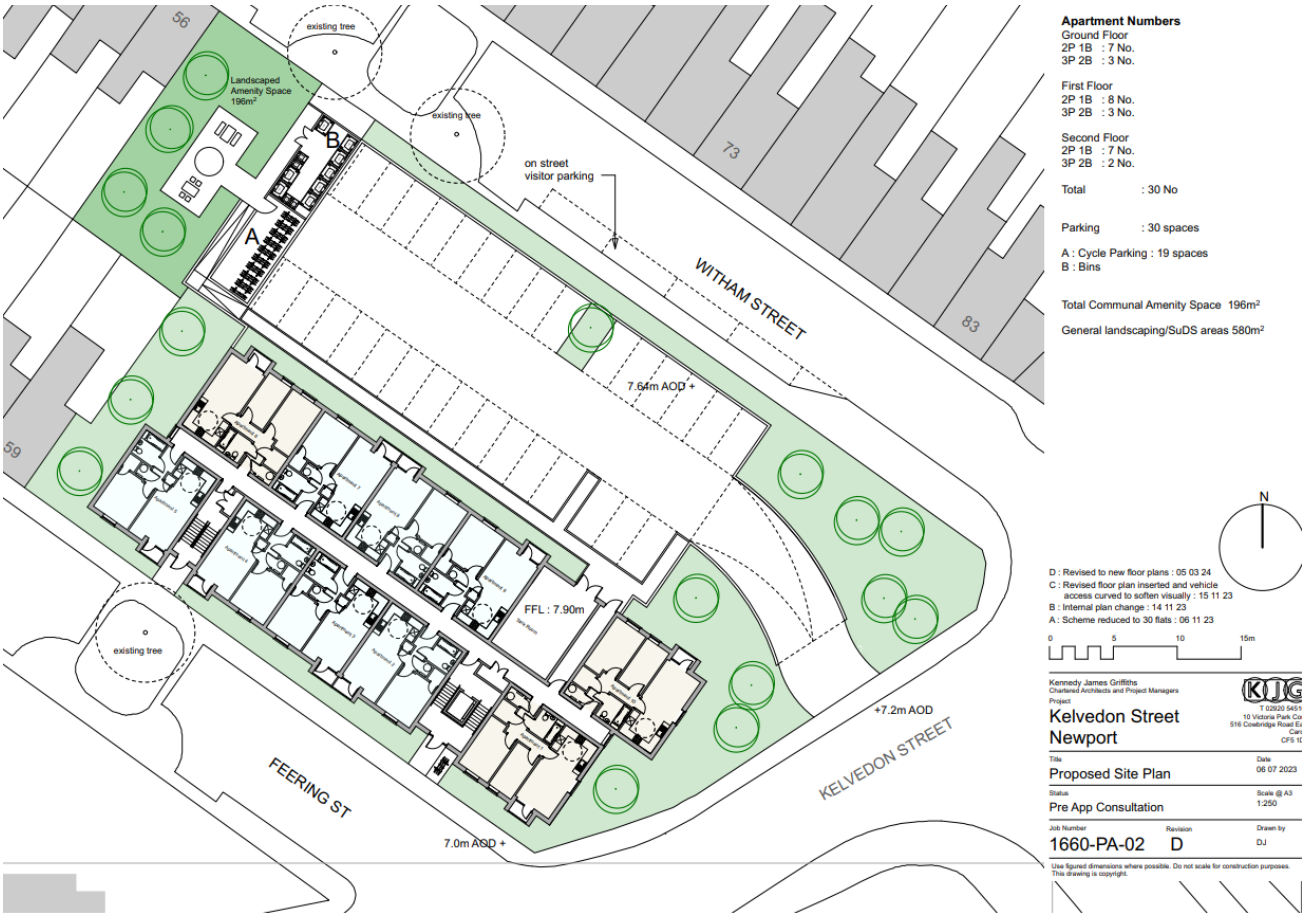


Figure 2-5 Overview of Proposed Development

Table 2-2 Proposed Site Levels

Development Area	Proposed Finish Floor Level (FFL)
Residential Apartment	8.00mAOD
Car Parking	7.72mAOD

3 Planning Policy and Flood Risk

3.1 Planning Context

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. These policies have the aim that all development in Wales is sustainable and improve the social, economic, environmental, and cultural wellbeing of Wales as set out in the Wellbeing of Future Generations Act 2015.

Technical Advice Note 15 (TAN-15), introduced by the Welsh Government in 2004, provides technical guidance relating to development planning and flood risk in Wales. The initial requirements of TAN-15 are to identify the vulnerability classification(s) and flood zones relevant to the proposed development and to apply this information to the application of the justification test.

An update for TAN-15 was released in October 2021 and was due to come into force on the 1st of December 2021. However, the Welsh Government subsequently suspended the implementation of the new TAN-15 and it is uncertain as to when the new TAN will be finalised and implemented. Although the new TAN-15 is not a material consideration, the Welsh Government and NRW advise that some consideration is given to the draft Flood Map for Planning (FMfP) as the best available information. Therefore, where a site is located in an FMfP flood risk zone it is recommended that an FCA is carried out.

As a result of the above, both the DAM and the FMfP are considered as part of this FCA.

3.2 Vulnerability Classification

TAN-15 assigns one of three flood risk vulnerability classifications to developments, as shown in Table 3-1. The proposed development is a residential development and is consequently classified as **Highly Vulnerable Development**.

Table 3-1 TAN-15 Vulnerability Classifications

Development category	
Emergency services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood.
Highly vulnerable development	**All residential premises** (including hotels and caravan parks), public buildings, (e.g., schools, libraries, leisure centres), especially vulnerable industrial development and waste disposal sites.
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car

Development category	
	parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

3.3 Lifetime of Development

The Welsh Government's latest technical guidance for climate change states:

When considering new development proposals, Technical Advice Note 15: Development, Flooding and Coastal Erosion (TAN-15) states that it is necessary to take into account of the potential impact of climate change over the lifetime of development. A rule of thumb is that residential development has a lifetime of 100 years while a lifetime of 75 years is assumed for all other developments.

As the proposals are for a residential development a 100-year lifetime of development has been considered in this assessment, in line with Welsh Government Guidance.

3.4 Development Advice Map Classification

The DAM zone classification is used to trigger different planning actions based on a precautionary assessment of flood risk.

Figure 3-1 shows that the site is located entirely within Zone C1. Zone C1 is described as “areas of the floodplain served by significant infrastructure, including flood defences”.

Highly vulnerable developments within Zone C1 are permitted subject to the application of the Justification Test and Acceptability Criteria.

Figure 3-1 Development Advice Map (DAM)

3.5 Flood Map for Planning Classification

As discussed above in Section 3.1, the new TAN-15 will replace the DAM with the Flood Map for Planning (FMfP), which will be used to trigger different planning actions. Whilst the new TAN-15 is not a material consideration until implemented, it does illustrate the current policy thinking of the Welsh Government and in some cases, the FMfP may constitute the best available information. Consequently, information on the FMfP is provided for information only. Importantly, the FMfP includes the predicted effects of climate change, whereas the DAM does not.

3.5.1 Flood Map for Planning - Flood Risk from Rivers

The site is shown to be in Flood Zone 1 for the FMfP - Flood Risk from Rivers as shown in Figure 3-2. This represents a less than 0.1% AEP (1 in 1000 year) chance of flooding from fluvial mechanisms in any given year including the effects of climate change.

Figure 3-2 FMfP- Flood Risk from Rivers

3.5.2 Flood Map for Planning - Flood Risk from the Sea

The site is shown to be entirely located within Flood Zone 3 of the FMfP- Flood Risk from the Sea as shown in Figure 3-3. This represents a greater than 0.5% AEP (1 in 200 year) chance of flooding from tidal/coastal mechanisms in a given year, including climate change.

The site is also protected by the presence of flood defences along the Bristol Channel and River Usk as mentioned in Section 2.4 above. These flood defences form part of the TAN-15 Defended Zone for flooding from the Sea as indicated by hatched marking within the figure.

Figure 3-3 FMfP- Flood Risk from the Sea

3.5.3 Flood Map for Planning - Flood Risk from Surface Water and Small Watercourses

The site is shown to be located within Flood Zone 2 of the FMfP- Flood risk from Surface Water and Small Watercourses as shown in Figure 3-4. Flood Zone 2 represents areas with a between 0.1% AEP (1 in 1000 year) and 1% AEP (1 in 100 year) chance of flooding from surface water or small watercourses in any given year, including the impacts of climate change.

Figure 3-4 FMfP- Flood Risk from Surface Water and Small Watercourses

3.6 Newport City Council Planning Policy

The Local Development Plan (LDP) is a land-use document in which the council sets out its land use development over a 15-year period. The current LDP for Newport was adopted in 2015[3] and provides a framework to guide future development and set out where, when, and how much new development can take place within the plan period (2011-2026).

Within the LDP, Objective 4 states that Newport aims to deliver approximately 10,350 new homes. The proposed development, therefore, supports this key objective by providing x30 new residential apartments, which will contribute to the number of homes required by the LDP.

The proposed development will also deliver housing land in line with Policy SP18 Urban Regeneration which states “Proposals will be favoured which assist the regeneration of the urban area, particularly where they contribute to:

1. The vitality, viability and quality of the environment of the city centre.
2. The provision of residential and business opportunities within the urban area.
3. Re-use of vacant, underused or derelict land.

3 https://www.newport.gov.uk/en/Planning-Housing/Planning/Planning-policy/Local-Development-Plan/Local-Development-Plan.aspx

4. Encourage the development of community uses where appropriate".

The proposed development meets points 2) and 3) of Policy SP18.

3.7 Justification Test

Developments in Zone C1 are subject to the justification test. TAN-15 states that development will be justified if it can be demonstrated that:

Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement.

or

Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and

It concurs with the aims of Planning Policy Wales and meets the definition of previously developed land;

and,

The potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable.

The proposed development has been assessed against the requirements of the Justification Test, with the results summarised in Table 3-2. All the criteria have been satisfied with regard to the proposed development.

Table 3-2 TAN-15 Justification Test

TAN 15 Justification Criteria	Comments	TAN 15 Justification Criteria
Its location is necessary to assist a local authority regeneration initiative or strategy or contribute to key employment objectives, necessary to sustain an existing settlement or region.	The proposed development will make an important contribution to redeveloping brownfield land and delivering housing for a supportive living environment. It is therefore concluded that the scheme is necessary in meeting the objectives and policies of the Newport City Council RLDP (Policy PS1) for providing housing and redevelopment of brownfield areas.	✓

TAN 15 Justification Criteria	Comments	TAN 15 Justification Criteria
The site meets the definition of previously developed land (i.e. it is not a Greenfield site) and concurs with the aims of Planning Policy Wales (i.e. the presumption in favour of sustainable development)	The proposed development site meets the criteria of previously developed land.	✓
The potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable.	Detailed flood modelling has been undertaken to demonstrate the acceptability of the proposed development. See sections 4 & 5.	✓

4 Flood Risk Assessment

4.1 Review of Existing Flood Risk Data

Table 4-1 Summary of Flood Risk

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	×	**Very Low** - Located in an area of very low risk of flooding from Rivers.
Flood Risk from the Sea	✓	**Low** - Located in an area that is of low risk of flooding.
Flood Risk from Surface Water and Small Watercourses	✓	**Low** - Located in an area of low risk of flooding from the Surface Water or Small Watercourses. The proposed development's drainage strategy will mitigate the risk.
Flood Risk from Groundwater	×	**Low** - it has been documented that groundwater flood risk in Newport is small
Flood Risk from Reservoirs	×	**Very Low** - the likelihood of a failure occurring is low.
Flood Risk from Sewers	×	**Low** - The site is considered to be at a low risk of flooding from sewers

4.2 Historical Flood Risk

NRW's map of recorded flood extents does not record any historic flooding on the site.

Newport City Council's Preliminary Flood Risk Assessment[4] and Flood Risk Management Strategy identified no other historic flooding records at the site.

4.3 Flood Risk from Rivers

NRW's Flood Risk Assessment Wales (FRAW) Flood Risk from Rivers mapping indicates that the proposed development site is at **very low** risk of fluvial flooding. This means there is less than a 0.1% AEP chance of fluvial flooding in any given year. This is shown by a transparent layer on the FRAW mapping, as shown in Figure 4-1.

4 Newport City Council - Preliminary Flood Risk Assessment (2011). Retrieved from: https://www.newport.gov.uk/documents/Planning-Documents/Flood-risk/Preliminary-Flood-Risk-Assessment-Report-April-2011.pdf

Figure 4-1 FRAW- Flood Risk from Rivers

4.4 Flood Risk from the Sea

The NRW FRAW Flood Risk from the Sea map shows the site is located within an area at **low risk** of tidal flooding, with between a 1 in 1000 and 1 in 100 (0.1% - 1% AEP) chance of flooding in any given year, as shown in Figure 4-2.

As noted in Section 2.5, the proposed development is in an area benefitting from flood defences due to the presence of flood defences along the River Usk.

To better understand the risk of flooding posed by tidal flooding sources and the implications of climate change on the flood risk to the proposed development, further assessment using detailed flood modelling data has been undertaken and is discussed in Section 5.

Figure 4-2 FRAW- Flood Risk from the Sea

4.5 Flood Risk from the Surface Water and Small Watercourses

The NRW FRAW map for Flood Risk from the Surface Water and Small Watercourses shows the site is at **low risk and very low risk** of flooding from this source. Low risk represents those areas with between 0.1% AEP (1 in 1000 year) and 1% AEP (1 in 100) year chance of flooding in any given year. very low are those areas with a 0.1% AEP chance of fluvial flooding in any given year.

Figure 4-3 FRAW- Flood Risk from Surface Water and the Small Watercourses

4.6 Flood Risk from Groundwater

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerges at the ground surface or within manmade structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in damage to property. This risk of groundwater flooding depends on the nature of the geological strata underlying the site and the local topography.

Newport City Council Flood Risk Management Plan[5] states that 'groundwater is not considered a significant flood risk' in Newport. It can therefore be concluded that the risk of groundwater flooding at the site is **low**.

4.7 Flood Risk from Reservoirs

The proposed site is shown to be at **very low** risk from reservoir flooding with the entire site boundary located in an area outside of the reservoir flood risk extent as shown on the NRW FRAW Flood Risk from Reservoir map in Figure 4-4.

5 https://www.newport.gov.uk/documents/Council-and-Democracy/Consultations/Newport-Flood-Risk-Management-Plan-Report-Issue-for-Consultation.pdf

Figure 4-4 Flood Risk from Reservoirs

4.8 Flood Risk from Sewers

Newport's Preliminary Flood Risk Assessment suggests there is no evidence of historic sewer flooding at the site. The PFRA concluded that flooding from sewers does not have significant consequences at a strategic scale, so it can be concluded that the risk of sewer flooding at the site is **low**.

5 Detailed Tidal Flood Risk Assessment

5.1 Hydraulic Modelling Availability

The detailed assessment of tidal flood risk is based on Version 7.0 of the Newport Tidal Flood Model (June 2020). This is a 1D-2D ESTRY-TUFLOW tidal model of Newport, which JBA Consulting prepared for a successful Flood Map Challenge at that time.

Further to the model updates contained in the 2020 Flood Map Challenge, the Newport Tidal model (Version 7.0) has been updated by JBA Consulting in 2022 and 2023 to include several further model improvements. In summary these updates include:

- Inclusion of the recently completed Crindau flood defences;
- The ESTRY-TUFLOW version was updated to 2020-10-AD -iSP-w64; and
- The tidal boundary conditions were updated to a base-year of 2023 in line with the latest (September 2021) Welsh Government climate change guidance for Flood Consequence Assessments[6] to consider flood risk for the lifetime of development (100 years).

Table 5-1 summarises the coastal flood boundary data used for updating the tidal boundary conditions; the same as used in the previous Newport Tidal Flood Model.

Table 5-1 Coastal Flood Boundary (CFB) Data

Highest Astronomical Tide (HAT) Location	Surge Donor Location	CFB dataset point chainage
Newport	22, Newport	_396

To represent the present-day 2023 scenario, the tidal boundary conditions were uplifted to the current year, from the CFB dataset base year of 2017, using the Higher Central allowance (70th percentile) of the UK Climate Projections (UKCIP 18) for 2100 for Representative Concentration Pathway 8.5 (RCP 8.5).

To account for the impact of sea level rise over the lifetime of the development (100 years), a further uplift was calculated for the 2123 scenario based on the Higher Central allowance (70th percentile) of the UKCP 18 for 2100, RCP 8.5 dataset. The uplift for the 23 years of additional climate change beyond 2100 was applied based on the dataset's average increase in the last five years. Table 5-2 summarises the sea level rise uplifts applied to the tidal boundary conditions and the resulting peak tide levels.

6 https://gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

Table 5-2 Sea Level Rise Uplifts and Peak Tide Levels

Scenario	Sea level rise uplift (m)	Peak tide level (m AOD)	
		0.5% AEP	0.1% AEP event
2017 (CFB dataset base year)	N/A	8.33	8.67
2023	0.032	8.36	8.70
2123	1.062	9.39	9.73

Further to the above updates model performance has been reviewed. This has found that within the updated flood model, 1D negative depths were observed in the 1D domain for the River Usk at cross-section USK08125. This location is approximately 200m downstream of the proposed development site. Upon further examination, these 1D negative depths occur twice in the simulations for very short periods at low water levels in tidal troughs around 11.75 hours and 48.9 hours and therefore do not impact peak water level results in the 2D model, which in the area of the proposed development site, occurs at around 15.8 hours. 1D negative depths were also observed in the Crindau Pill tributary, on the opposite bank of the River Usk to the proposed development site, also around periods of low water levels in tidal troughs, but again do not impact peak water levels in the 2D domain.

The Newport tidal flood model has a coarse grid size of 10m and features below 10m in size may not be fully represented. The 10m grid size, however, provides a balance between representing sufficient detail of the floodplain/flow routes across the mainly rural catchment and model run times; whilst also limiting the computational size of model outputs and has been previously accepted by NRW as part of the Flood Map Challenge circa June 2020.

5.2 Tidal Flood Risk Results

5.2.1 Baseline

During the present day 0.5% AEP and 0.1% AEP events the site remains flood-free. As the site remains flood-free during both present-day events no further assessment of the present-day events has been undertaken.

During the 2123 tidal flood events, flooding originates from the River Usk and the Severn Estuary, flooding significant areas of the City of Newport.

The maximum predicted flood level for the 2123 0.5% AEP event is 7.37mAOD at the site. This would result in maximum flood depths of 660mm if site levels remained unchanged as shown in Figure 5-1.

During the 2123 0.1% AEP event the predicted flood extent is similar. However, flood depths increase significantly. The maximum predicted flood level on site is 8.31mAOD, which would result in maximum flood depths of 1.6m on site if site levels remained. See Figure 5-2.

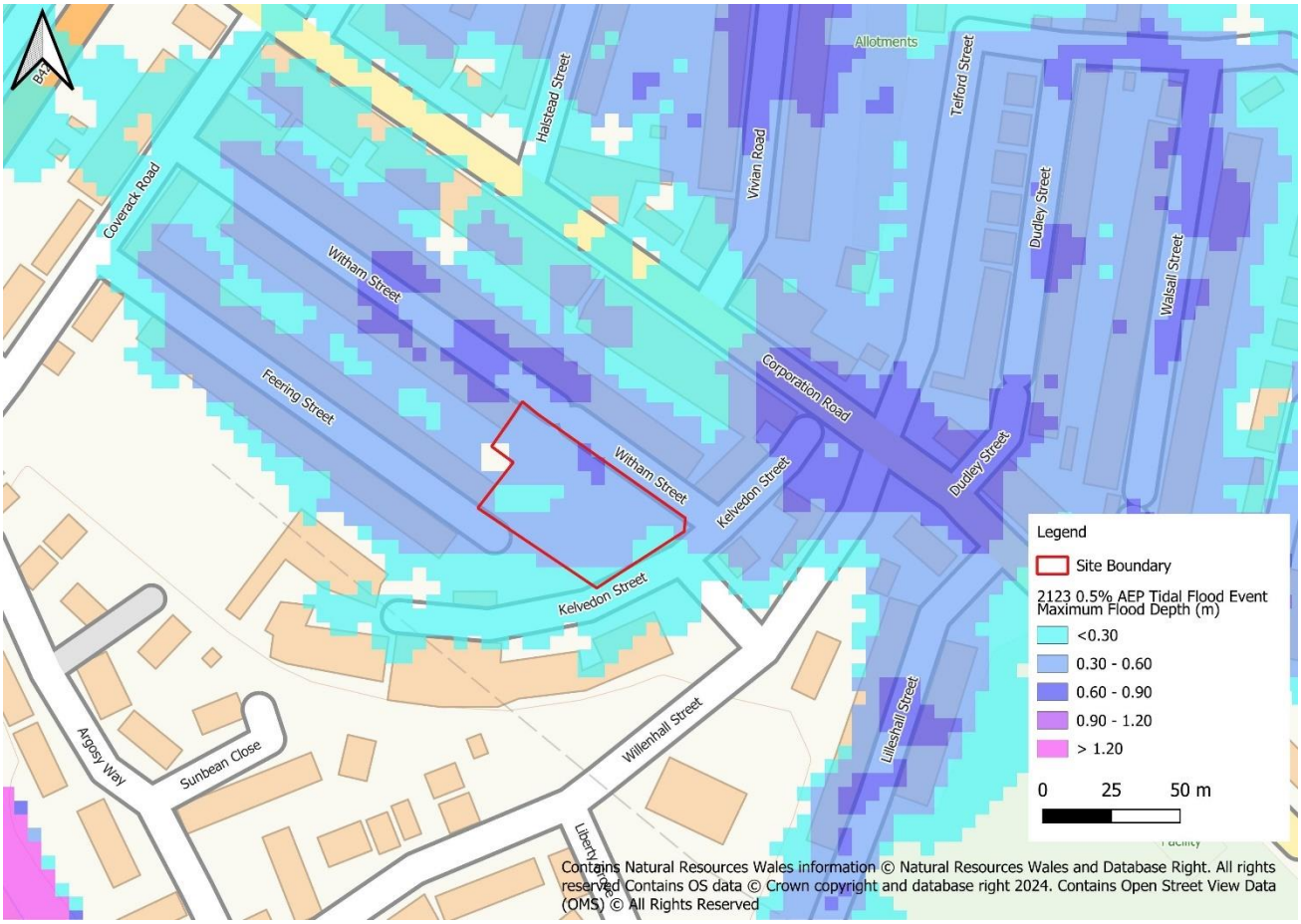


Figure 5-1 Baseline 2123 0.5% AEP Max Flood Depths

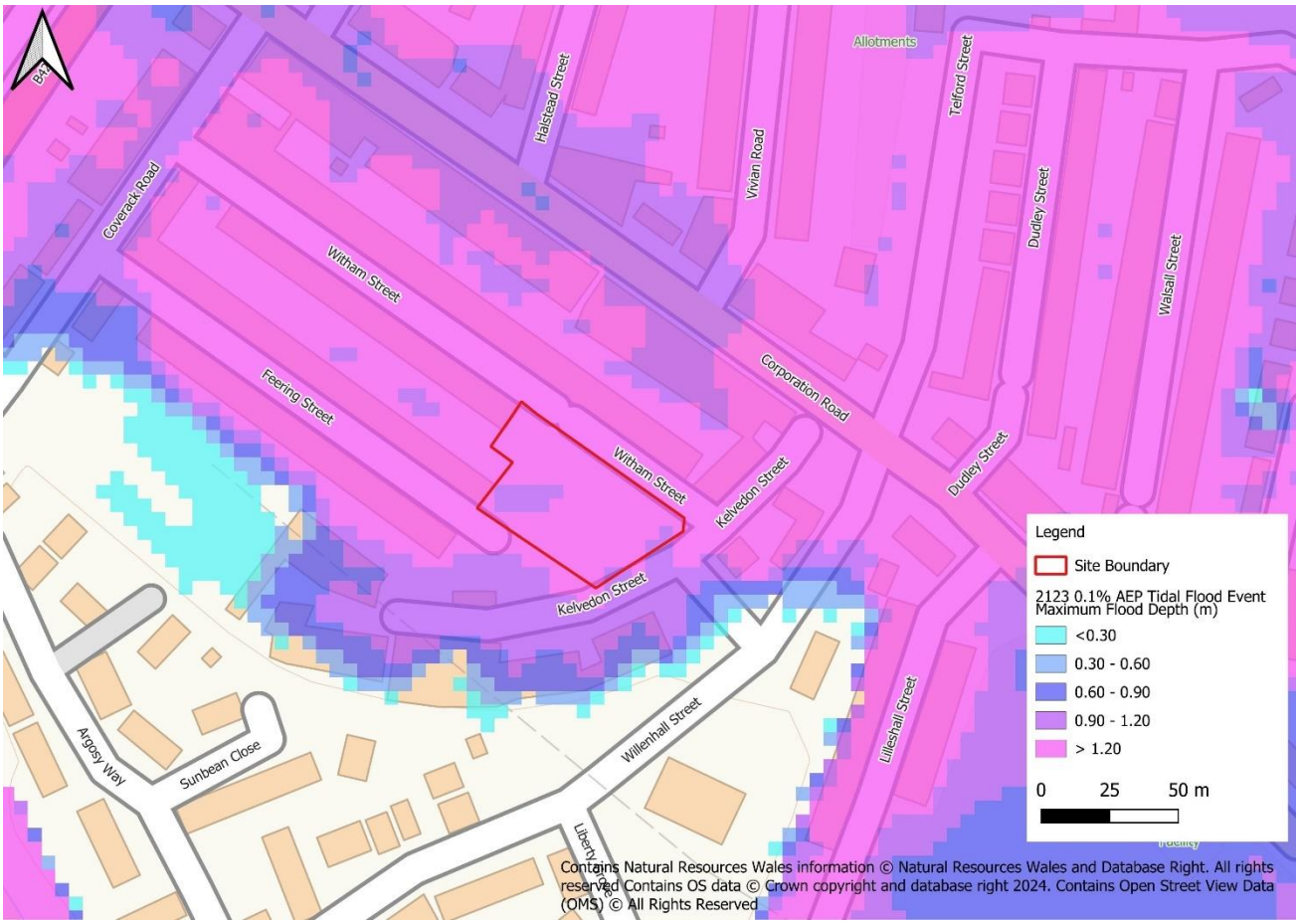


Figure 5-2 Baseline 2123 0.1% AEP Max Flood Depths

5.2.2 Flood Risk Mitigation

As noted in Section 2.5, the proposed development site will be raised to mitigate against the risk of flooding, with proposed ground level and FFL varying across the site.

2123 0.5% AEP Event

As a result of the proposed ground raising, both the apartment buildings and the car park remain flood-free during the 2123 0.5% AEP event. Table 5-3 below provides a summary of development levels against the 2123 0.5% AEP flood level.

Table 5-3 Predicted Flood Depths During the 2123 0.5% AEP Event

Development Area	Ground / Finished Floor Level (mAOD)	Flood level (mAOD)	Maximum Flood Depth (m)
Apartment FFL	8.00	7.37	Flood Free
Car Parking Area	7.72		Flood Free

2123 0.1% AEP Event

During the 2123 0.1% AEP the proposed site is predicted to flood to generally shallow depths. Maximum flood depths for the apartments is predicted to be 310mm. This is considerably less than the recommended tolerable maximum of 600mm set out in A1.15 of TAN-15. Maximum flood depths in the car park are predicted to be close to the tolerable limit, with depths of 590mm.

Table 5-4 Predicted Flood Depths During the 2123 0.1% AEP Event

Development Area	Ground / Finished Floor Level (mAOD)	Flood level (mAOD)	Maximum Flood Depth (m)
Apartment FFL	8.00	8.31	0.31
Car Parking Area	7.72		0.59

5.3 Access and Egress

In the 2123 0.5% AEP event, the maximum flood depths surrounding the site are predicted to be shallow (>300mm). Consequently, whilst movement around the city in such an event should be advised against, access and egress to the site would be largely unaffected by flooding.

In the 2123 0.1% AEP event access and egress to and from the site could become restricted and potentially hazardous due to significant flood depths present immediately adjacent to the site and across Newport. In this event flooding across the city would be widespread, meaning that almost any travel across the city would encounter hazardous floodwater and as such be strongly advised against.

Tidal storm surges are slow moving metrological events. The 'Coastal flood boundary conditions for the UK' storm surge profile for Newport takes 35hrs to reach its peak, and storm surges are typically forecast days in advance. This makes tidal flooding relatively predictable as storm surges are slow moving and must coincide with entirely predictable astronomical high tides. This means that effective flood warnings are provided with at least 48 hours in advance of flooding. This is ample time to notify residents and encourage them to take appropriate action. As the site is only at flood risk when allowing for many years (>75years) of climate change, it can be reasonably assumed that flood forecasting and warning will be further improved in the future.

Section 5.3.1 provides detailed information on the modelled flood mechanism, event timings and flood hazard as it may affect access and egress and emergency planning in the most extreme design event. Further information of Flood Warning is provided in Sections 5.3.2.

5.3.1 Flood mechanism, timings and hazard

A typical storm surge takes 35 hrs from arrival at Newport to reach its peak. Before this time, it is possible to track and forecast a tidal surge for several days. However, to reduce the computational time of flood modelling, the Newport flood model is set up to only

simulate approximately 17 hours before the peak flood depths are reached at the site. This means that the model simulates one full tidal cycle before the most extreme flooding occurs. Although the peak is at 17 hrs, the flood warning and lead time will be considerably greater than this (>48hrs).

The Newport TUFLOW model provides simulation outputs at each hour of the simulation. The results for the 0.1% AEP 2123 event have been inspected to understand the mechanisms, propagation and timing of flooding in the extreme design event. From these results, we have extracted the following key observations:

Tidal flooding first occurs in Newport 3hrs into the model simulation. This flooding is associated with the high tide preceding the peak of the storm surge. The event floods low-lying areas along the riverbanks of the Usk as seen in Figure A of Table 5-5. This includes the Riverside area to the north of the site. However, flooding does not come within the immediate vicinity of the site or impact travel to and from the site.

Flooding doesn't occur at the site until 16hrs into the simulation with only the northern corner of the site adjacent to Witham Street becoming flooded as seen in Figure B of Table 5-5. By this time much of Newport is already flooded. This means that there are approximately 15 hours between the overtopping of the riverside area and flood water first reaching the site, giving robust warning of flooding.

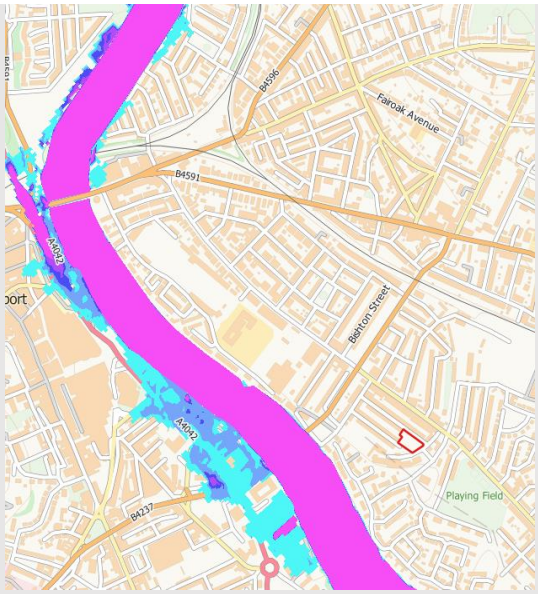
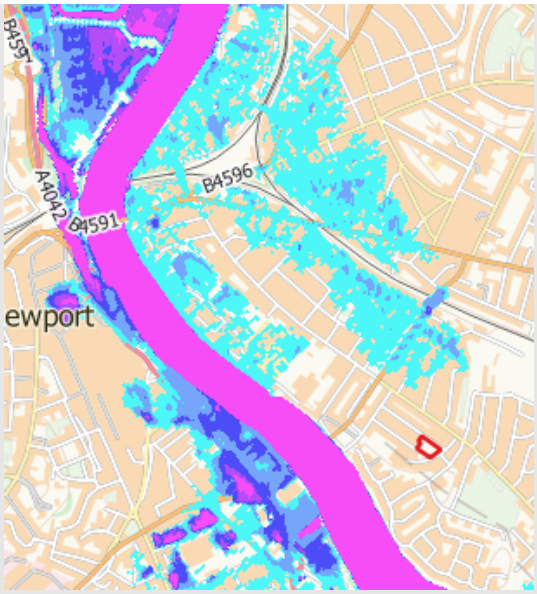
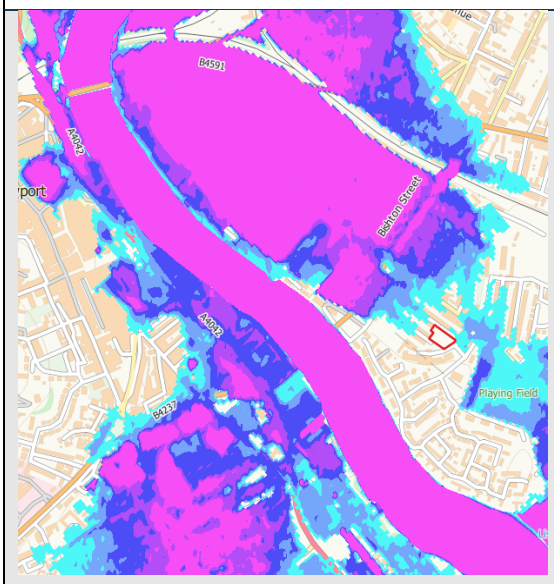
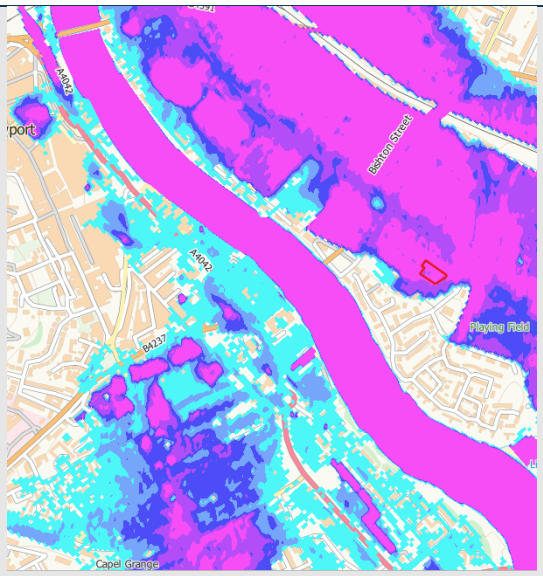
17 hrs into the simulation, when the tidal peak occurs, rapid inundation of the area surrounding the site occurs as shown in Figure C of Table 5-5. At this point in the event, flooding around the site is significant and access around the site and the surrounding area will be severely restricted with flood depths over 1.17m. However, during this peak depth, an area of high ground remains flood-free close by on Willenhall Street.

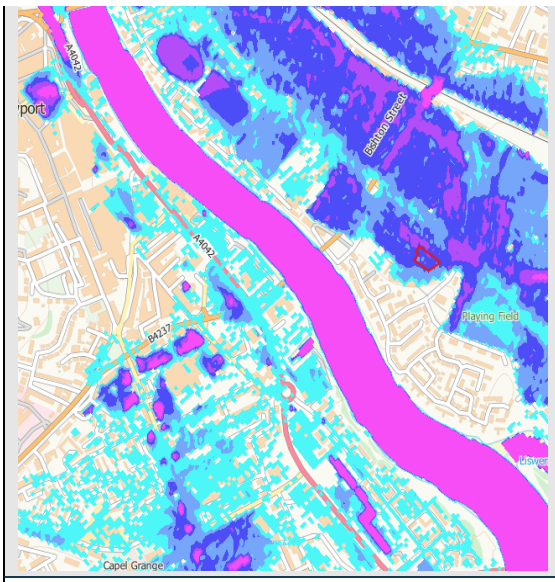
Between 17hrs and 24hrs in the simulation maximum flood depths remain above the 600mm of tolerable conditions on Kelvedon Road meaning access would still be restricted. This duration of flooding is likely to be overestimated, as the flood model does not account for the considerable drainage infrastructure in the area which would help to drain down floodwaters.

By 26hrs into the simulation, flood depths have decreased to depths below 600mm around the surrounding roads as shown in Figure D of Table 5-5. Evacuation towards Willenhall Street could occur for those who choose not to evacuate ahead of flooding.

The above predictions assume that no improvements are made to flood defences in Newport. This is extremely unlikely given the massive predicted impacts of flooding on property and people.

Table 5-5 Flood Inundation Simulations

	
A. 3 hours	B. 15 hours
	
C. 16 hours	D. 17 hours



25 hours	Key

5.3.2 Flood warning

NRW flood warnings for tidal surge events are typically provided 48hrs in advance of a tidal flood event. Flood warnings give notice that “flooding is expected” and “immediate action is required”. Such significant lead times provide ample time for residents to prepare and respond to a flood warning. On a flood warning residents would be advised to evacuate or very closely monitor the situation around high tide; following the advice of the emergency services.

The site covered by the site is within the Usk Estuary Flood Alert Area and within the North Liswerry and Spytty Pill’ flood warning area. It is recommended that the residential occupants and management company of the site sign up for these flood warnings. The flood warnings will provide sufficient time for flood preparations to be made.

The effectiveness, accuracy and lead-in time for flood warnings can reasonably be expected to improve over time and may be significantly improved over the next 75 years when the site becomes at flood risk.

6 Assessment of Acceptability Criteria

Due to the location of the site in DAM Zone C1 the site has been assessed against the acceptability criteria as shown in Table 6-1 below.

Table 6-1 Assessment of Acceptability Criteria

TAN- 15 Justification Criteria	Comments	Achieved
The developer is required to demonstrate that the site is designed to be flood free for the lifetime [Ref: TAN-15 A1.5] of development for a 1 in 100 (1%) chance (fluvial) and 1 in 200 (0.5%) chance (tidal) flood event including an allowance for climate change in accordance with TAN-15 table A1.14.	The proposed site is flood free during both the present day 0.5% AEP event and the 2123 0.5% AEP event. Therefore, the requirement of A1.14 is satisfied.	Yes
The development should be designed so that in an extreme (1 in 1000 chance) event there would be less than 600mm of water on access roads and within the property.	As mentioned in section 5.2.2 maximum flood depths inside the ground floor apartments in the 2123 0.1% AEP event would be 310mm. This is well within the maximum tolerable depth recommended by TAN-15. Therefore, the site satisfies the criteria.	Yes
No flooding elsewhere.	The proposed development shall not increase flood risk elsewhere, due to the near limitless volume of tidal inundation.	Yes
Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that that flood with a 1 in 1000 chance of occurring in any given year).	Existing NRW flood defences along the River Usk throughout Newport provide protection to the site during the 0.1% AEP, present-day tidal event. As per the current FRM policy of 'Hold the Line' set out in the Severn Estuary Shoreline Management Plan, future tidal flood risk to the development site will be managed in the same manner as existing properties and businesses in the area. Flood mitigation to the development site is in the form of ground raising - a passive measure with negligible future maintenance requirements	Yes
The developer must ensure that future occupiers of development are	The applicant is aware of the flood	Yes

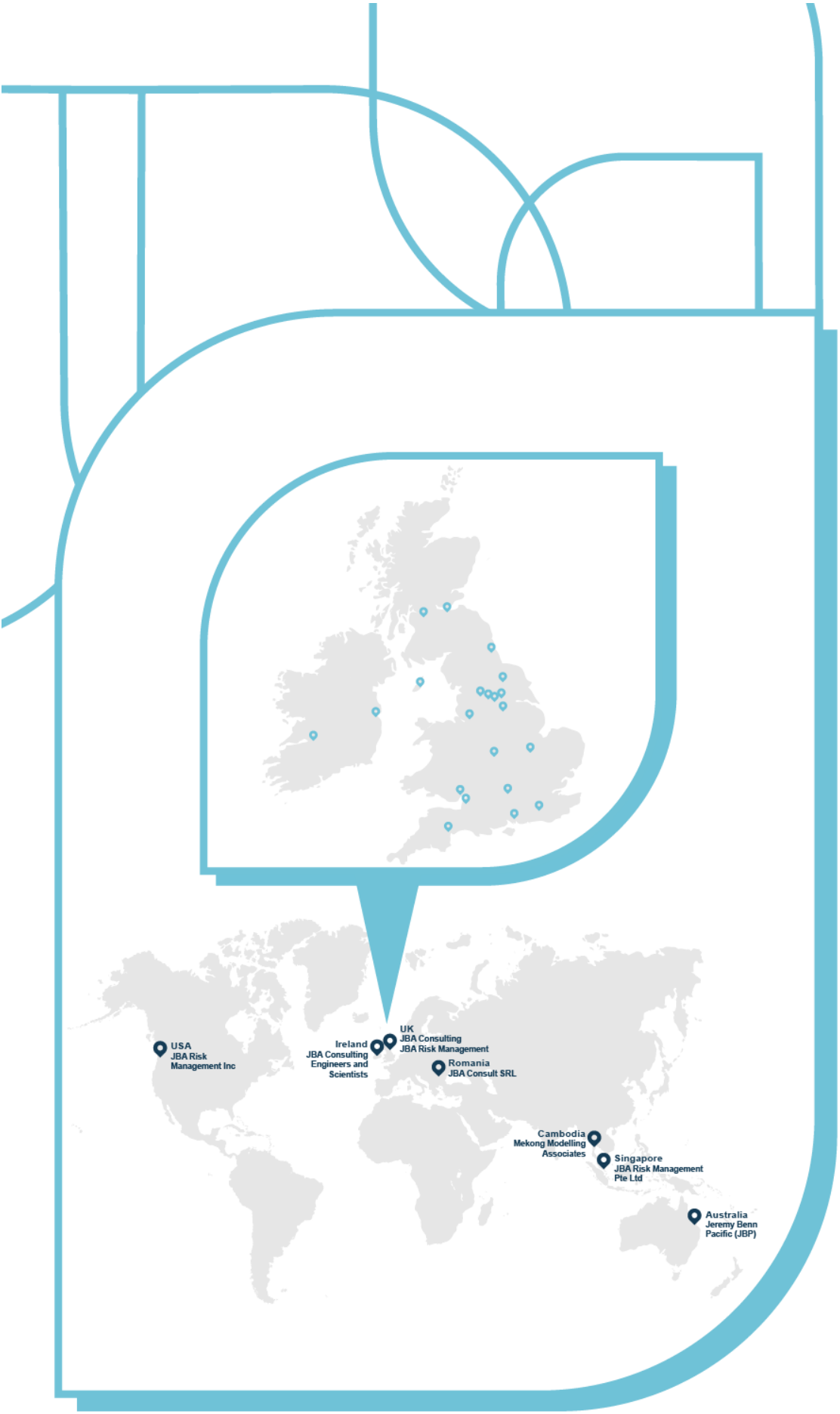
TAN- 15 Justification Criteria	Comments	Achieved
aware of the flooding risks and consequences.	risks on site. The applicant is advised to prepare a Flood Emergency Plan.	
Effective flood warnings are provided at the site.	The proposed site is within the Usk Estuary Flood Alert Area and within the North Liswerry and Spytty Pill' flood warning area. Substantial flood warning lead times of several days are typical for tidal storm surges.	Yes
Escape/evacuation routes are shown by the developer to be operational under all conditions.	Considerable flood warning lead time (>48hrs) should provide plenty of time to evacuate the site safely.	Yes
The development is designed by the developer to allow the occupier of the facility for rapid movement of goods/possessions to areas away from flood waters.	Considerable flood warning lead time (>48hrs) should provide adequate time to evacuate the site safely including moving possession to areas away from flood water.	Yes
Development is designed to minimise structural damage during a flooding event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of the flood.	The development has included ground raising so that flood depths within the ground floor of the building are minimal. It is also recommended that resilience measures are considered to allow for the building to return to use after the flood event.	Yes

7 Conclusion and Recommendations

- JBA Consulting were commissioned by MVR Solutions Ltd to prepare an outline Flood Consequences Assessment (FCA) to support the planning application of residential development and associated works on land located off Kelvedon Road, Newport.
- The development proposal is for 30 apartments set within a three-storey building, car parking and associated landscaping.
- The proposed development approximately 0.255ha site is located on disused brownfield land to the north of Kelvedon Road, Newport.
- The site is located within DAM Zone C1. Zone C1 is described as “areas of the floodplain served by significant infrastructure. Highly vulnerable development within Zone C1 is permitted subject to the application of the Justification Test and Acceptability Criteria.
- The site is located within Flood Zone 3 of the Flood Map for Planning (FMfP)- Flood Risk from the Sea and is also located within a TAN-15 Defended Zone.
- The proposed site is flood free in both the 0.5% AEP and 0.1% AEP event for the present day (2023).
- To manage the risk of flooding brought about by climate change and sea level rise, the proposals include ground raising of the site. The ground floor of the development will be raised to a finished floor level of 8.0mAOD. Car parking areas will be raised to a minimum level of 7.72mAOD
- A review of JBA's Newport Tidal Flood Model updated in 2023 showed that the proposed building and car parking area remain flood free during both the 2023 0.5% AEP event and the 2123 0.5% AEP event, assuming a 100 year lifetime of development.
- During the 2123 0.1% AEP event the ground floor apartments are predicted to flood to a maximum of 310mm, below the 600mm deemed tolerable under the guidance of TAN-15. The car parking area is predicted to flood to a maximum depth of 590mm.
- The FCA has shown the proposed development satisfies the requirements of the Justification Test, including the Acceptability Criteria. Consequently, the proposed redevelopment meets the requirements set out in TAN-15 and the aims of Planning Policy Wales.

Appendix A - Topographical Survey

Appendix B - Development Plans



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