

5 Detailed Fluvial and Tidal Flood Risk Assessment

As identified in Sections 3 and 4, a better understanding of the tidal and fluvial flood risks and potential implications of climate change is required. The following section assesses these sources of flood risk in more detail.

5.1 JBA Flood Modelling

5.1.1 Model provenance

To comprehensively assess the risk of flooding to the proposed development site, updated detailed flood modelling has been undertaken for the study area. The detailed fluvial and tidal flood risk model of Port Talbot is 1D-2D linked ESTRY-TUFLOW Model. This was originally developed by JBA Consulting in August 2017 for Neath Port Talbot CBC and subsequently adopted by NRW.

The 2017 detailed model was subsequently updated by JBA for another location close to the proposed development (planning reference P2020 0303). These updates included:

- Updating the building representation to be based solely on the OS Mastermap layer with a 90% blockage factor applied.
- Run the model with the latest version of TUFLOW.
- Update the tidal boundary conditions to be uplifted to 2021 to represent present-day conditions and consider the impact of the 2096 climate change epoch.

In accordance with Welsh Government Guidance on Climate Change Allowances for Planning Purposes⁵ the 75-year cumulative Sea Level Rise needs to be considered for commercial land uses. To account for the impact of sea level rise over the lifetime of the development a further uplift was calculated for the 2096 scenario based on the Higher Central allowance (70th percentile) of the UKCP 18 for 2100, RCP 8.5 dataset. Table 5-1 summarises the sea level rise uplifts applied to the tidal boundary conditions and the resulting peak tide levels.

Table 5-1 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
2096	0.711	7.08	7.40

5.1.2 Project Dragon Model Updates (2023)

For this FCA the tidal boundaries have not be updated from a base year of 2021 to 2023 for consistency with other recent FCA's in the area. From 2096 to 2098 an additional increase of 25mm is expected based of the UKCP18 dataset. This negligible difference is not expected to impact on the results. Therefore, the tidal boundaries have not been updated for these additional 2 years.

The model uses TUFLOW executable 2020-01-AB. Whilst it is acknowledged that this is not the most recent version of the software, subsequent software updates have focused on the TUFLOW HPC solver, not TUFLOW classic, which has been used as part of this modelling.

For the Project Dragon FCA, the initial conditions have been updated so that the use of restart files is no longer required. This is considered to be an improvement on the previous model as new initial conditions no longer need to be produced for each different model scenario as is the case when using restart files.

⁵ Welsh Government Guidance on Climate Change Allowances for Planning Purposes: <https://gov.wales/sites/default/files/publications/2018-11/flood-consequence-assessments.pdf>

Additional minor updates, include fixing the initial water level in the dock to the target level maintained by ABP (5.66mAOD) and removing duplicate points from the 1D Initial Water Level (IWL) layer which is used to specify the initial conditions for the 1D river channel.

There are a small number of 1D Negative depths present, however these occur at the start on the simulation. Whilst it would be preferable for these to not be present, their location at the downstream end of the River Afan, and occurrence at the start of the simulation means that they have no impact on the peak results at the site of interest.

The flood model and results were submitted to NRW for review prior to the completion of this assessment. This review concluded that the model results "are suitable to support an FCA". The NRW review certificate is contained in Appendix C.

The results for the 0.5% AEP plus climate change and 0.1% plus climate change were used to assess the risk of tidal flooding and 0.1% AEP defended events were used for this assessment to assess the risk of fluvial flooding. The results from these return periods are detailed below.

5.2 Fluvial Flood Risk

5.2.1 Baseline Flood Risk

0.1% AEP event

The baseline modelling shows that the land within the site is predicted to be flood free in the 0.1% AEP fluvial flood event, as shown in Figure 5-1. Flood water is confined to the docks with flooding within the red line boundary limited to the water compatible dockside structures immediately adjacent to the dock. There are no proposals to modify these structures or ground levels as part of this development.

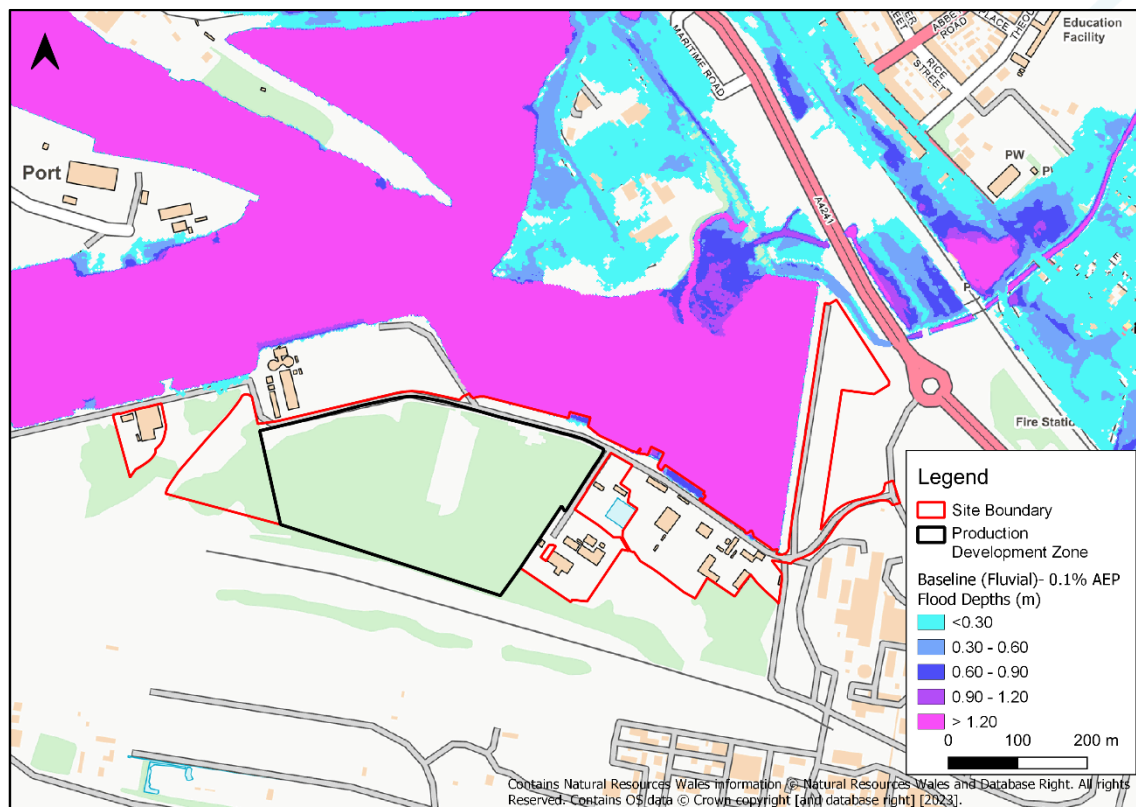


Figure 5-1 0.1% AEP flood depths

As the proposed development site is not predicted to flood in the 0.1% AEP, no further assessment of the post development scenario has been undertaken.

5.3 Tidal Flood Risk

5.3.1 Baseline Model Results

The present day 0.5% AEP and 0.1% AEP event show that the land within the site is predicted to be flood free and as a result, have not been presented.

0.5% AEP 2096 event

The baseline modelling shows that the land within the site is not predicted to flood in the 0.5% AEP 2096 tidal flood event, as shown in Figure 5-2. Flood water is confined to the docks with flooding limited to the water compatible dockside structures immediately adjacent to the dock. There are no proposals to modify these structures or ground levels as part of this development.

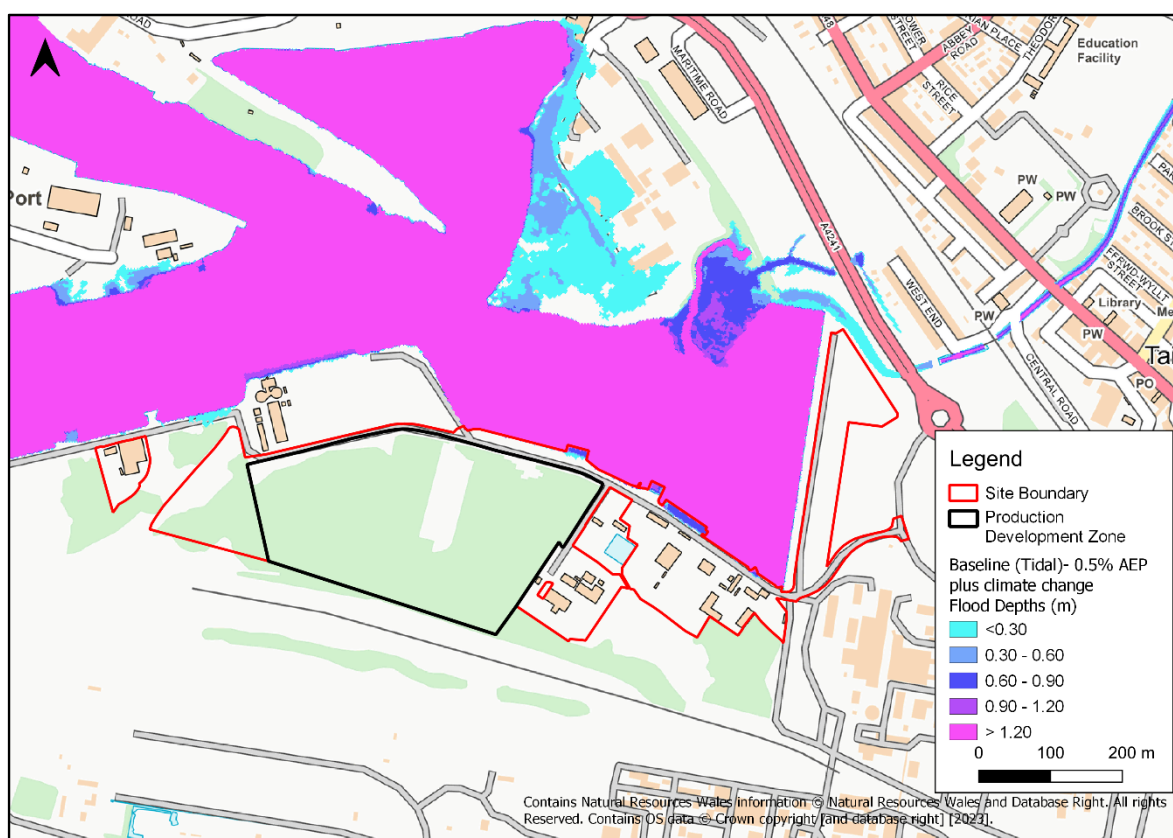


Figure 5-2 0.5% AEP plus climate change baseline flood depths

0.1% AEP 2096 event

Areas of the proposed Production Development Zone are predicted to flood in the 0.1% AEP 2096 event, as shown in Figure 5-3 below. During this event, the majority of the site is flood-free, with a small amount of flood water overtopping from the Port Talbot Docks onto the access roads to the north of the site and flowing in a southerly direction before ponding into the topographic depression in the north of the Production Development Zone. Predicted flood depths across the site are shallow and are less than 300mm with a maximum flood depth of 250mm. Water levels remain consistent across the site at a level of 7.30mAOD.

The Phoenix Way Supporting Infrastructure is predominantly at very low risk of flooding. A very small part of the access road is predicted to flood to depths of up to 4mm.

The Temporary Construction Area is not predicted to flood during this event.

The water compatible dockside structures immediately adjacent to the dock to the northern extent of Phoenix Way Support Infrastructure may be flooded in this event.

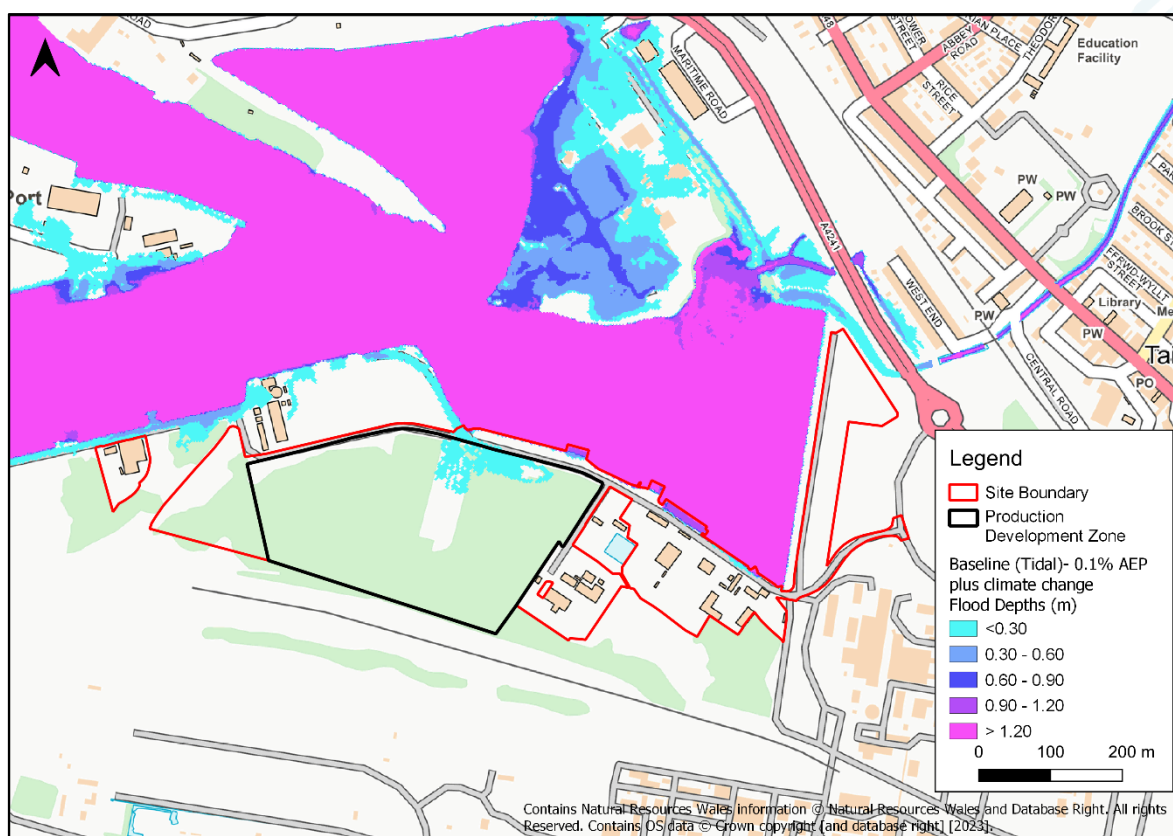


Figure 5-3 0.1% AEP plus climate change baseline flood depths

5.3.2 Post-Development Model Results

As a result of the predicted flood depths across the site in the 0.1% AEP 2096 event and engineering requirements of the project, ground levels across the Production Development Zone will be raised to a minimum ground level of 7.5mAOD. Most areas of the site already exceed this level. No changes in level to the Phoenix Way Supporting Infrastructure or the Temporary Construction Area are proposed.

As the proposed development site is not predicted to flood in the 0.5% AEP 2096 event, this event is not presented below for the post-development scenario.

0.1% AEP 2096 event

As a result of ground raising to the Production Development Zone, this area is predicted to be flood free in the 0.1% AEP 2096 event. The predicted flood extent for the 0.1% AEP 2096 event post-development scenario is shown in Figure 5-4.

As no changes in level are proposed to the Phoenix Way Supporting Infrastructure, this area is still predicted to flood to shallow depths, although these flood depths remain well within acceptable tolerances set out in TAN15. No level changes are proposed to water compatible dockside structures, therefore there will be no change in flood depths to this area.

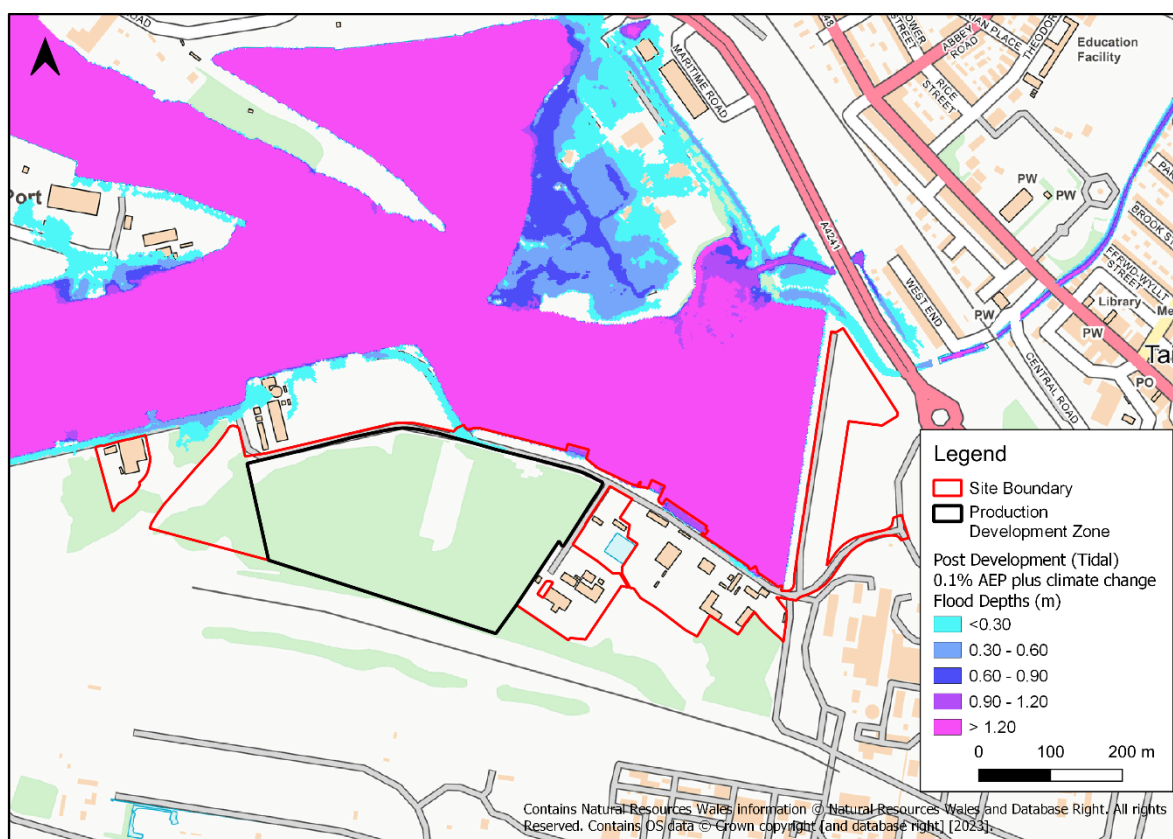


Figure 5-4 0.1% AEP plus climate change post development flood depths

5.3.3 Third-Party Impacts

TAN-15 Section 7.3 requires that new development should ensure 'minimal impact of the proposed development on flood risk generally'. Although TAN-15 provides little guidance on how off-site impacts should be assessed and evaluated, NRW has published guidance on 'Modelling for Flood Consequence Assessment'⁶, which provides guidance on the measurable limits of flood models and assessment of off-site impacts.

A comparison of maximum water depths from the baseline and post-development model results was undertaken to determine the impacts of the proposed development on off-site flood risk.

0.1% AEP 2096 event

Figure 5-5 shows the impact on water depths during the 0.1% AEP plus climate change tidal flood event. The analysis shows that there is no detrimental change to flood depths around the site resulting from the proposed development.

⁶ Modelling for Flood Consequence Assessments (Ref. GN028). Natural Resources Wales, Jan 2020

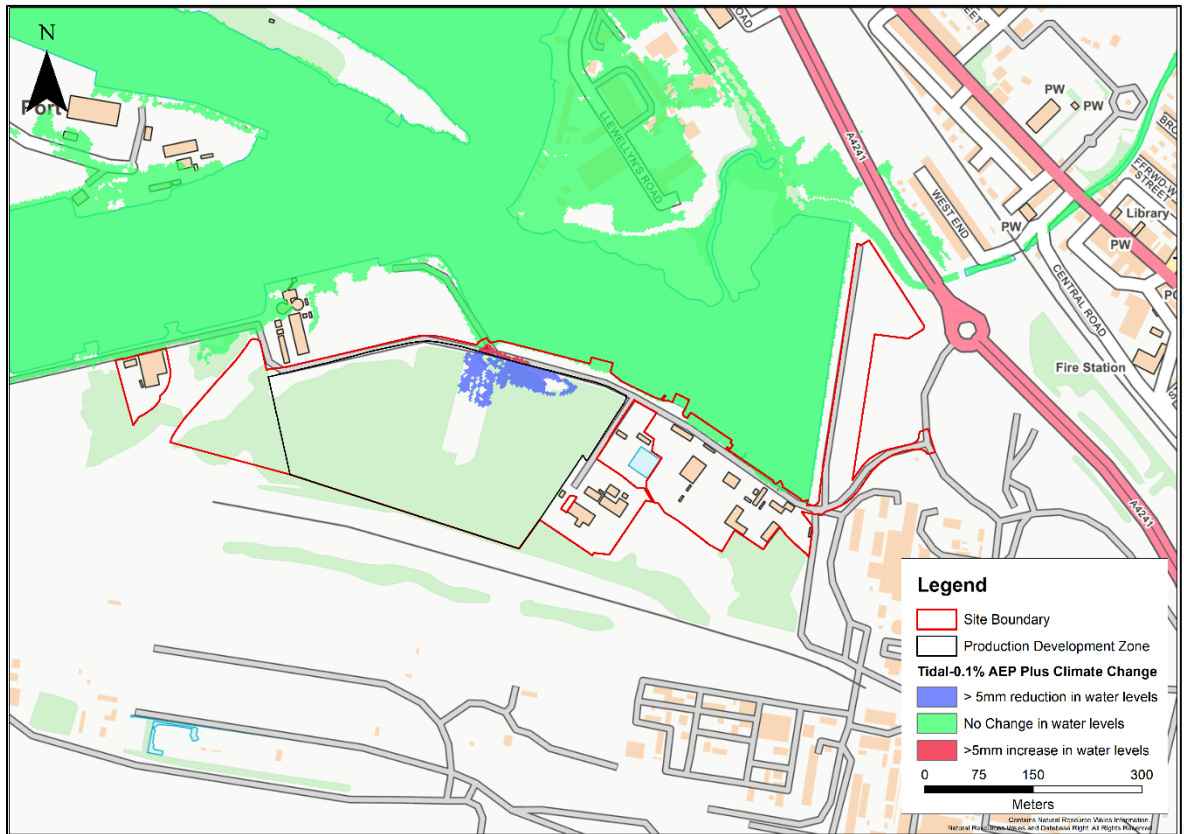


Figure 5-5 0.1% AEP plus climate change Depth Comparison Grid

6 Assessment of Acceptability Criteria

Table 6-1 below details the acceptability criteria required by TAN-15.

Table 6-1 TAN-15 Acceptability Criteria

TAN-15 Acceptability Criteria	Comments	Satisfied
Developer is required to demonstrate that the site is designed to be flood free for the lifetime 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 land within the proposed development site will be flood free in the 1% AEP plus climate change fluvial flood event and the 0.5% AEP plus climate change tidal flood event. In the area of the Phoenix Way Support Infrastructure, dockside structures within or immediately adjacent to the dock may be flooded. However, these shall be water compatible structures designed to cope with these conditions.	Yes
In respect of the residual risk to the development it should be designed so that in an extreme (1 in 1000 chance) fluvial flood event and 0.1 plus climate change tidal flood event there would be less than 600mm of water on access roads and within property.	In the 0.1% AEP fluvial flood event, the development will be flood free. In the 0.1% plus climate change tidal flood event, the proposed development will also be flood free following ground raising to a minimum ground level of 7.5mAOD. In the area of the Phoenix Way Support Infrastructure, dockside structures within or immediately adjacent to the dock may be flooded. However, these shall be water compatible structures designed to cope with these conditions.	Yes
No flooding elsewhere	The proposed development has no impact on flood risk to third parties (Section 5.2.3)	Yes
Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a 1 in 1000 chance of occurring in any given year).	The proposed development site is not protected by the presence of flood defences.	Yes
Effective flood warnings are provided at the site.	The site is not located in a Flood Warning or Flood Alert area due to the low flood risk. The proposed development site is predicted to be flood free under all conditions.	Yes
The developer must ensure	The site is predicted to be flood free	Yes

that future occupiers of the development are aware of the flooding risks and consequences.	therefore there is no risk of flooding to the site.	
Escape/evacuation routes are shown by the developer to be operational under all conditions.	In the 1% plus climate change fluvial flood event and the 0.5% plus climate change tidal flood event, safe access/egress from the site is maintained. In the most extreme and exceptional 0.1% AEP plus climate change tidal flood event, flooding is shallow and will not affect access to and from the site.	Yes
The development is designed by the developer to allow the occupier the facility for rapid movement of goods/possessions to areas away from flood waters.	The proposed development site is predicted to be flood free for all fluvial and tidal design flood events.	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 proposed development site is predicted to be flood free for all fluvial and tidal design flood events.	Yes

7 Conclusions

- JBA Consulting were commissioned by LanzaTech UK Limited to undertake a Flood Consequence Assessment to support a planning application for the construction of Sustainable Aviation Fuel production facility in the Port Talbot Docks.
- The proposed development site is located on land at Crown Wharf, Port Talbot Docks. It is set within an established heavily industrialised area and is bound to the north and east by a private road, to an unused section of railway line to the south and brownfield land to the west.
- The red line boundary includes the Production Development Zone, the Phoenix Way Supporting Infrastructure, and Temporary Construction Areas.
- Development proposals are *Demolition of existing structures and erection of a Sustainable Aviation Fuel (SAF) production facility, including enclosed ground flare, storage tanks, installation of pipework and electrical, processing and utility equipment, administration, warehouse and laboratory buildings, new access, car parking and transport infrastructure including a truck loading area and associated works, hard and soft landscaping, areas for temporary construction laydown, and associated development*
- The proposed site is located in Zone B of Natural Resources Wales (NRW) Development Advice Map (DAM). Zone B is defined as areas of the floodplain that is known to have flooded before, as evidenced by sedimentary deposits. Development within Zone B can occur subject to the acceptability of consequences being satisfied.
- The site is at little or no risk of flooding from reservoir failure and a low risk of groundwater and surface water flooding.
- The dominant flood risk to the site is tidal and fluvial. An updated detailed flood model of Port Talbot has been used to gain a better understanding of the potential implications of climate change on the risk of tidal and fluvial flooding. This model has been accepted by NRW as suitable to inform an FCA for the proposed development.
- During the pre-development scenario, the land within the PDZ is predicted to be flood free during the tidal 0.5% AEP plus climate change and fluvial 1% AEP plus climate change and 0.1% AEP events. Flood water is confined to the docks with flooding limited to the water compatible dockside structures within or immediately adjacent to the dock.
- During the 0.1% AEP plus climate change tidal event, the PDZ is predicted to experience shallow flooding, to a maximum depth of 250mm. To manage this, the ground levels of the site will be raised to a minimum ground level of 7.5mAOD, a level above the 0.1% AEP design event.
- In the post-development scenario, the PDZ is predicted to remain flood free during the 0.1% plus climate change tidal flood event as a result of ground raising works.
- A comparison of maximum water depths from the baseline and post-development model results was undertaken to determine the impacts of the proposed development on off-site flood risk. There will be no third-party impacts resulting from ground raising.
- In conclusion, this FCA demonstrates that the proposed development satisfies the Justification Test requirements, including managing flood risk in line with the acceptability criteria. It is therefore concluded that the development meets the principles and requirements set out in TAN15 and the aims of Planning Policy Wales.