

Chain Works Flood Consequence Assessment

Version 1

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This report describes work commissioned by Thomas Gronow on behalf of SA1 Business Park Ltd, by an email dated 2nd February 2022. Hannah Bard of JBA Consulting carried out this work.

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Purpose

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1 Introduction

JBA Consulting were commissioned by Craig Lloyd on behalf of SA1 Business Park Ltd to prepare a Flood Consequence Assessment (FCA) to support a planning application for the construction of 8 industrial units at the Chain Works, Fabian Way, Swansea. This FCA demonstrates the suitability of the proposed development and describes the flood mitigation measures recommended to manage flooding at the site.

1.1 FCA requirements

This FCA follows Welsh Government guidance on development and flood risk set out in the Technical Advice Note 15: Development and Flood Risk (TAN15). Where appropriate, the following aspects of flood risk should be addressed in all planning applications over their expected lifetime:

- The likely mechanisms of flooding
- The likely source of flooding
- The depths of flooding through the site
- The speed of inundation of the site
- The rate of rise of flood water through the site
- Velocities of flood water 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 site is part of the former Chain Works industrial site in Crymlyn Burrows to the east of Swansea, as shown Figure 2-1. The site is bounded to the east by Fabian Way (A483), Baldwin's Crescent to the south and west and commercial units to the north. including SBS Bodyshop, Deputy Dog Care and Fuel Rail. The wider site was formally an engineering factory and is now occupied by industrial units including Lloyds British testing, Deputy Dog Care and SBS Bodyshop. The site itself is dominated by bare ground of crushed stone and tarmac scalplings currently used for storage.

The former Chain Works site is situated approximately 350m north of Swansea Bay.

Table 2-1 summarises the key characteristics of the site.

Table 2-1: Site Summary

Site name	Chain Works
Site area	0.35ha
Existing land use	Storage and parking
Purpose of development	Industrial
OS NGR	SS 6944 9303
Local Planning Authorities	Swansea Council
Lead Local Flood Authority	Swansea Council

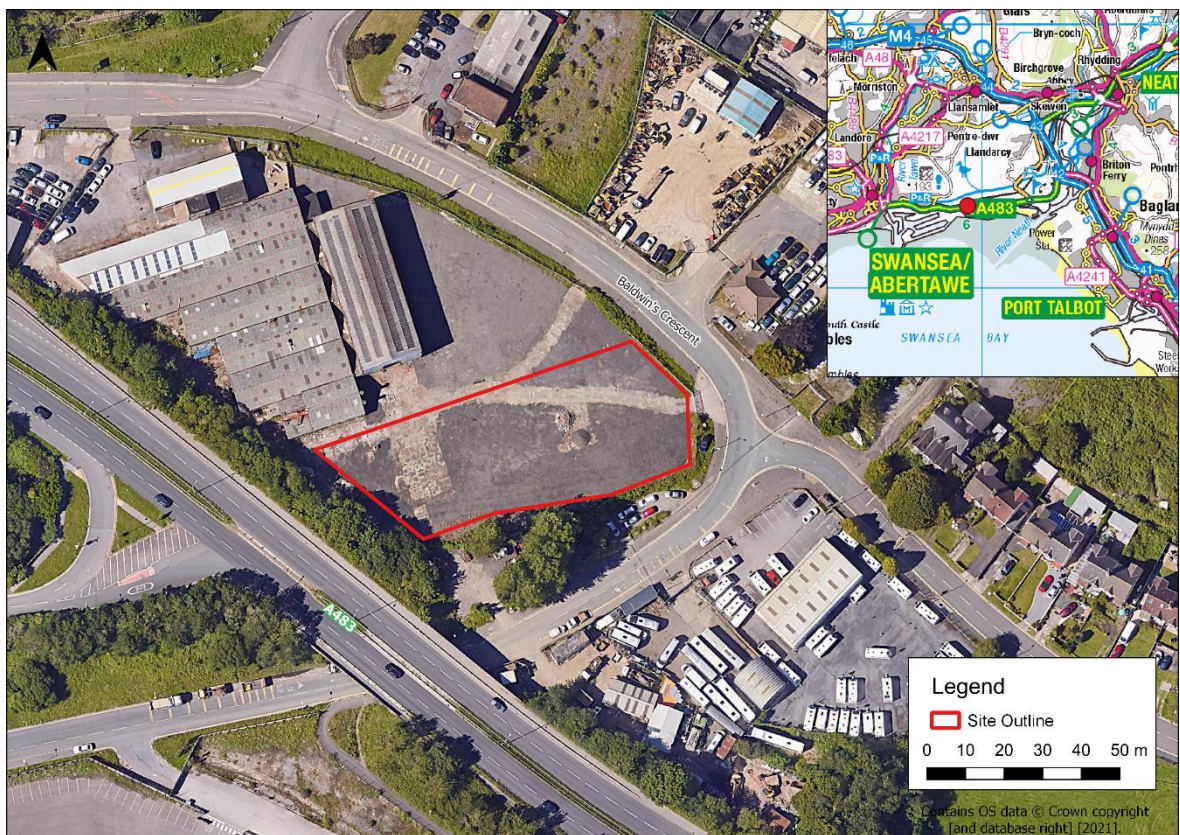


Figure 2-1 Proposed development site

2.2 Site topography

The Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data¹ across the site is shown in Figure 2-2. The LiDAR data shows the site slopes northwards varying between 7.3mAOD at the northern site boundary, to 8.1mAOD towards Baldwin's Crescent.

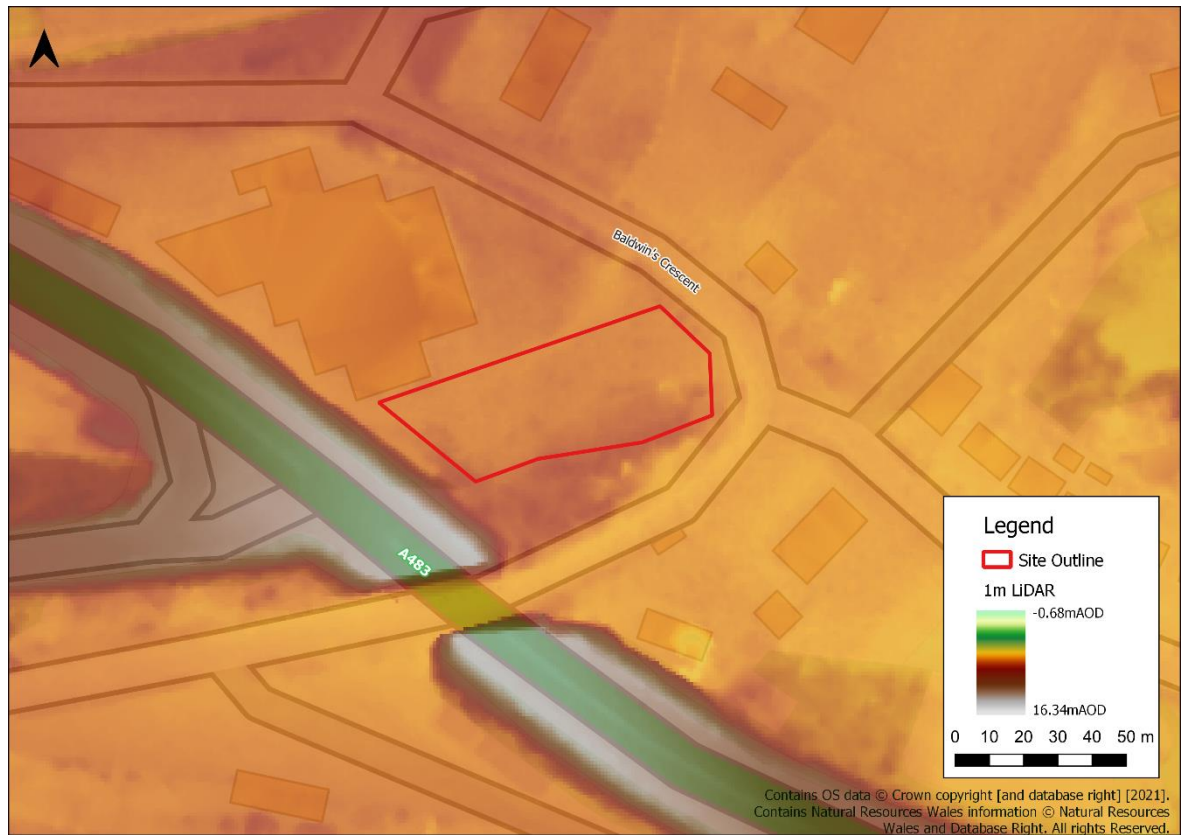


Figure 2-2: LiDAR Topographic data from NRW (1m resolution)

2.3 Soils and geology

The geology of the site has been assessed using the BGS Geology of Britain Viewer². The bedrock geology is shown to be South Wales Middle Coal Measures Formation comprised of mudstone, siltstone and sandstone. Superficial geology at the site is comprised of blown sand.

The soils on site have been assessed on the Cranfield University Soilscales Viewer³ and are shown to be loamy and clayey floodplain soils with naturally high groundwater.

¹ LLE Geoportal for Wales: <http://lle.gov.wales/catalogue/item/LidarCompositeDataset/?lang=en>

² Geology of Britain Viewer. <https://bgs.ac.uk/map-viewers/geology-of-britain-viewer/>

³ Cranfield Soilscales Viewer. <https://landis.org.uk/soilscales/>
HQJ-JBAU-XX-XX-RP-Z-0001-S3-P01-Chain_Works_FCA

2.4 Proposed development

Development proposals for the Chain Works are to erect a row of 8 industrial units consisting of a monopitch roof and a light portal frame constructed on pad foundations. Each unit will have a designated parking space immediately north. The proposal aims to utilise the existing access track to the north of the site leading from Baldwins Crescent. The proposed development layout is shown in Figure 2-3.



Figure 2-3 Layout of proposed development

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.

PPW uses a series of Technical Advice Notes to provide more guidance on areas of planning and development in Wales. Technical Advice Note 15 (TAN15), introduced by the Welsh Government in 2004, provides technical guidance relating to development planning and flood risk in Wales.

The initial requirements of TAN15 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 tests.

An update for TAN15 was released in October 2021 and was due to come in force on the 1st December 2021. However, Welsh Government have since suspended the implementation of the new TAN15 until 1st June 2023. Section 3.4 recognises the draft Flood Map for Planning, which will be applied with the updated TAN15. Although the new TAN15 is not a material consideration, Welsh Government and NRW are advising that some consideration is given to the draft Flood Map for Planning (FMfP) as best available information. Therefore, where a site is located in a FMfP flood risk zone it is recommended that an FCA is carried out, even where the site is not shown to be at risk on the Development Advice Map.

3.2 Vulnerability classification

As shown in Table 3-1, TAN15 assigns one of three flood risk vulnerabilities to development. As this development is proposed for residential purposes it is classified under TAN15 as a 'less vulnerable' development.

Table 3-1: Development categories as defined by TAN15

Development category	Types
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 (e.g. power stations, chemical plants, incinerators), and waste disposal sites.
Less vulnerable development	General industrial , employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

3.3 Development Advice Map classification

The Development Advice Map (DAM) created by the Welsh Government is used to trigger different planning actions based on a precautionary assessment of flood risk. Figure 3-1 shows that the site is located outside of any DAM flood zones, effectively placing the site in Zone A of the DAM. Zone A is described as areas “*Considered to be at little or no risk of fluvial or tidal/coastal flooding*” and is “*Used to indicate that justification test is not applicable and no need to consider flood risk further*”⁴.

Under normal circumstances an FCA would not be required for development in Zone A.

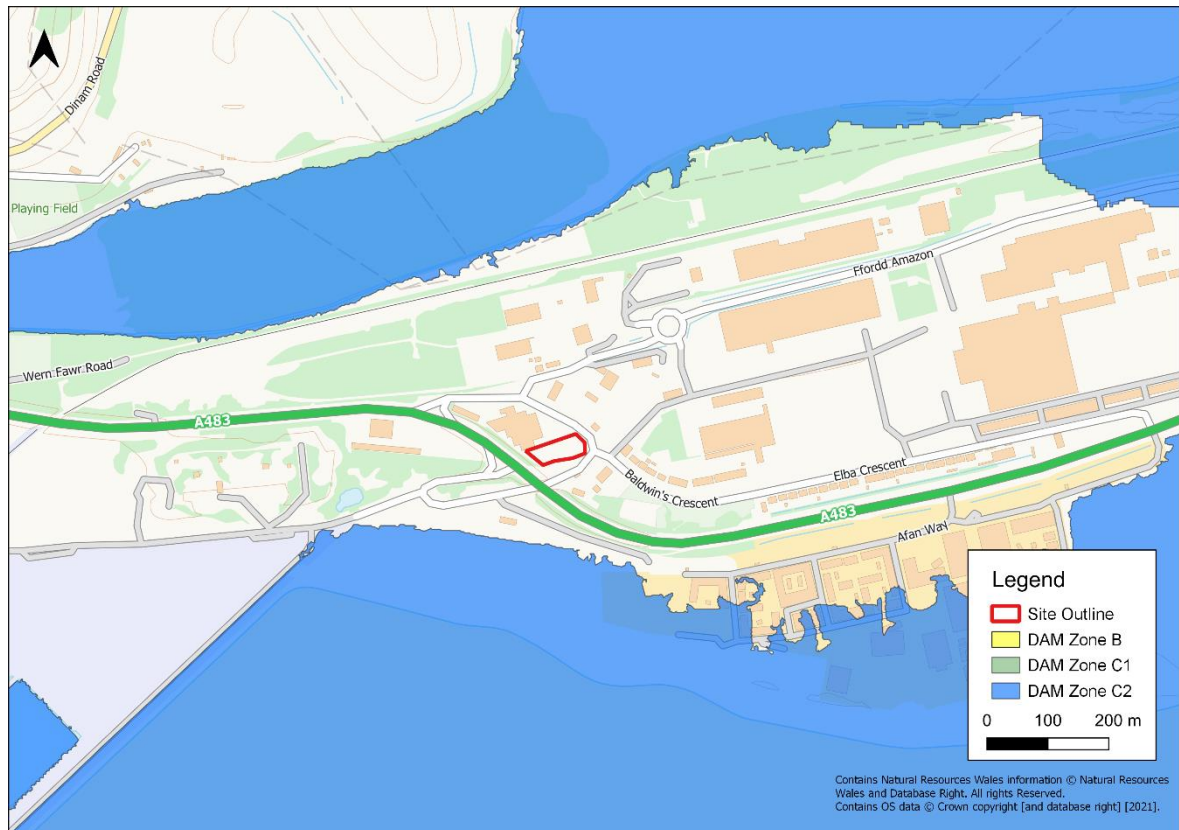


Figure 3-1: Development Advice Map

3.4 Flood Map for Planning

The new TAN15 will replace the DAM with the Flood Map for Planning (FMfP), which will be used to trigger different planning actions based on a precautionary assessment of flood risk. Importantly the FMfP includes for the predicted effects of climate change, whereas the DAM did not. This difference is particularly important in coastal locations where rising sea levels can significantly extend the extent of flood risk.

The site is located in Flood Zone 1 of the Flood Map for Planning for Rivers. This means that there is less than a 0.1% Annual Exceedance Probability (AEP) chance of fluvial flooding in any given year, including climate change. This is shown by a transparent layer on the Flood Map for Planning and as such a map has not been provided in this assessment.

As shown in Figure 3-2, the majority of the site is located in Flood Zone 3 of the Flood Map for Planning for the Sea. This means the site has a greater than 0.5% (1 in 200) chance of flooding tidal flooding in a given year, including the effects of climate change. These flood

⁴ Extracts from Figure 1 of TAN15 (2004)

zones assume 100 years of climate change, whereas the lifetime of development for less vulnerable is typically 75 years.

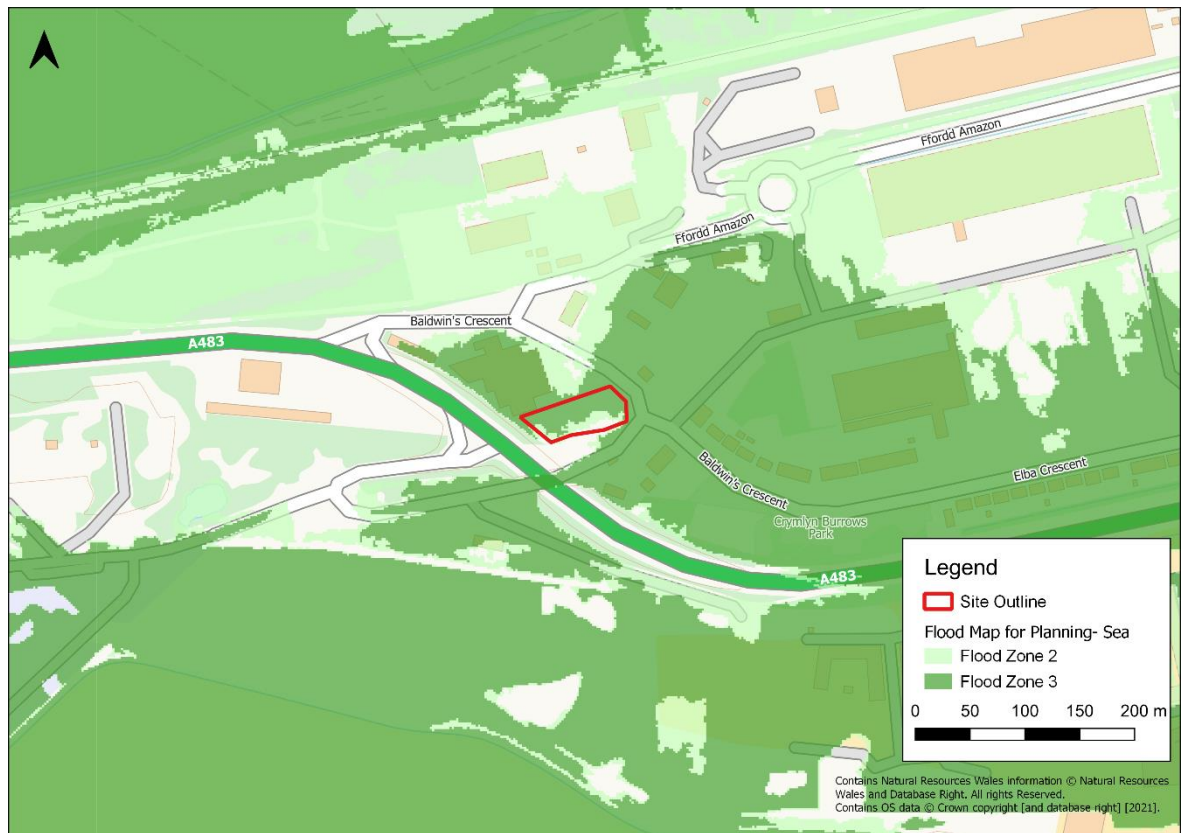


Figure 3-2 Flood Map for Planning – Sea

The majority of the site is in Flood Zone 1 of the Flood Map for Planning for Surface Water and Small Watercourses, as shown in Figure 3-3. This means that there is less than a 0.1% Annual Exceedance Probability (AEP) chance of flooding from these sources in a given year. A small area on the northern boundary of the site is however located in Flood Zone 2, between a 0.1% and 1% chance of flooding from surface water and small watercourses in a given year.

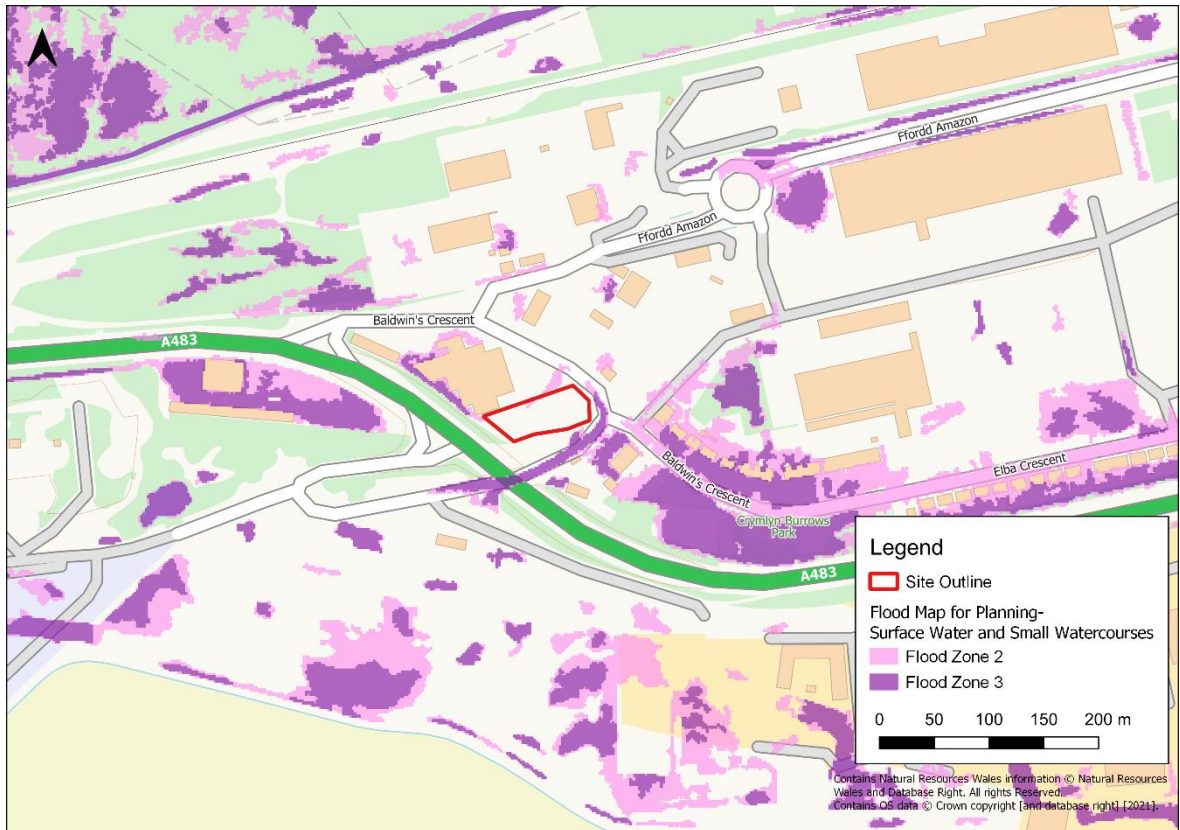


Figure 3-3 Flood Map for Planning – Surface Water and Small Watercourses

In a letter dated 14th January 2022, NRW clarified how they intended to respond to development management consultations, where flood risk is a material consideration. In particular, the letter stated:

'If a site is shown to not be at risk of flooding on the DAM but it is shown to be at risk of on the new Flood Map for Planning, our substantive response will be 'concerns' and we will recommend an FCA is submitted in support of the planning application. Where these concerns are not appropriately addressed, we are likely to object to the development'

As shown in Figure 3-1 and Figure 3-2 above, the site is shown not to be at risk of flooding on the DAM but it is shown to be at risk of on the new Flood Map for Planning. This Flood Consequence Assessment has therefore been prepared in line with NRW guidance.

3.5 Local Development Plan

The Swansea Local Development Plan (LDP), adopted in 2019 provides land use policies and proposals to encourage sustainable growth within the Swansea Council area until 2025.

The proposed development will contribute to the Sustainable Employment Strategy (PS 4) which aims to create 13,600 additional jobs over the plan period using allocated mixed use Strategic Development Areas.

The proposed development site is located in strategic development site K (SD K), Fabian Way Corridor. SD K is allocated for mixed commercial, residential and employment development, including 12 hectares of potential development accommodating business, general industrial and storage or distribution uses. Within SD K, the former Chain Works are located within an area allocated for employment land or under flexible review.

Furthermore, Regeneration and Commercial Development 10 (RC 10) encourages proposals for employment use to be developed on the land protected as part of the County's employment land bank. The proposed development is industrial and therefore complies with policy RC 10.

3.6 Justification Test

As the site is located in Zone A of the DAM, the Justification Tests do not apply. However, for completeness Table 3-2 below summarises how the proposed development would meet the requirements set out within the Justification Test. All of the criteria have been satisfied with regards to the proposed development.

Table 3-2: Justification Test applied to the proposed development

TAN 15 Justification Criteria	Comments	Achievable?
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 assist with the relevant policies listed in the Local Development Plan and will contribute to employment objectives in Swansea.	✓
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 is on the former Chain Works site and is currently used for storage.	✓
A Flood Consequence Assessment has been produced to demonstrate that the potential consequences of a flood event up to the extreme flood event (1 in 1000 chance of occurring in any year) have been considered and meet the [Acceptability Criteria] ... in order to be considered acceptable	An assessment of the flood consequences at the site has been undertaken to demonstrate the proposed development's acceptability. See Section 4 and Section 5.	✓

4 Flood risk assessment

This section assesses the risk to the proposed development from all sources of flooding, the risk of increased flooding to others, and how flood risks can be managed. As a Level 1 FCA, the flood risk assessment is based solely on a desk-based analysis of existing flood risk data.

4.1 Review of existing flood risk data

The latest available information on flood risk at the site, published by Natural Resources Wales (NRW) is summarised in Table 4-1 below.

Table 4-1: Summary of flood risk

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	×	The site is in at very low risk of flooding from rivers (Section 4.3).
Flood Risk from the Sea	×	The site is at very low risk of tidal flooding (Section 4.4).
Flood Risk from Surface Water and Small Watercourses	×	The site is at very low risk of surface water flooding (Section 4.5).
Flood Risk from Groundwater	×	The site is at very low risk of flooding from groundwater (Section 4.6).
Flood Risk from Reservoirs	×	The site is not at risk of flooding from reservoirs (Section 4.7).
Flood Risk from Sewers	×	There is no evidence to suggest that the site is at risk of flooding from sewers (Section 4.8).

4.2 Historical flooding

The site is not located within NRW's historic flood outline. The City and County of Swansea Flood Risk Management Plan⁵ (2015) highlights that St Thomas is one of the top communities at risk from surface water flooding in Swansea. In particular, there is a high risk of flooding on Fabian Way due to ordinary watercourses and the intakes to existing surface water culverts. There is however no specific mention of historic flooding to the proposed development site itself.

⁵ City and County of Swansea Flood Risk Management Plan 2015 <https://www.swansea.gov.uk/article/9578/Flood-Risk-Management-Plan-2015>

4.3 Flood risk from rivers

The site is at **very low risk** of flooding from rivers according to NRW's Flood Risk Assessment Wales (FRAW) Flood Risk from the Rivers map shown in Figure 4-1. This means that there is less than a 0.1% AEP chance of fluvial flooding in any given year.

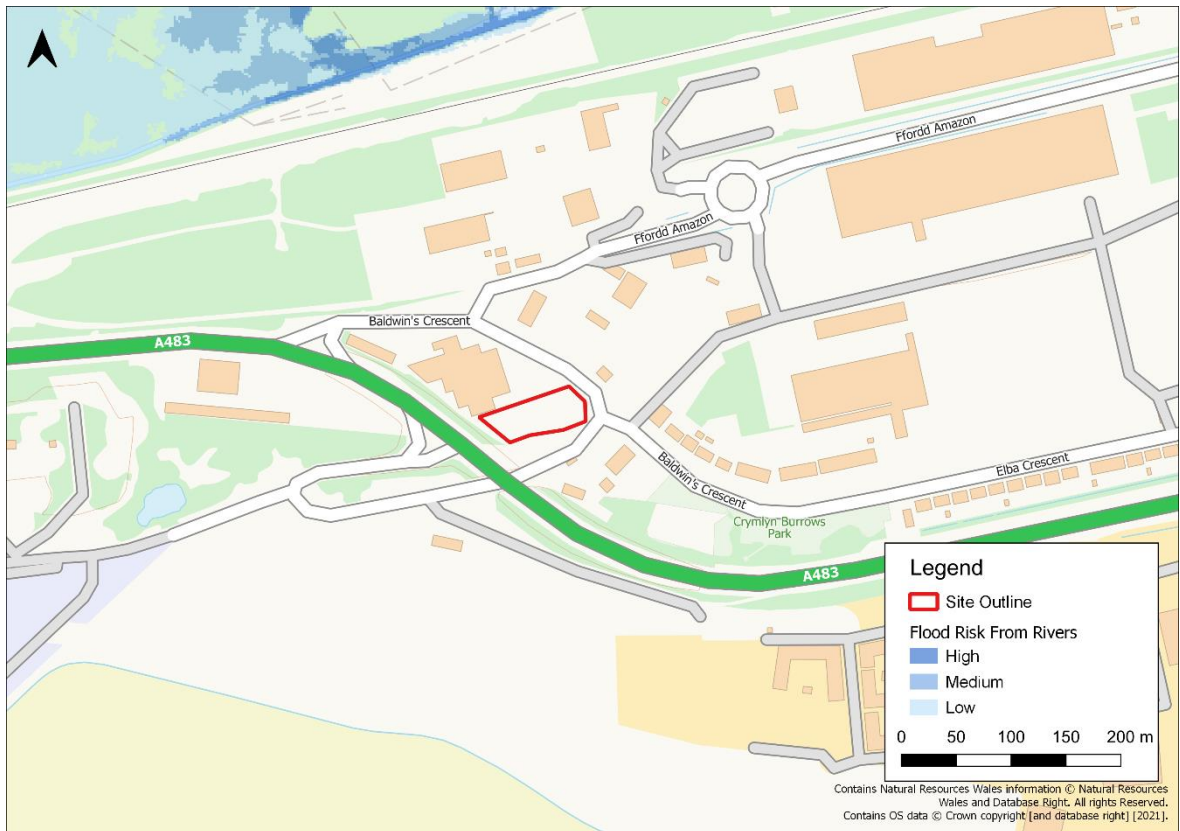


Figure 4-1 Risk of flooding from rivers

4.4 Flood risk from the sea

The site is at **very low risk** of flooding from rivers according to NRW's Flood Risk Assessment Wales (FRAW) Flood Risk from the Sea map shown in Figure 4-2. This means that there is less than a 0.1% AEP chance of tidal flooding in any given year.

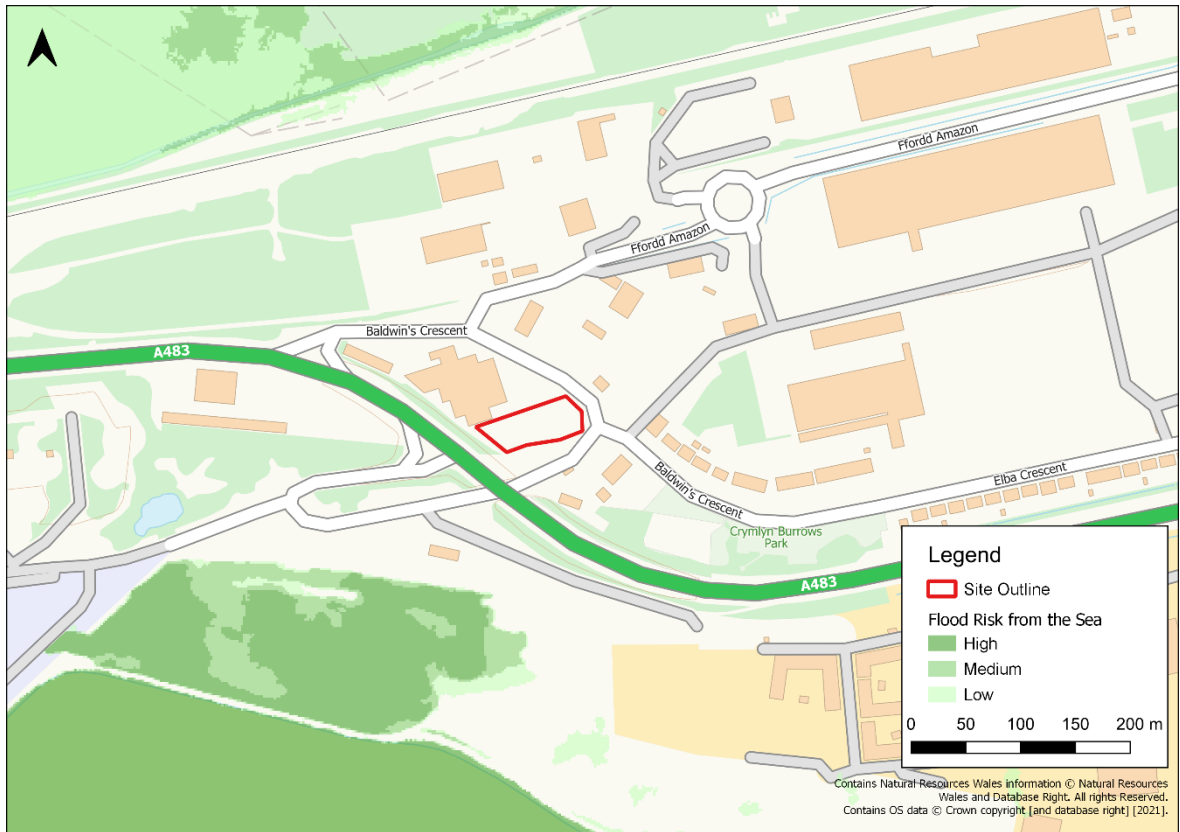


Figure 4-2 Risk of flooding from the sea

4.5 Flood risk from surface water and small watercourses

The site is at **very low risk** of flooding from rivers according to NRW's Flood Risk Assessment Wales (FRAW) Flood Risk from the Surface Water and Small Watercourses map shown in Figure 4-3. This means that there is less than a 0.1% AEP chance of flooding from these sources in any given year.

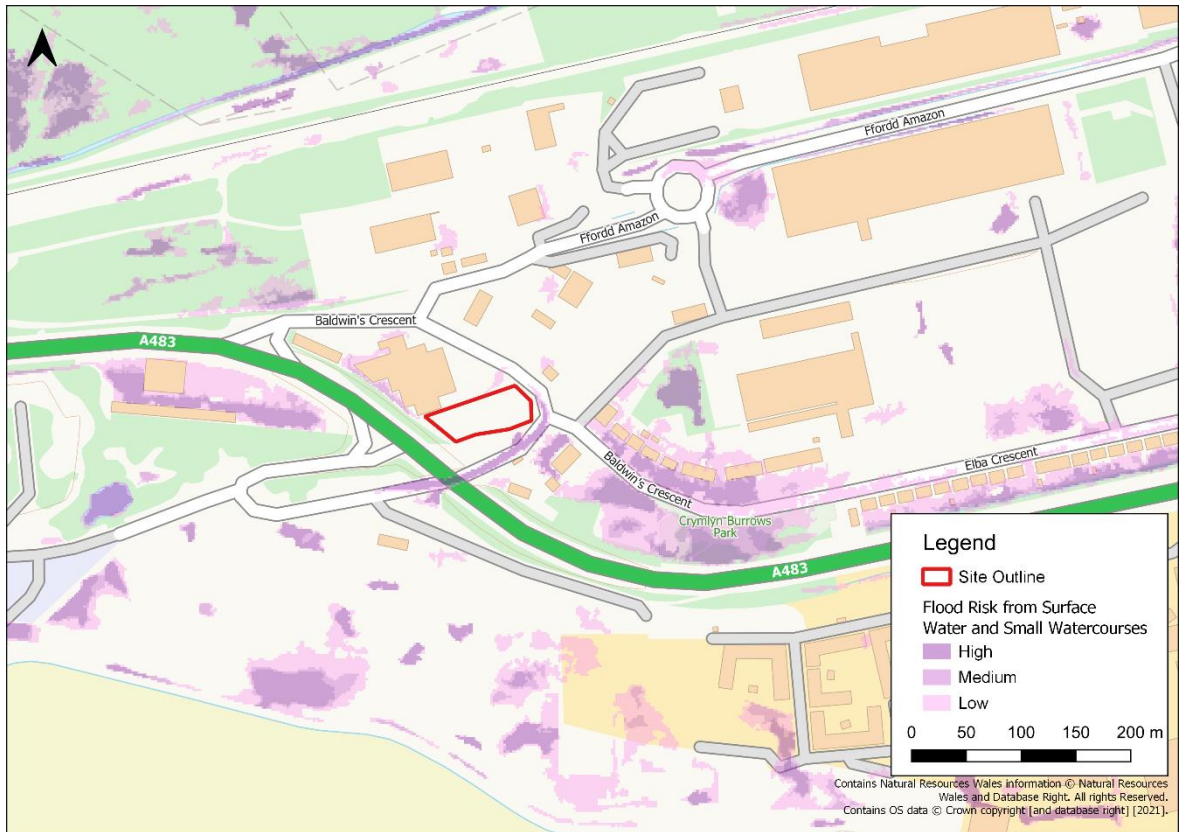


Figure 4-3: Risk of flooding from surface water and small watercourses.

4.6 Flood risk from groundwater

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerging 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.

The City and County of Swansea Local Flood Risk Management Strategy⁶ states '*the risk of groundwater flooding is greatest in areas with significant coal mining. However, the majority of the former coal mining areas within the City and County of Swansea are understood to be fully recovered and therefore are not considered to present a significant risk of flooding*'. The preliminary flood risk assessment shows the site, and its surrounding area has a low (less than 25% chance) risk of flooding from groundwater. The risk of groundwater flooding at the site is therefore considered to be **very low**.

4.7 Flood risk from reservoirs

Given the absence of any nearby reservoirs, the NRW's reservoir flood map shows the site, and its surrounding area is not at risk of reservoir flooding. This is shown by a transparent layer on the NRW mapping and as such a map has not been provided in this assessment.

4.8 Flood risk from sewers

The City and County of Swansea Local Flood Risk Management Strategy⁶ states '*sewer flooding is expected to occur in some areas of the City and County of Swansea during a storm*

⁶ City and County of Swansea Local Flood Risk Management Strategy, 2010. <https://www.swansea.gov.uk/floodstrategy>

event which is less severe than a 1 in 30-year event'. However, the strategy does not show any evidence of historic sewer flooding on or close to the development site. It can therefore be concluded that the risk of sewer flooding at the site is **very low**.

5 Detailed assessment of tidal flood risk

5.1 Detailed hydraulic modelling

As the Flood Map for Planning identifies tidal flooding is the main flood risk to the site, a more detailed assessment of tidal flooding has been carried out to understand predicted flood depths at the site. Extreme sea level estimates have been calculated and mapped for the 0.5% and 0.1% AEP events, for the present day (2022) and with 75 years lifetime of development (2097).

5.2 Extreme sea level estimates

Extreme sea level estimates have been taken from the Environment Agency Coastal Flood Boundary Conditions for UK Mainland and Islands; Design Sea Levels (ref. SC060064)⁷. Extreme sea level predictions are provided at node locations at approximately 2km spacing along the coastline. For this assessment the closest extreme sea level node is Node 484 located to the south of Swansea Bay, approximately 2.6km from the site. The extreme sea level estimates for this node are shown in Table 5-1:

Table 5-1 Extreme sea level estimates (2017)

Event (AEP)	Predicted sea level (mAOD)
0.5%	6.37
0.1%	6.66

For all coastal locations, future sea level rise is a major consideration and should be applied to the extreme sea level estimates. Welsh Government guidance suggests that the lifetime of a development for an industrial site is 75 years and so extreme sea level estimates have been uplifted to include sea level rise to 2097.

The UKCP18 User Interface⁸ has been used in accordance with Welsh Government Guidance on Climate Change Allowances for Planning Purposes (September 2021)⁹ to provide climate change uplifts for Swansea Bay. The cumulative increase in sea level has been calculated between 2017 and 2022 to uplift extreme sea level estimates to present day, and then furthermore to 2097. The climate change uplifts applied to the extreme sea level estimates are shown in Table 5-2.

Table 5-2 Cumulative sea level rise

Period	Cumulative sea level rise (m increase)
2017-2022	0.03
2017-2097	0.72

Using the extreme sea level estimates and climate change uplifts calculated in Table 5-3, the predicted still water levels have been mapped (tidal projection mapping) for the 0.5% AEP and 0.1% AEP events in 2097.

⁷ UK Government (2019) Coastal flood boundary conditions for the mainland UK coasts and islands <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/coastal-flood-boundary-conditions-for-the-mainland-uk-coasts-and-island>

⁸ UK Climate Projections User Interface. <https://ukclimateprojections-ui.metoffice.gov.uk/ui/home>.

⁹ Welsh Government. Flood Consequences Assessment: Climate Change Allowances (Sept 2021) https://gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf.

Table 5-3 Predicted tidal flood levels

Event (AEP)	2022 Still Water Level (mAOD)	2027 Still Water Level (mAOD)
0.5%	6.40	7.09
0.1%	6.69	7.38

This method of predicting tidal flood risk does not truly represent the hydraulic connectivity of areas to tidal water, but rather assumes the same water levels is maintained across all areas irrespective of the distance from the coast for intervening landform features for structures. It is therefore important to note that tidal projection modelling is typically conservative by nature.

5.3 Tidal flood risk

Depth grids, using 1m LiDAR Digital Terrain Model (DTM) data and the predicted still water levels, were created to determine the predicted the depth and extent of flooding at the proposed development site for the events in Table 5-3.

5.3.1 0.5% AEP Event (2027)

As shown in Figure 5-1, the site is predicted to be flood free in the 2027 0.5% AEP event. There are maximum flood depths of 370mm along Baldwin's Crescent to the south of the site boundary.

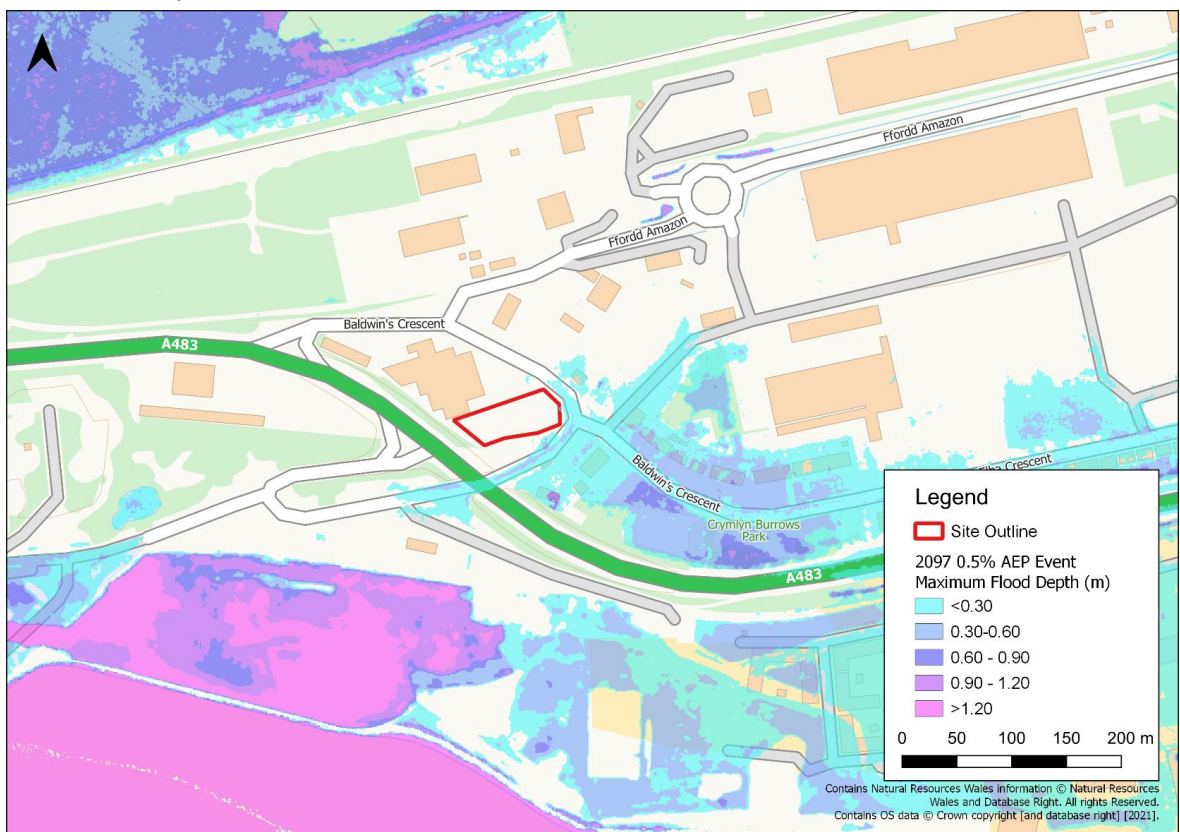


Figure 5-1 0.5% AEP event maximum flood depth

5.3.2 0.1% AEP Event (2097)

As shown in Figure 5-2, the site is predicted to flood at the northern and eastern boundaries of the site. Maximum flood levels across the site are predicted to be 7.38mAOD resulting in maximum flood depths of 120mm.

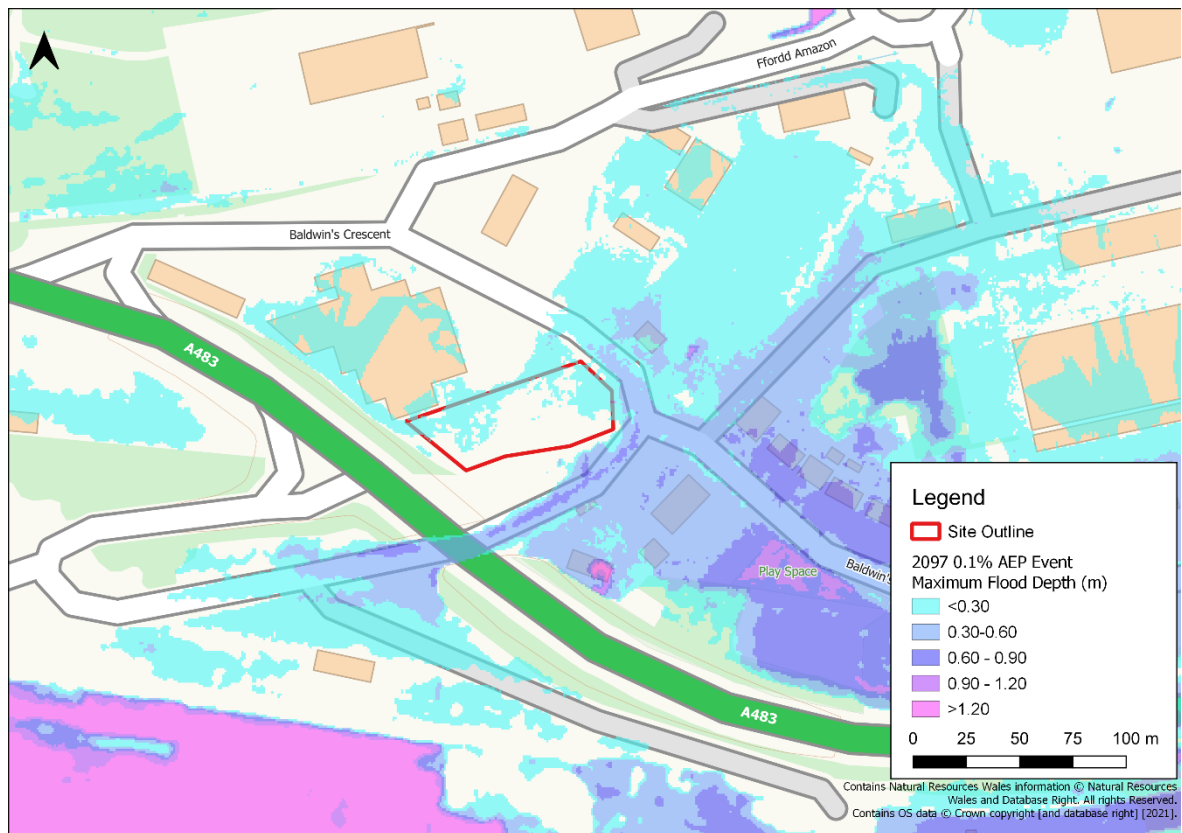


Figure 5-2 0.1% AEP event 2097

5.4 Flood risk summary and compliance with TAN15

As shown in Table 5-4, the proposed development is predicted to be flood free in the 2022 0.5% AEP, 2022 0.1% AEP and 2097 0.5% AEP events. Tidal projection modelling shows the site is predicted to flood to a maximum depth of approximately 120mm in the 0.1% AEP 2097 event. However, this flooding would be largely located in areas proposed for parking. The most eastern and western industrial units may be at some flood risk in the event depending on their final finished floor level, which are likely to be built up above existing ground levels.

TAN15 states the maximum depth of flooding for an industrial unit is 1000mm. The flood depths modelled are well below this in all scenarios. The flood risk is therefore well within the recommended tolerable limits of TAN15 A1.15.

Table 5-4 Predicted flood depths

Event	Still Water Level (mAOD)	Flood depth on site (mm)
2022 0.5%	6.40	0
2022 0.1%	6.69	0
2097 0.5%	7.09	0
2097 0.1%	7.38	120

6 Assessment of Acceptability Criteria

Table 6-1 assesses the proposed refurbishment against the acceptability requirements.

Table 6-1 Acceptability Criteria for TAN15

TAN15 Acceptability Criteria	Comments	Assessment
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% AEP) chance (fluvial) and 1 in 200 (0.5%) chance (tidal) flood event including an allowance for climate change in accordance with TAN15 Table A1.14.	The site is predicted to be flood free during the 2097 0.5% tidal flood event and all fluvial flooding events.	✓
In respect of the residual risk to the development it should be designed so that in an extreme (1 in 1000 chance) [0.1% AEP] event there would be less than 600mm of water on access roads and within the property, the velocity of any water flowing across the development would be less than 0.4m/s.	The site is flood free in the 0.1% AEP 2022 event. In the 0.1% AEP 2097 event flood depths are predicted to be approximately 120mm.	✓
No flooding elsewhere	The proposed development does not increase flood risk elsewhere as it is not possible to displace tidal flood waters.	✓
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).	There are currently no flood defences which benefit the site	N/A
The developer must ensure that future occupiers of the development are aware of the flooding risks and consequences.	Upon sale or transfer of the land to new occupiers, the developer should inform occupiers of flood risk at the site.	✓
Effective flood warnings are provided at the site.	The site is not located within an NRW Flood Warning or Flood Alert Area due to the present level of flood risk.	N/A
Escape/evacuation routes are shown by the developer to be operational under all conditions.	The development proposes to utilise the existing car park and access route to Baldwins Crescent. This area remains flood free in all events except the 0.1% AEP 2097 event where there are areas of flooding to depths of approximately 100mm. However, due to the nature of flooding a greater lead time (>24	✓

	hours) is available to allow for safe evacuation.	
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.	If goods need to be removed from the building the tidal nature of flooding provides a long lead time (> 24 hours). Furthermore, all units are likely to be constructed above the 2079 0.1% AEP event flood level.	✓
Development is designed to minimise structural damage during a flood event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of a flood.	The structure should be able to withstand the shallow flood waters that will be present in the 2079 0.1% AEP event.	✓

7 Conclusions

- JBA Consulting were commissioned by Craig Lloyd on behalf of SA1 Business Park Ltd to prepare a Flood Consequence Assessment (FCA) to support a planning application for the construction of 8 industrial units at the Chain Works, Fabian Way, Swansea.
- The proposed development will have a 'less vulnerable' development vulnerability classification.
- The proposed development lies in Zone A of the Natural Resources Wales (NRW) Development Advice Map (DAM). Zone A is described as areas "*Considered to be at little or no risk of fluvial or tidal/coastal flooding*" and is "*Used to indicate that justification test is not applicable and no need to consider flood risk further*".
- The development lies within Flood Zone 3 of the draft Flood Map for Planning for the Sea. Consequently, the FCA has been prepared on a precautionary basis as advised by NRW.
- NRW's Flood Risk Assessment Wales maps shows the site has a very low risk of all sources of flooding.
- Extreme sea level calculations and tidal projection mapping, shows the site to be flood free in the 0.5% AEP event with an allowance for climate change and flood to depths of 120mm in the 0.1% AEP event with an allowance for climate change, assuming a 75 year lifetime of development.
- This FCA has demonstrated that all aspects of the acceptability criteria set out in TAN15 have been satisfied. Consequently, we conclude that on the grounds of flood risk, the proposed development meets the requirement set out in TAN15 and the aims of Planning Policy Wales.

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