Adventure Parc Snowdonia FCA

Date 09/12/2024

Prepared for:

Global Shred Ventures UK ltd

www.jbaconsulting.com

Document Status

Issue date	09/12/2014
Issued to	Adam Lamond
BIM reference	NWS-JBA-XX-XX-RP-C-0001-A3-C01-Adventure_Parc_Snowdonia_FCA
Revision	V 4.1
Prepared by	Sam Brown BEng MSc GMICE Assistant Analyst
Reviewed by	Howard Keeble MPhil BEng BSc CEng CWEM CSci CEnv MICE MCIWEM MCMI Technical Director
Authorised by	Kevin Frodsham BSc BA MSc PhD Project Manager

Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

Contract

JBA Project Manager	Kevin Frodsham
Address	Phoenix House, Lakeside Drive, Centre Park, Warrington WA1 1RX
JBA Project Code	2024s1292

This report describes work commissioned by UK Shred Ventures Ltd, by an instruction dated 1st August 2024. The Client's representative for the contract was Adam Lamond of Global Shred Ventures UK Ltd. Sam Brown and Howard Keeble of JBA Consulting carried out this work.

Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Flood Consequence Assessment for the sole use of Global Shred Ventures UK Ltd and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Global Shred Ventures UK Ltd for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by JBA has not been independently verified by JBA, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Flood Consequence Assessment was undertaken between (12th November and 09 December 2024) and is based on the conditions encountered and the information available during this said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

JBA disclaims any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to JBA's attention after the date of the Report.

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. JBA specifically does not guarantee or warrant any estimates or projections contained in this Report.

Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Copyright

© Jeremy Benn Associates Limited 2024

Contents

List of Figures

List of Tables

Abbreviations

DAM- Development Advice Maps

NRW- Natural Resources Wales

FCA- Flood Consequence Assessment

LiDAR- Light Detection and Ranging

TAN- Technical Advice Note

AEP- Annual Exceedance Probability

1 Summary

This Flood Consequence Assessment (FCA) is a comprehensive assessment of flood risk to the Adventure Parc Snowdonia site. The proposed adaptation of the site includes the installation of a new wave generation technology and installation of 21 holiday lodges.

The FCA is based on reinstatement of any low spots to the 6.86m AOD level in accordance with the 2014 Planning Approval and subsequent construction.

Works are planned within the extent of the previously constructed embankments and an area of local bank settlement will be topped-up to the approved 2014 minimum level. This design was previously reviewed by a reservoir panel engineer and signed off as low risk, further information is available from Global Shred Ventures UK Ltd.

The previous design for the lagoon, (Figure 3-2) was put forward and accepted with the supporting "Surf Snowdonia at Dolgarrog" FCA from 2014. The design included raised land levels and a bund around the eastern end of the lagoon to manage flood risk. This layout reflects the agreed 2014 Planning Approval for the Surf Snowdonia site.

Based on both current (2004) and emerging (2021) TAN15 guidance, further modelling has been completed for this FCA. Full details on the latest 2024 modelling are included in the accompanying modelling report and summarised in Section 6 of this FCA.

It should be noted that some settlement has occurred since land raising following the 2014 Planning Approval. The applicant completed a survey in October 2024 to confirm crest and land levels that form the current basis of the Adventure Parc Snowdonia site. Prior to any construction phase, the applicant will reestablish the agreed minimum land level of 6.86m AOD in accordance with the 2014 Planning Approval.

For completeness, an updated modelling assessment has been undertaken (refer to the associated flood modelling report for full details). Based on the modelling, it is noted that all tidal and fluvial events up to a 0.1% AEP event do not cause flooding based on baseline / current levels.

When localised ground levels are reinstated to 6.86m AOD, the latest modelling demonstrates no flooding during the design fluvial or tidal 0.1% with climate change AEP events.

The site under the TAN 15 (2004) DAM maps is located within Flood Zones B and C2. However, the raised ground levels and bund at the Adventure Parc Snowdonia site, as previously agreed for the 2014 Planning Approval means that the site is now served by significant infrastructure, including flood defences (C1). Modelling indicates that the constructed defences will prevent the Adventure Parc Snowdonia site from flooding in a future 0.1% AEP event. Access and egress can be maintained during all design events.

Whilst previous Flood Zone mapping has not included a full representation of either the current or consented site topography across the Adventure Parc Snowdonia site, the latest

updated modelling demonstrates that the Adventure Parc Snowdonia site is not located within either Flood Zone 2 or 3, at consented levels.

The Afon Conwy is considered the significant flood risk in the area. Flood risk is managed by perimeter defences and raised land.

The information presented in this FCA and associated modelling appraisal report demonstrates the actual flood risk to the area during tidal and fluvial events. This demonstrates that the Adventure Parc Snowdonia site is not reliant on the Conwy flood defences to mitigate flood risk.

Redevelopment of the Adventure Parc Snowdonia site is a reuse of an existing facility. Modelling demonstrates that redevelopment is not at risk of flooding during an extreme 0.1% with climate change AEP event. Redevelopment in accordance with proposals for the Adventure Parc Snowdonia site are not at flood risk.

2 Introduction

2.1 Overview

This Flood Consequence Assessment (FCA) has been prepared following instruction from Adam Lamond, on behalf of Global Shred Ventures UK Ltd, by email dated 19 November 2024. The FCA is based on a combination of Natural Resources Wales' (NRW's) open data flood maps and includes new hydraulic modelling and flood mapping.

Adventure Parc Snowdonia's intended development involves alterations to the lagoon, wave machine, the construction of 21 holiday lodges and refurbishment of an activity centre.

2.2 Scope

This FCA includes an assessment of flood risk at Adventure Parc Snowdonia. Review of flood risk for re-development proposals are based on existing information, supplemented with updated modelling based on NRW's existing Conwy Valley (2023) hydraulic model.

3 Site location

3.1 Site location and description

Global Shred Ventures UK ltd is seeking to redevelop the existing surfing lagoon with updated wave generation technology to create a new surfing experience, engineering works to infill part of the surfing lagoon together with associated landscaping and siting of 21 lodges. Refurbishment and extension to the existing Adrenaline Indoors building to house a new leisure attraction along with all associated site infrastructure and external works.

The site is located in Dolgarrog (postcode LL32 8QE) and the red line boundary for the development is shown in Figure 3-1. The 18.5-hectare site is located within a developed area with the Hilton Garden Inn Snowdonia to the north, and Clark Street and some commercial buildings to the south. Within the wider area, the Adventure Parc Snowdonia site is surrounded by the Afon Conwy floodplain and fields to the south and east, whilst to the north of the site is the hydro-electric power station operated by RWE / Npower. Access to the site is via the B1056 (Conway) road or Clark Street to the south of the site.

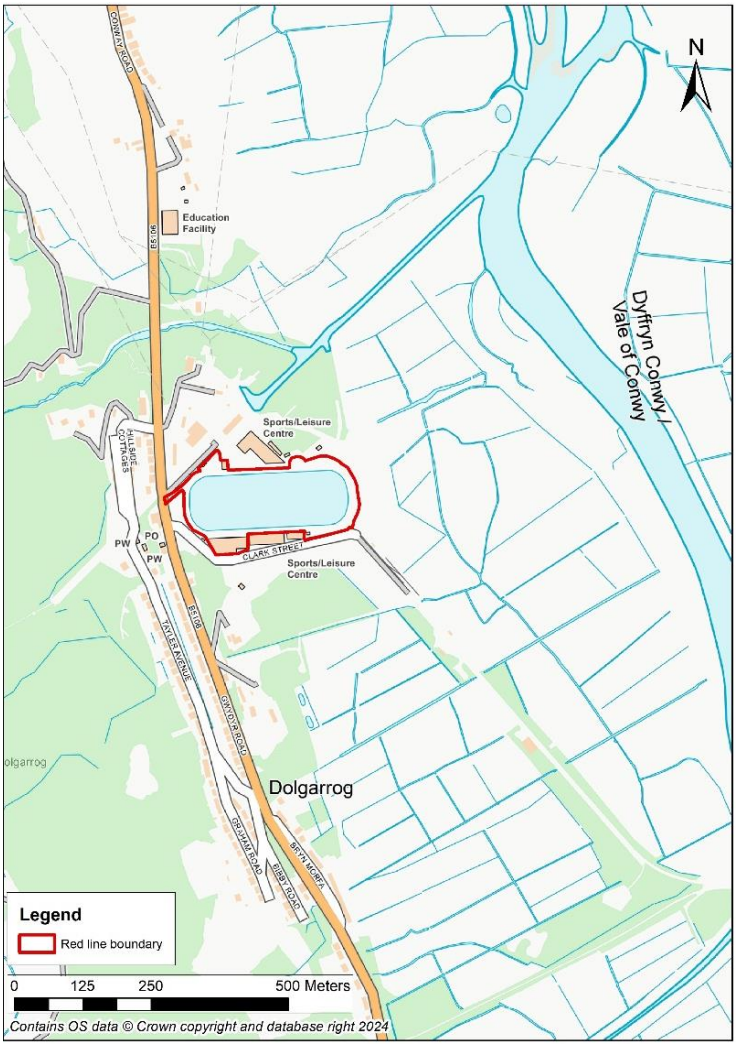


Figure 3-1 Redline boundary

The Afon Conwy is 700m to the east of the site with the Afon Porth-llwyd around 200m to the north of the site. Both rivers are tidally influenced at this point. Multiple reservoirs are connected to the Afon Porth-llwyd by two large supply pipes. These flows power the hydro power station before the water discharges back into the Afon Porth-llwyd.

3.2 Existing Site Layout

The original design for the lagoon (as shown in Figure 3-2), was put forward and accepted with the supporting "Surf Snowdonia at Dolgarrog" FCA (final version dated February 2014). The design included raised land levels and a bund around the perimeter of the lagoon to manage flood risk. The lagoon was also equipped with an overflow drain to the northwest of the site. The raised bund and ground levels, lagoon design, construction and inspections where all reviewed by a qualified panel engineer with documentation available from Global Shed Ventures UK Ltd. Figure 3-2 reflects the agreed 2014 Planning Approval for the Surf Snowdonia site, which was developed based on a 100-year development lifetime. Subsequent phases of development at the site (approved in 2019) have included the construction of the Hilton Garden Inn Snowdonia and erection of camping pods. The activity lagoon is currently unused.

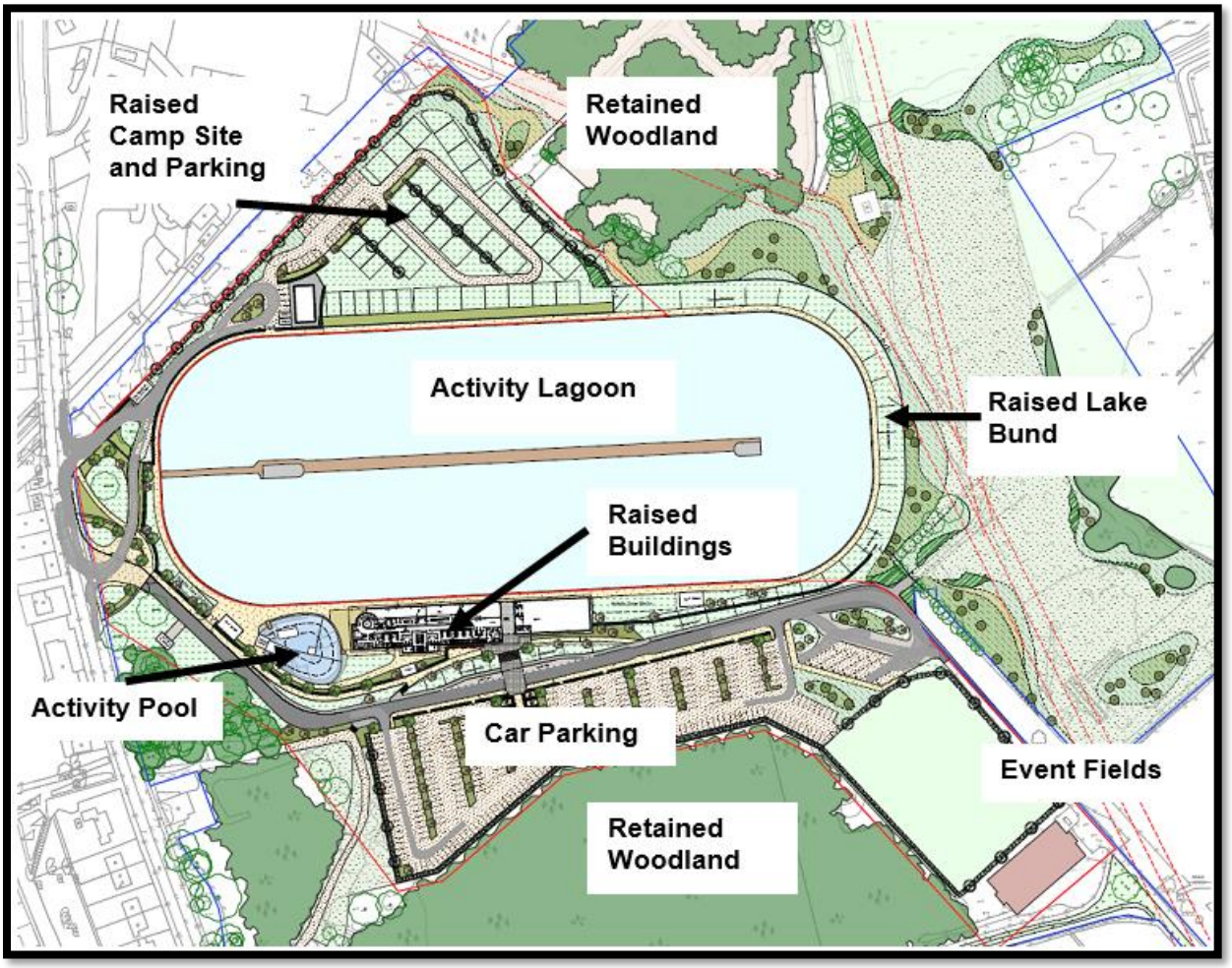


Figure 3-2 Approved 2014 site layout plan

3.3 Current topography

The lagoon is surrounded by raised ground in accordance with the survey/LiDAR data as shown in Figure 3-3.

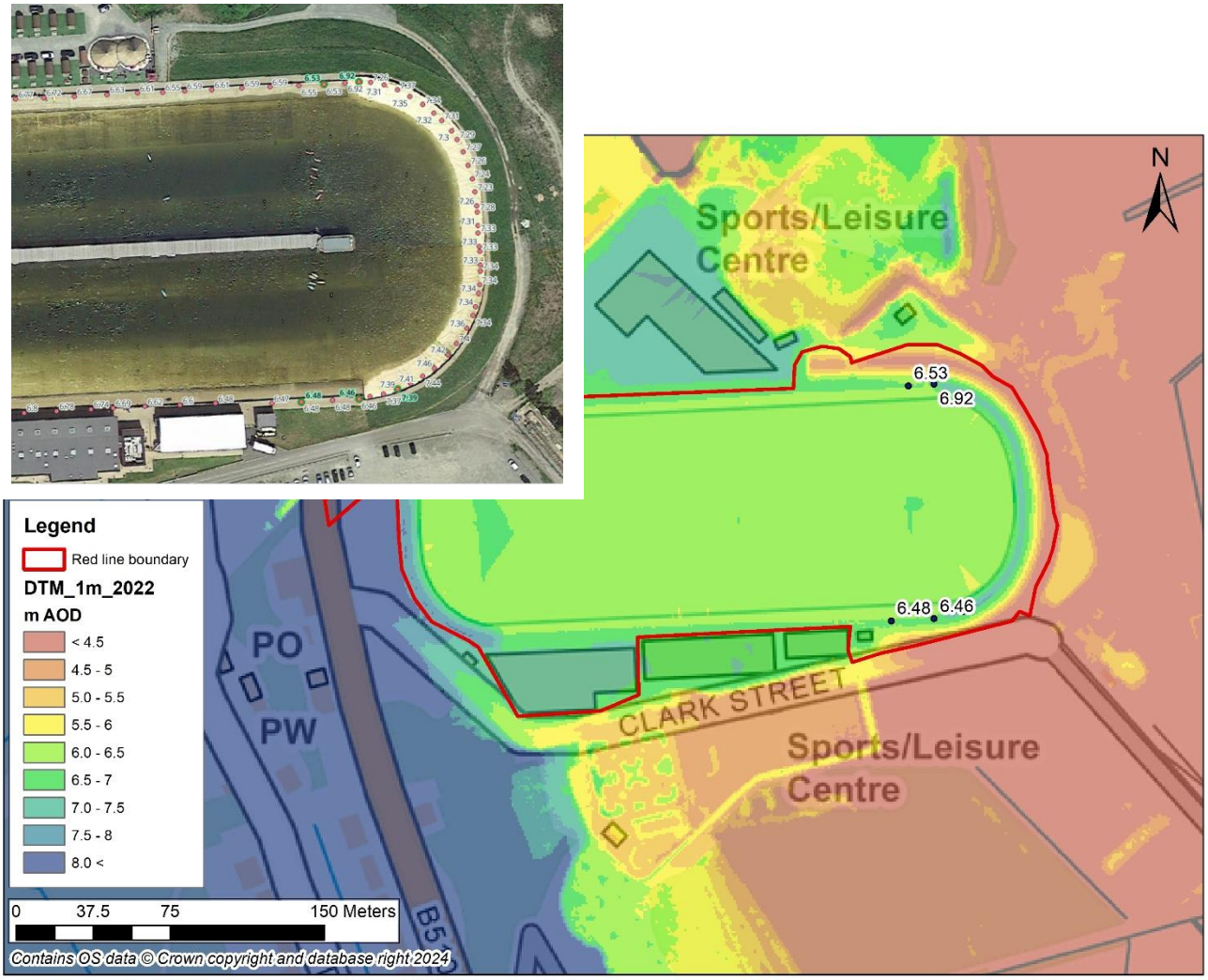


Figure 3-3 Site Lidar

Adventure Parc Snowdonia is surrounded by areas of raised land with a bund at the eastern end. The lowest point of the raised bund is 6.92m AOD and the highest point on the raised bund is 7.39m AOD. The lowest point on the perimeter land of the site is currently 6.48m AOD, which is a result of local settlement, and this will be reinstated to the previously approved minimum ground level of 6.86m AOD.

The surrounding land naturally slopes towards the northeast, with the floodplain to the east of the site being approximately 4.33m AOD. Meanwhile, the land to the west of the site increases to a high point of 8.7m AOD. The B5106 runs north-south along the east side of the site at around 9.5m AOD.

3.4 Site development history

The site was originally the home to Dolgarrog Aluminium Works from 1907 until its demolition in 2009. After the aluminium works ceased operations, the site was redeveloped as the current Surf Snowdonia Park which opened in 2015. Surf Snowdonia featured a proprietary wave generator that required specialized parts for maintenance. Due to the high costs of repair, the facility became unviable, leading to the disuse of the lagoon.

Land raising was an agreed measure for this development and included raising land 600mm above the previously modelled highest flood level to a minimum level of 6.86mAOD.

3.5 2024 Proposed Development

The proposed 2024 site layout is included as Figure 3-4. The works include:

- Reinstatement of localised ground levels to the previously agreed 6.86m AOD level.
- Redevelopment of the existing surfing lagoon to include updated wave generation technology.
- Engineering works to infill part of the surfing lagoon together with associated landscaping and siting of 21 lodges.
- Refurbishment and extension to the existing Adrenaline Indoors building to house a new leisure attraction along with all associated site infrastructure and external works.

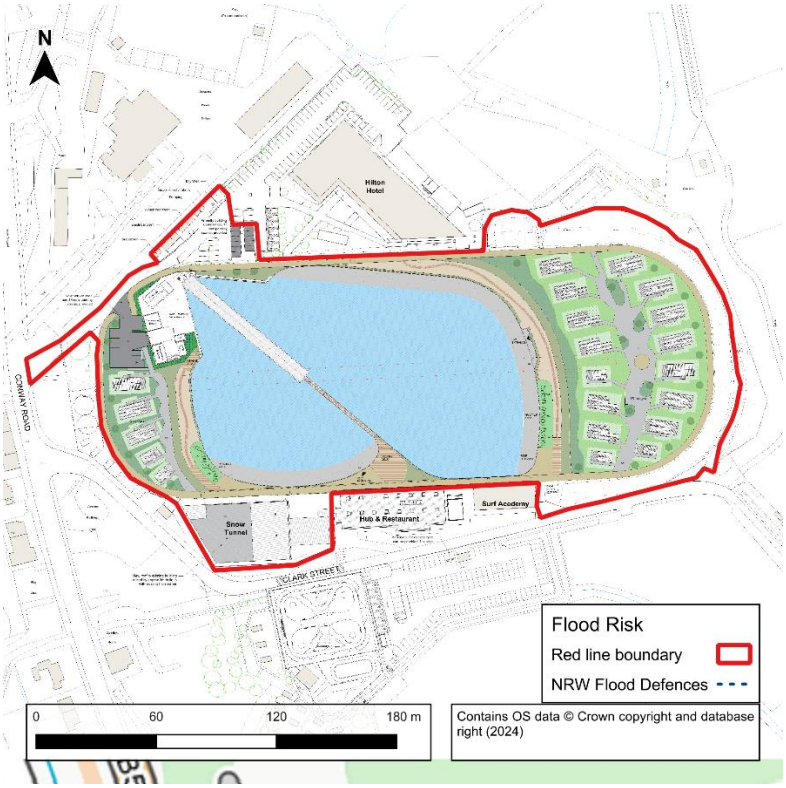


Figure 3-4 2024 Proposed site layout

4 Planning Policy

4.1 2014 Site

Planning Approval for development, including consideration of flood risk and land raising, has previously been accepted for the Surf Snowdonia Park in 2014. Current proposals are based on a reuse of previously agreed perimeter ground levels as a means of managing flood risk.

4.2 Current development policy

Guidance provided in Technical Advice Note (TAN) 15, dated December 2004, is used in the determination of planning applications by Local Planning Authorities (LPAs) in Wales with respect to flood risks.

4.3 TAN15 2004 (overview)

Under TAN15 2004, NRW Development Advice Maps (DAM) are used as the basis against which to assess the flood risk to development sites. The DAM is split into three zones (A, B & C, with the latter split into zones C1 (areas of floodplain that are served by significant infrastructure including flood defences) and C2 (areas of floodplain without significant flood defence infrastructure)), for which specified planning tests are required.

New development should, where possible, be directed away from Zone C towards suitable land in Zone A, otherwise to Zone B, where river or coastal flooding will be less of a potential risk.

In Zone C, the tests outlined in sections 6 and 7 (of TAN15) will be applied, recognising that highly vulnerable development and Emergency Services in Zone C2 should not be permitted.

In this instance, the original 2014, and updated 2024, modelling demonstrates that the Adventure Parc Snowdonia site is defended from flooding during events including the extreme 0.1% with climate change design event.

Proposals involve constructing 21 holiday lodges which are classified as "Highly Vulnerable" under the TAN15 (2004) guidance. Based on modelling, the development will not be at risk of flooding during all design events including breach defence failure scenarios along the Afon Conwy.

4.4 TAN15 2021 (overview)

The emerging TAN15 2021 (dated December 2021) proposes that the Flood Map for Planning, which presents Flood Zones for different sources of flooding, should be used as the basis against which to assess flood risk to development sites. This highlights that the Flood Map for Planning is likely to be the more up-to-date guidance than the DAM and is considered the best source of flood risk information.

Implementation of the 2021 TAN is still under review. The proposed holiday lodges would also be classed as 'Highly Vulnerable' under TAN15 2021.

The current revision of TAN15 2021 (as of June 2024) includes key guidance with respect to site development and flood risk.

4.5 TAN 15 (2004) Summary for Highly Vulnerable development

The guidance for local planning authorities is outlined in "Summary of what TAN15 requires for highly vulnerable development (houses) to be considered acceptable." This document outlines the necessary justification and acceptability criterion which are as follows:

Justification Criteria:

1. Should be located only in an area of flood risk which is developed and served by significant infrastructure, including flood defences (Zone C1 of the DAM)

(FCA response - Modelling demonstrates that the site is not at risk of flooding. Raised land and bunds will prevent inundation during the extreme 0.1% with climate change AEP event.)

2. 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

(FCA planning response - The application site is allocated in the Conwy LDP as a mixed tourism/residential site as a major previously developed site under policy "POLICY TOU/2 – NEW SUSTAINABLE TOURISM AND RECREATIONAL DEVELOPMENT")

3. 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).

(FCA planning response - Proposals are for the redevelopment of previous Surf Snowdonia Site as Adventure Parc Snowdonia.)

4. 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 criteria below to be considered acceptable.

(FCA response - 2024 modelling demonstrates that the site will not flood during a 0.1% with Climate Change AEP event from fluvial or tidal sources. Breach assessment demonstrates that flood risk to the development area is not dependent on the Afon Conwy flood defences.

4.5.1 Acceptability Criteria

The following criterion must be met:

- 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 year).

(FCA response - the applicant has confirmed that the previously agreed bund design and construction have been overseen by a Reservoir Panel Engineer. Settlement in ground levels will be reinstated to the agreed level of 6.86m AOD prior to redevelopment.)

- The cost of future maintenance for all new/approved flood mitigation measures, including defences must be accepted by the developer and agreed with Natural Resources Wales.

(FCA response - the applicant has confirmed that the defence condition and defence level will be maintained for the lifetime of the development in accordance with the requirements of the 2014 Planning Approval.)

- The developer must ensure that future occupiers of the development are aware of the flooding risks and consequences.

(FCA response - whilst the site is not at direct risk of flooding, flood risk awareness shall be incorporated into the site management plan for visitors.)

- Effective flood warnings are provided at the site

(FCA response - refer to previous.)

- Escape/evacuation routes are shown by the developer to be operational under all conditions

(FCA response - refer to previous. Safe egress can be maintained)

- Flood emergency plans and procedures produced by the developer must be in place

(FCA response - refer to previous. Development is not at direct risk of flooding during the 0.1% with climate change AEP event.)

- The development is designed by the developer to allow the occupier the facility for rapid movement of goods/possessions to areas away from floodwaters.

(FCA response - not applicable as no direct flooding)

- 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.

(FCA response - not applicable as no direct flooding)

- No flooding elsewhere.

(FCA response - not change in development footprint agreed under the 2024 Planning Approval)

- Developer is required to demonstrate that the site is designed to be flood free for the lifetime (A1.5) of development for either a 1 in 100 chance (fluvial) flood event, or a 1 in 200 chance (tidal) flood event including an allowance for climate change (depending on the type of flood risk present) in accordance with table A1.14.

(FCA response - requirement exceeded as the development is not at direct risk of flooding during the 0.1% with climate change AEP event.)

- In respect of the residual risk to the development it should be designed so that over its lifetime (A1.5) in an extreme (1 in 1000 chance) event there would be less than 600mm of water on access roads and within properties, the velocity of any water flowing across the development would be less than 0.3 m/second on access roads and 0.15m/second in properties, and the maximum rate of rise of floodwater would not exceed 0.1m/hour. (see table A1.15).

(FCA response - requirement exceeded as the development is not at direct risk of flooding during the 0.1% with climate change AEP event.)

4.6 Guidance for developing housing in Flood Zone 3

Section 4 of TAN 15 (2021) outlines constraints to developing in Flood Zone 3 for 'Highly Vulnerable' uses.

"…flooding consequences associated with highly vulnerable development *(in FZ3)* are not considered to be acceptable. Plan allocations must not be made for such development and planning applications not proposed. Flood Consequences Assessments (FCAs) should not be prepared as there is no requirement for Natural Resources Wales to provide advice."

Section 10 outlines the need to be free of flooding in a 1% AEP (1 in 100-year return period) fluvial event and a 0.5% AEP (1 in 200-year return period) tidal event, with allowance for climate change.

Again, in this instance modelling undertaken for this FCA demonstrates that the Adventure Parc Snowdonia site is not at risk of inundation during the extreme 0.1% with climate change AEP event.

4.6.1 Adventure Parc Snowdonia proposal

Further modelling has been undertaken to confirm flood extents as part of this FCA. The outcomes and mapping are presented in Section 6 of this report.

This latest modelling (as summarised in the associated modelling report) demonstrates that the new wave machine and associated holiday lodges will remain outside Flood Zones 2 and 3. Owing to the previous design and construction there will remain no significant off-site impacts.

As previously outlined, the C2 designation does not include the previously agreed flood defences and land raising at the Adventure Parc Snowdonia site. Effectively the site is

defended by significant flood defence infrastructure, as per the 2014 Planning Approval and subsequent construction. The site is, therefore, within defended C1.

The Adventure Parc Snowdonia site (as of 2014) has already been designed to remain free from flooding during the 1% AEP event, including allowances for climate change. The 2024 modelling also demonstrates that the site will remain free from flooding during the extreme 0.1% with climate change allowance event.

4.7 Climate change allowances used in FCA

Climate change allowances are explained in the associated modelling report that supports this FCA. The Welsh Government publishes updates on how climate change should be assessed for flood risk studies in Wales. The latest version was published in August 2022[1] and recommends that climate change allowances should be calculated as follows.

Fluvial risk - Peak river flow uplifts are still based on an assessment of UKCP09 data that was undertaken by the Environment Agency between 2014 and 2015. Wales is divided into three river basin districts (of which the River Conwy is situated within West Wales) and each district is provided with a series of potential climate change uplifts across two scenarios and three epochs (Table 4-1).

Table 4-1 Current climate change uplift guidance for fluvial flows in West Wales

Scenario	Total potential change anticipated for the 2020s (2015 to 2039)	Total potential change anticipated for the 2050s (2040 to 2069)	Total potential change anticipated for the 2080s (2070 to 2115)
Upper (90th)	24%	40%	75%
Central (50th)	15%	25%	30%

Current guidance recommends using the Central (50th percentile) estimate for change for most purposes for the proposed lifetime of the development with the Upper (90th percentile) typically being reserved for sensitivity testing solutions. Therefore, the FCA modelling is based on applying the Central estimate for change for an assumed 100-year lifetime of the development (i.e. a 30% uplift).

Tidal Risk - The August 2022 'Adapting for Climate Change Wales' guidance note recommends that mean sea level rises due to climate change should be based on the projections published in November 2018 by UK Climate Projections (UKCP18). As with the fluvial uplifts, the guidance provides two confidence bands that arise from the relevant emissions scenario; the 70th percentile, which is recognised as the more likely scenario, and the 95th percentile, which is considered less likely and is typically reserved for sensitivity testing.

[1] Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales, August 2022

The sea level rise for this study was obtained directly from the UK Climate Projections (Met Office) user interface, which predicted a 0.95 metre rise for the 70th percentile for a location offshore of the Conwy Estuary between 2024 and 2125. According to the Adapting to Climate Change guidance, the 95th percentile would be in the order of 0.37 metre higher.

5 Available information Flood Risk

5.1 Historic flood events Afon Conwy

The Afon Conwy experiences both tidal and fluvial flooding in this area. Recent flooding on the river includes:

1990 - Towyn Event - Significant tidal flood and a fluvial event combined

1993 - Significant tidal flood and a fluvial event combined

1999 - Significant fluvial flooding event

2002 - Tidal flooding (Overtopping) event

2004 - Significant fluvial flooding (substation flooded) event

Although there is significant flooding in the area, the site does not display any flooding using the NRW Historic flood maps, Figure 5-1, and indeed has not been flooded since the 2014 site design was implemented.

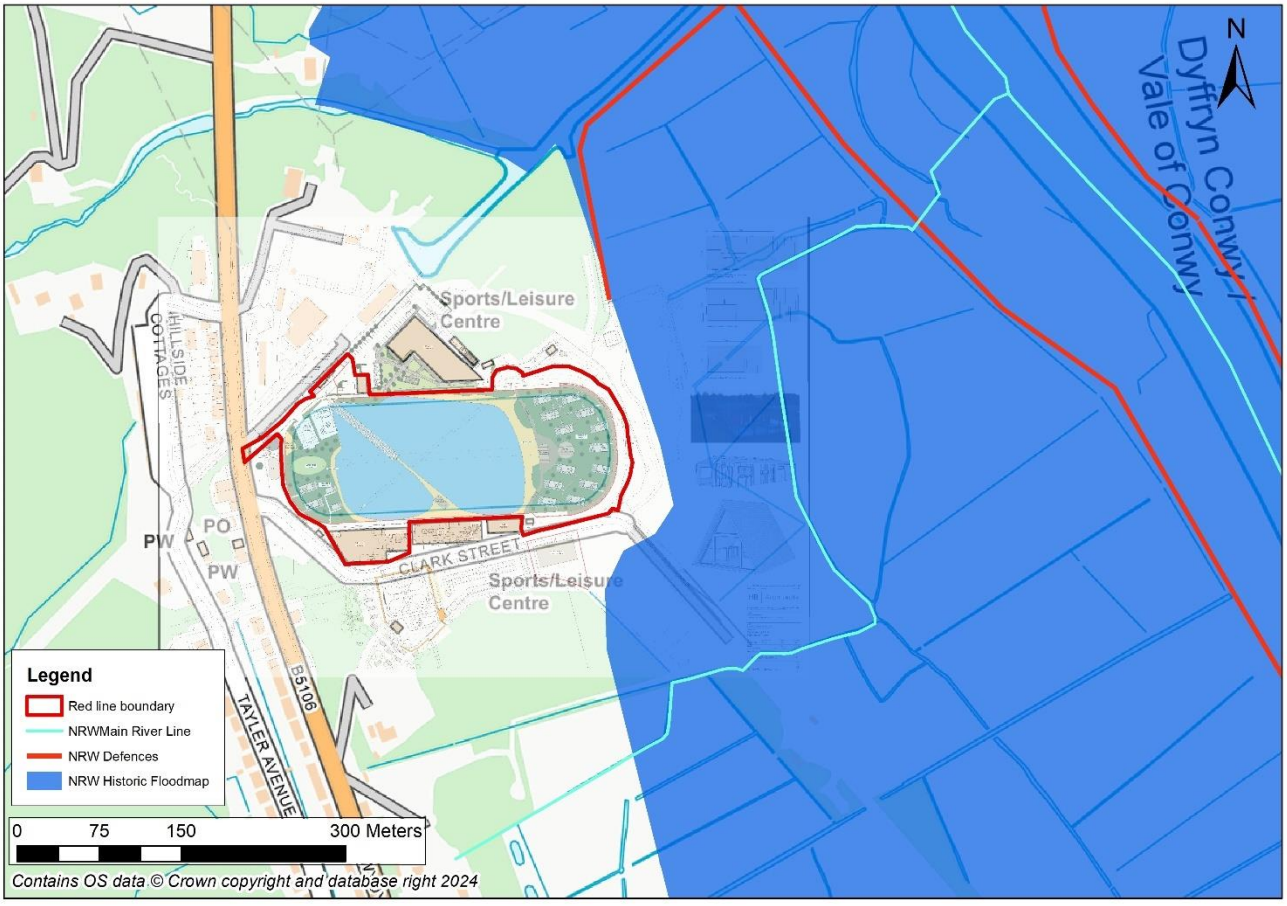


Figure 5-1 NRW's Historic Flood Map

5.2 Development Advice Maps

The Afon Conwy at this location is tidally influenced, meaning that flooding can be either fluvial, tidal or a combined event. The site is primarily located within DAM C2 (model defined Zone C1 defended), with a small area in DAM Zone B (Figure 5-2). Zone C2 on these maps at this location is defined by the Afon Conwy defences, which may be overtopped during major flood events.

It should be noted that the published DAM has not been updated to include the constructed land and bund works agreed under the 2014 Planning Approval. These features mitigate flood extents to the Adventure Parc Snowdonia site.

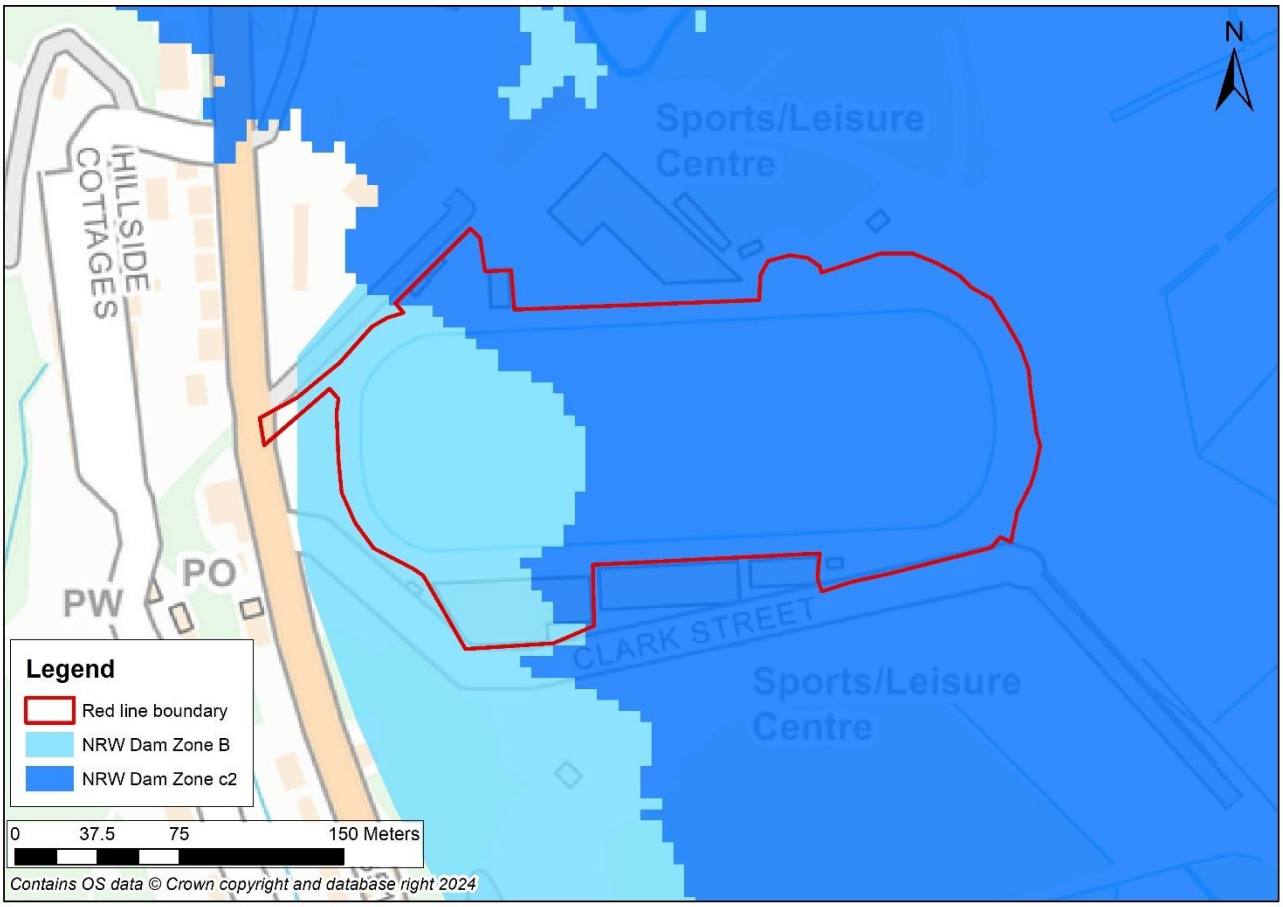


Figure 5-2 NRW Development Advice Maps

The Justification for development formed part of the 2014 application and subsequent Planning Approval.

5.3 Flood map for planning (TAN 2021)

The definitions of the Flood Map for Planning Zones are provided in Table 5-1 while the vulnerability categories are reproduced in Table 5-2. In accordance with published mapping, the Adventure Parc Snowdonia remains within Flood Zone 3 (without defences). Again, published mapping does not include the flood management impacts of the Adventure Parc Snowdonia's raised defences and land.

Table 5-1 Flood map for planning flood zone explanation

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN 15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard[6]).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

Table 5-2 Flood map for planning vulnerability classification.

Development category	Types
Highly vulnerable development	All residential premises (including hotels, Gypsy and Traveller sites and caravan parks and camping sites). Schools and childcare establishments, colleges and universities. Hospitals and GP surgeries. Especially vulnerable industrial development (e.g. power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites. Emergency services, including: ambulance stations, fire stations, police stations, command centres, emergency depots. Buildings used to provide emergency shelter in time of flood.
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). Public buildings including libraries, community centres and leisure centres (excluding those identified as emergency shelters). Places of worship. Cemeteries. Equipped play areas. Renewable energy generation facilities (excluding hydro generation).
Water compatible development	Boatyards, marinas and essential works required at mooring basins. Development associated with canals. Flood defences and management infrastructure. Open spaces (excluding equipped play areas). Hydro renewable energy generation.

The Flood Map for Planning, illustrates the interactions between Flood Zones 2 and 3, for both tidal and fluvial inundation at Adventure Parc Snowdonia as shown in Figure 5-3 to Figure 5-5.

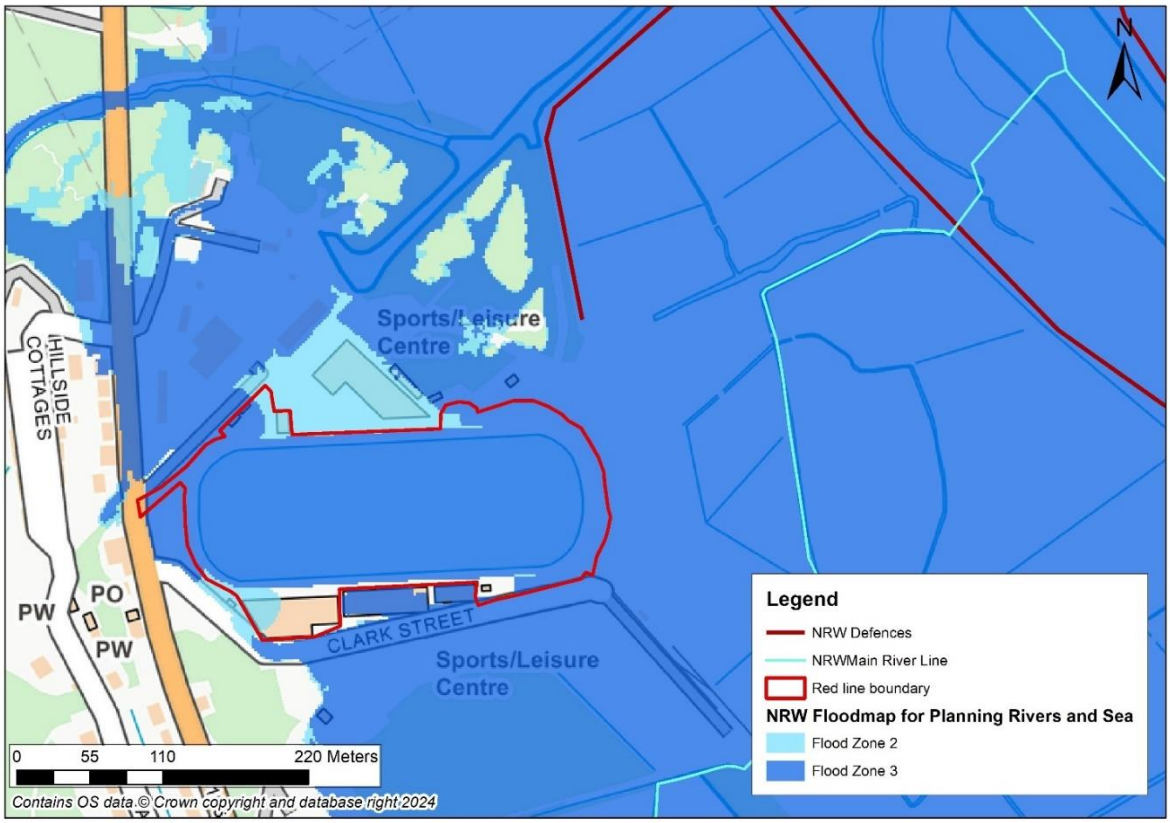


Figure 5-3 NRW Rivers and Sea Flood Map for Planning

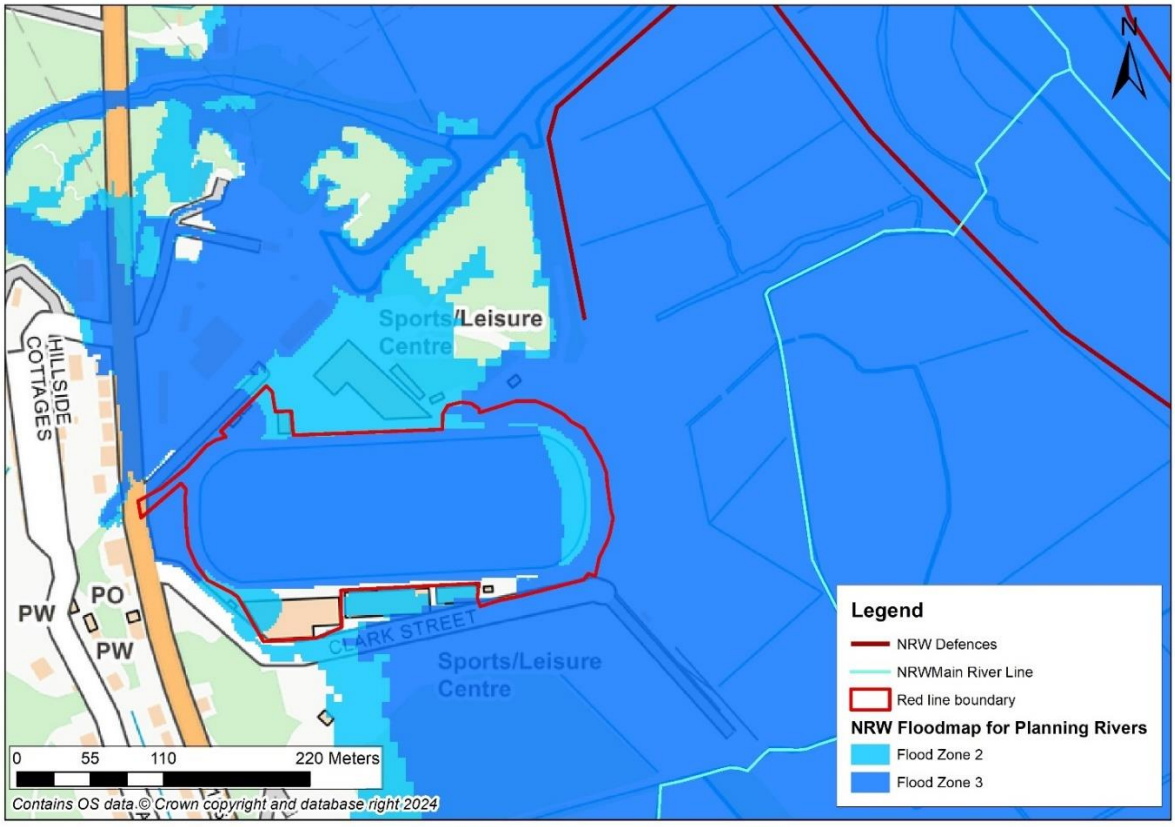


Figure 5-4 NRW Rivers Flood Map for Planning

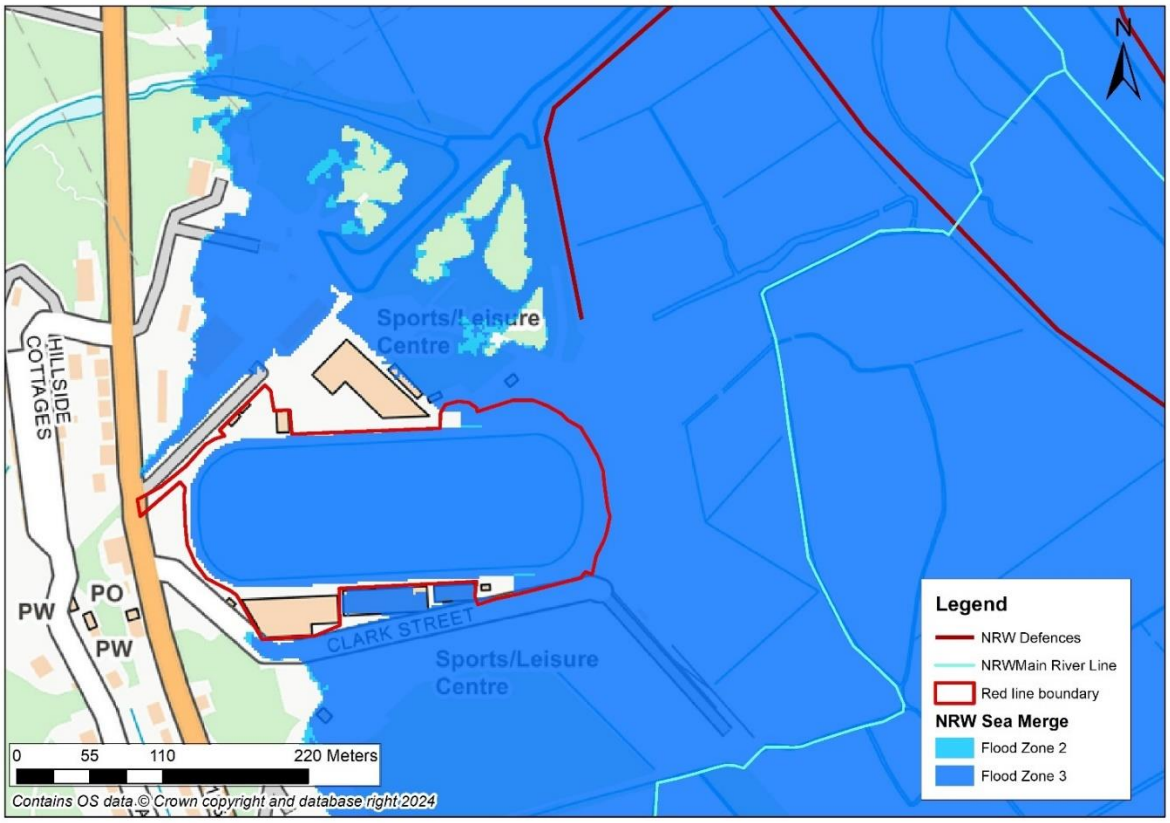


Figure 5-5 NRW Sea Flood Map for Planning

5.4 Surface water flooding

The site is at no risk of surface water flooding, according to NRW's Flood Zone 2 and 3 surface water and small watercourses map, as shown in Figure 5-6. Surface water runoff within the Adventure Parc Snowdonia site will drain to the lagoon. Water levels are controlled by the water outfall to the northwest of the site that drains directly to the Afon Porth-llwyd canal.

5.5 Groundwater flooding

There is no available information for groundwater flooding within Wales at this moment in time. No impact is envisaged to the lagoon. Any emerging groundwater in the area will follow topography towards the Afon Conwy.

5.6 Flooding from sewers

Foul drainage subject to detail design, there is no available information for utility flooding within Wales at this moment in time.

5.7 Flooding from reservoirs

NRW provides a reservoir inundation flood map for use in planning (reproduced for the site in Figure 5-7). This highlights that the site could potentially be inundated in response to failure of Coedty, Cowlyd or Llyn Eigiau reservoir. This is owned and maintained by RWE

npower plc., and we have assumed that this asset is fully managed and maintained as part of the power station infrastructure.

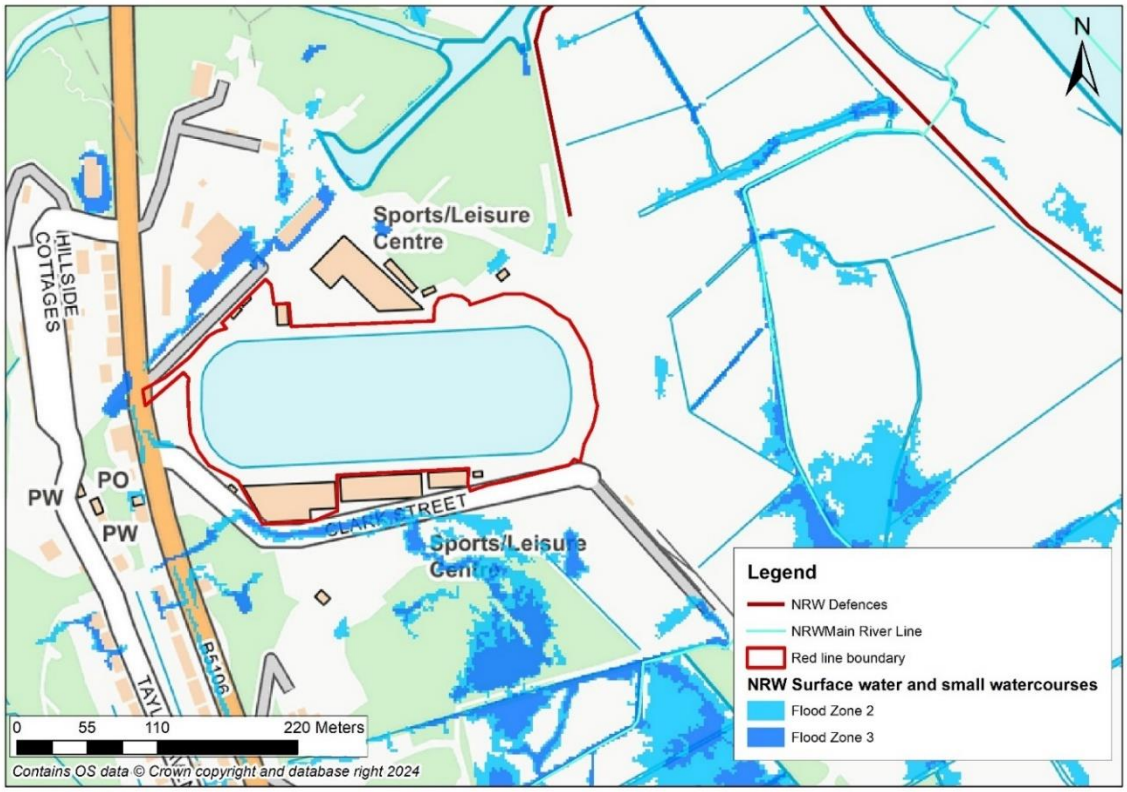


Figure 5-6 NRW Surface Water Map

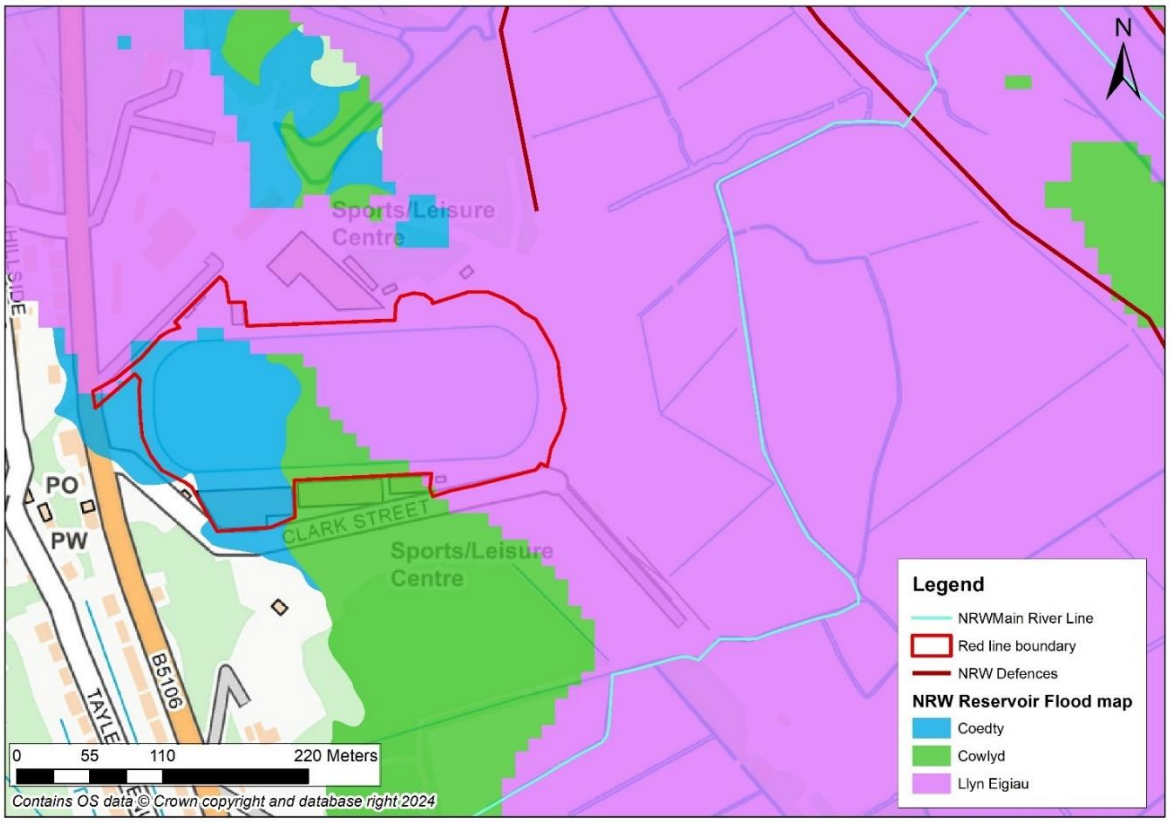


Figure 5-7 NRW Reservoir flood maps

5.8 2014 Modelling of Surf Snowdonia development.

Previous modelling was undertaken for the 2014 Planning Approval, in consultation with NRW. Figure 5-8 defines the flood extents modelled at that time.

The 2014 modelling demonstrated that the raised bund and elevated surrounding land were suitable and sufficient mitigation for the Surf Snowdonia site to remain free from both tidal and fluvial flooding. (Note that the map background of the lagoon area is presented as a similar colour to 0.1% flood outlines (refer to Key figures 5-8) but the lagoon itself did not flood in this design model event).

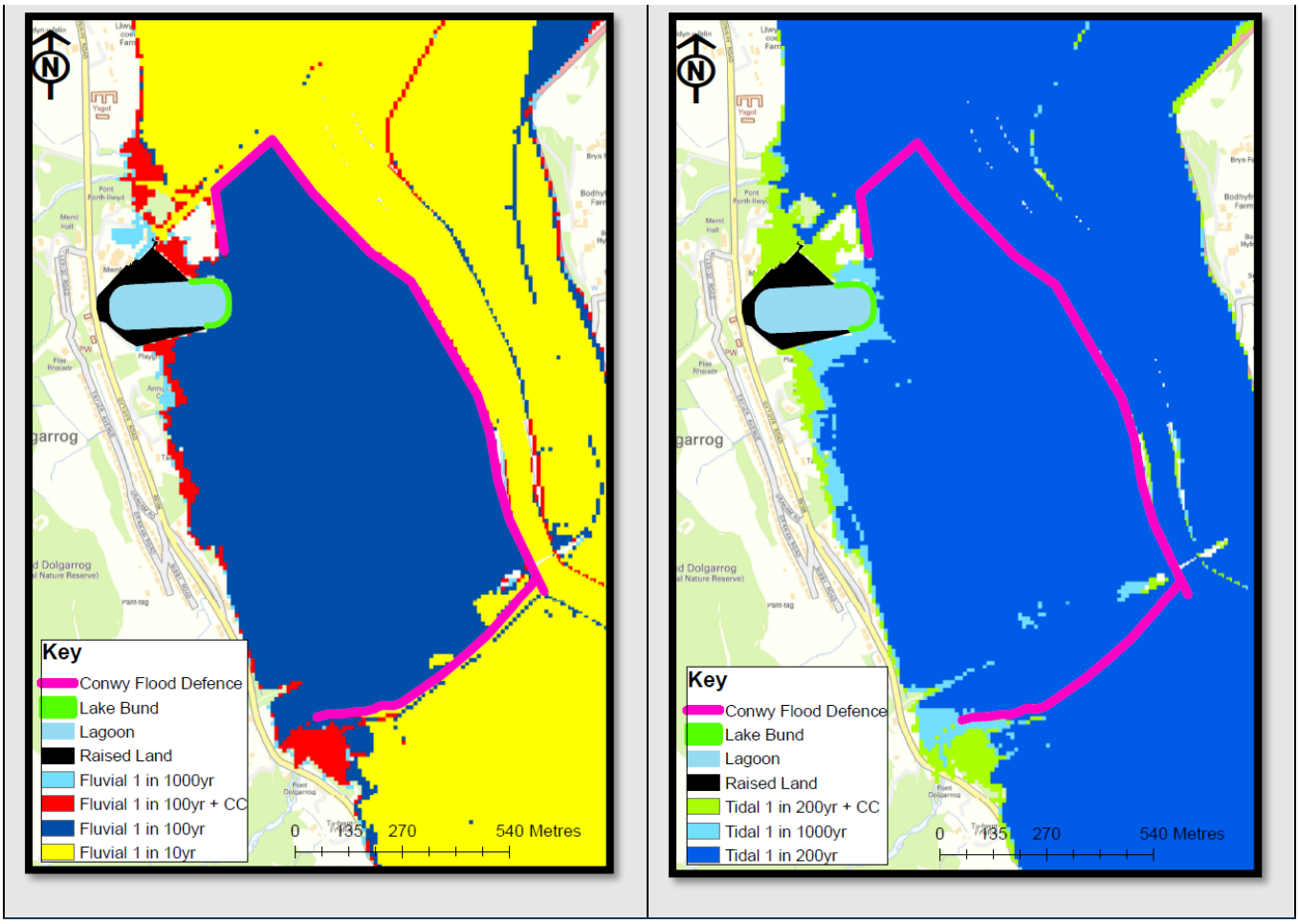


Figure 5-8 2014 Detailed Model of Fluvial (left) and Tidal (right) Events

6 2024 Modelled Flood Risk

Based on emerging TAN15 (2021) guidance, further modelling has been completed for this FCA. Full details on the latest 2024 modelling are included in the accompanying modelling report.

It should be noted that some settlement has occurred since land raising following the 2014 Planning Approval. The applicant undertook a topographic survey in October 2024 to confirm crest and land levels that form the basis of the ground levels and bund at the Adventure Parc Snowdonia site. Prior to any construction phase, the applicant will reestablish the agreed minimum land / defences level of 6.86m AOD.

The Afon Conwy at this location is tidally influenced, meaning that flooding can be either fluvial, tidal or a combined event. The site is primarily located within DAM C2 (model defined Zone C1 defended), with a small area in DAM Zone B (Figure 5-2). Zone C2 is defined by the Afon Conwy defences at this location which overtop during events. However, it should be noted that the published DAM has not been updated to include the constructed land and bund works agreed under the 2014 Planning Approval. These features mitigate flood extents to the Adventure Parc Snowdonia site.

The FCA is based on reinstatement of any low spots to the 6.86m AOD level in accordance with the 2014 Planning Approval and subsequent construction.

For completeness, the modelling assessment has included flood modelling based on current baseline settlement levels (as depicted on the recent topographic survey) as well as the reinstated 6.86m AOD scenario.

It is noted that all tidal and fluvial events up to a 0.1% AEP event do not cause flooding based on baseline levels. When localised ground levels are reinstated to 6.86m AOD, the latest modelling demonstrates no flooding during the design 0.1% with climate change event.

In summary, the purpose of this updated modelling was to demonstrate that the site would remain free from flooding during the:

- 1 % AEP event + CC fluvial event,
- 0.1% AEP fluvial and
- Residual risk 0.1% AEP + CC fluvial events (with agreed minimum land level of 6.86m AOD)
- 0.5 % AEP + CC tidal event,
- 0.1% AEP tidal
- 0.1% AEP tidal event + CC.

6.1 Fluvial events

Mapping indicates the Adventure Parc Snowdonia site will not flood during the 1% with climate change 0.1% AEP events, Figure 6-1 (Flood depth map), Figure 6-2 (Flood level map) and Figure 6-3 respectively. This is based on defended modelling and confirms the previous modelling from 2014 that the site is not at risk of flood inundation.

In addition, risk mapping (Figure 6-4) associated with the extreme 0.1% with climate change AEP event also demonstrates no flooding, provided that any low spots are reinstated to 6.86m AOD. Risk mapping associated with baseline (current) ground levels, Figure 6-5, demonstrates that the lagoon area is currently vulnerable to an extreme 0.1% with climate change AEP event.

Modelling confirms the requirements for localised bank level reinstatement.

Access routes to Adventure Parc Snowdonia remain clear.

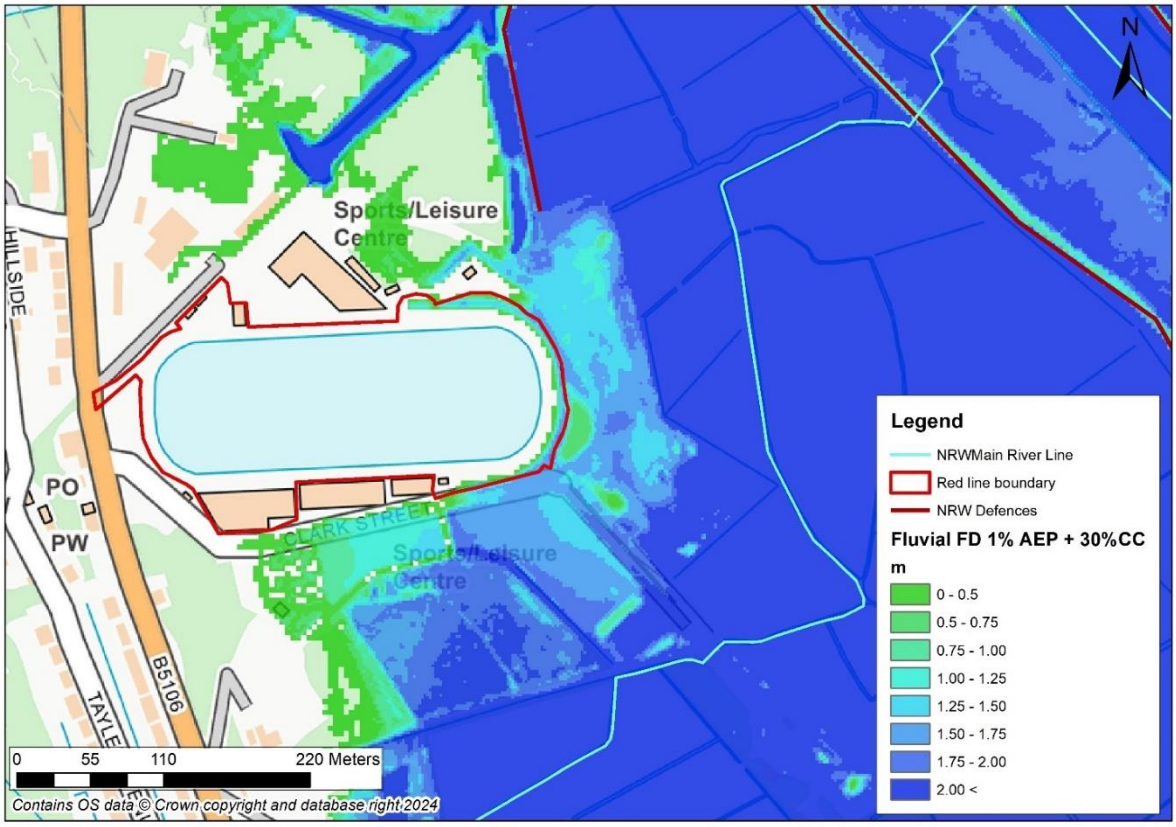


Figure 6-1 1% AEP + CC fluvial event flood depth map (no site flooding).

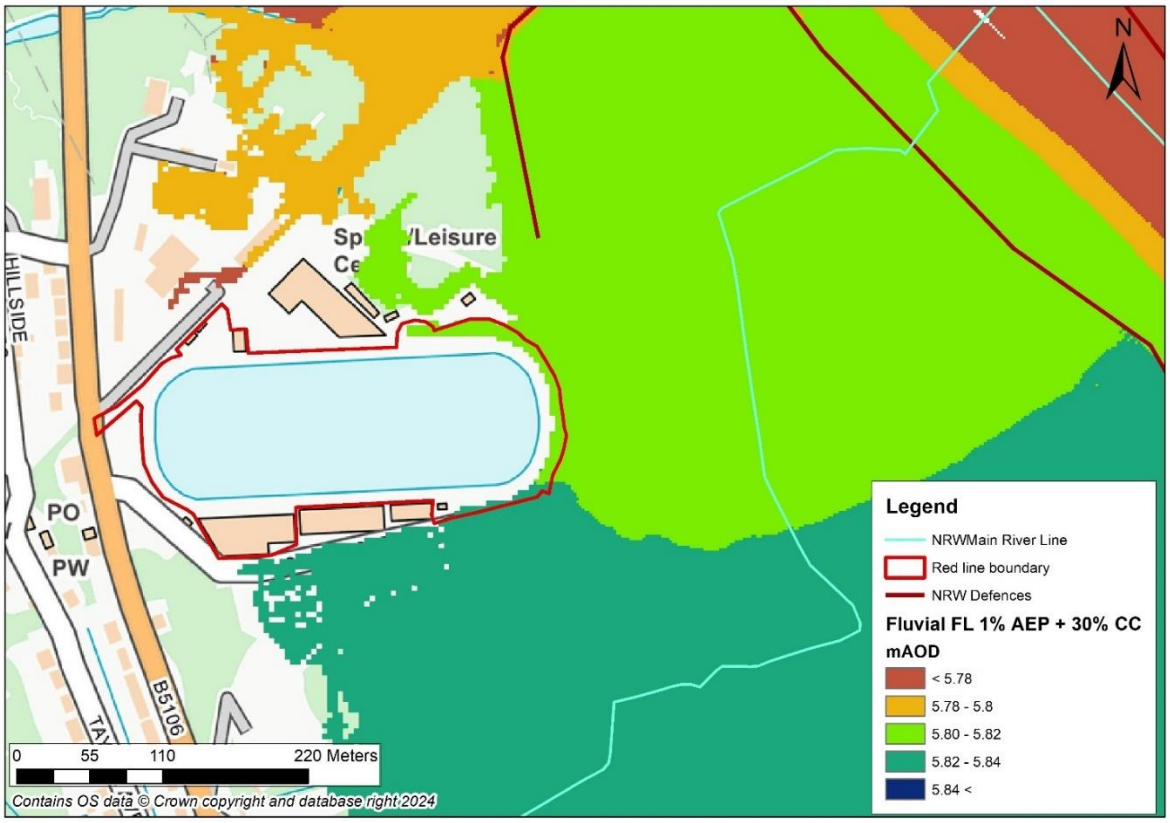


Figure 6-2 1% AEP+CC fluvial event peak flood level map (no site flooding).

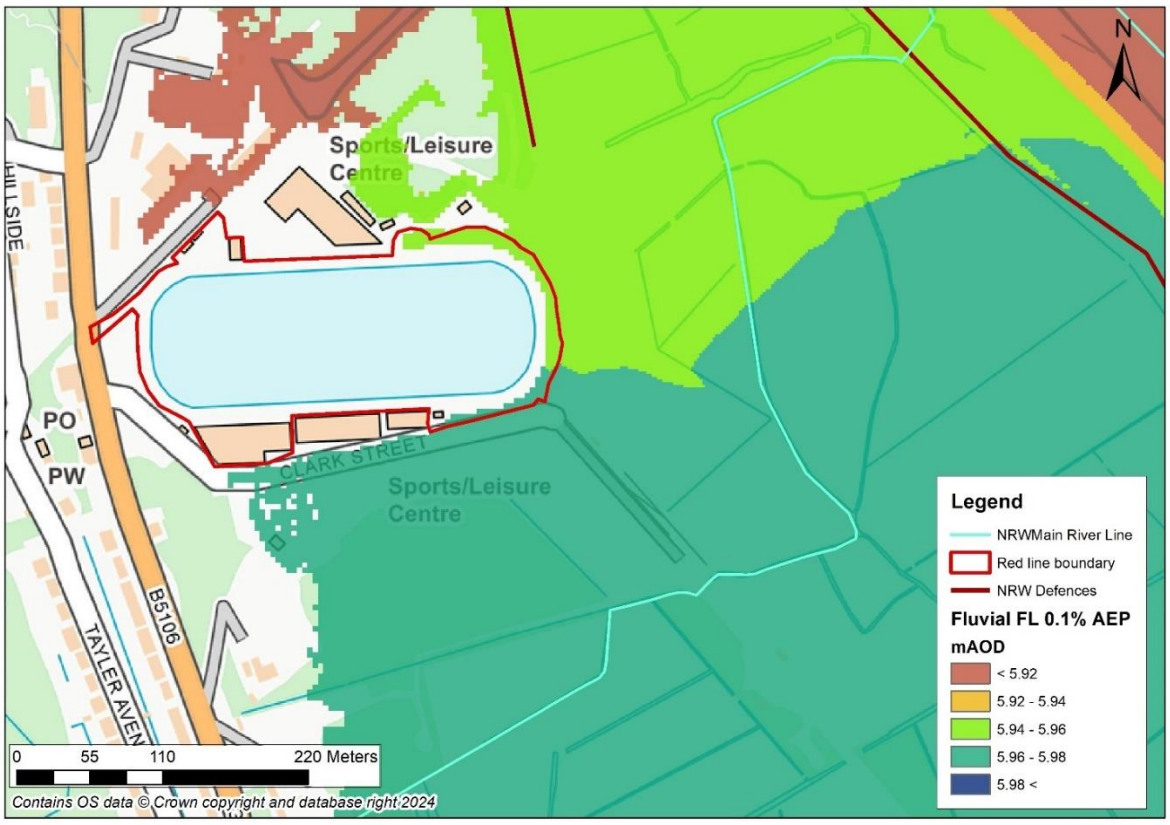


Figure 6-3 0.1% AEP fluvial event peak flood level map (no site flooding).

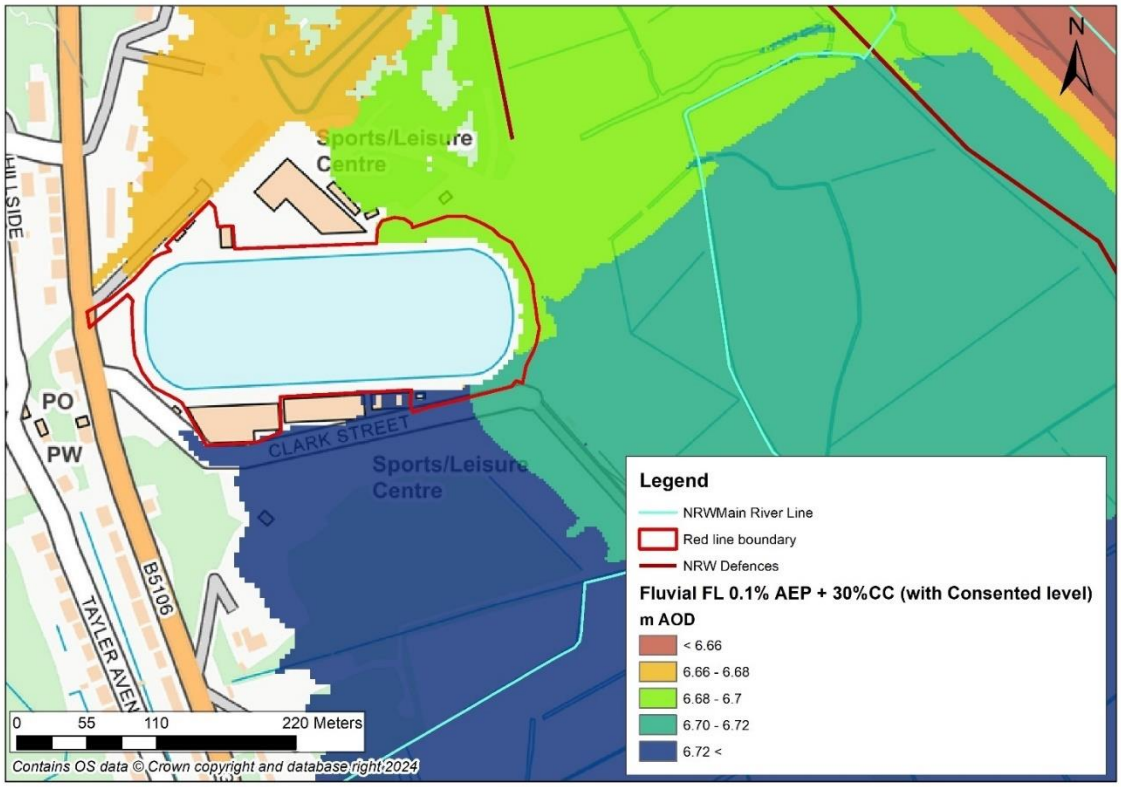


Figure 6-4 Extreme 0.1%+CC AEP fluvial event, peak flood level map - reinstatement to 6.86m (no site flooding).

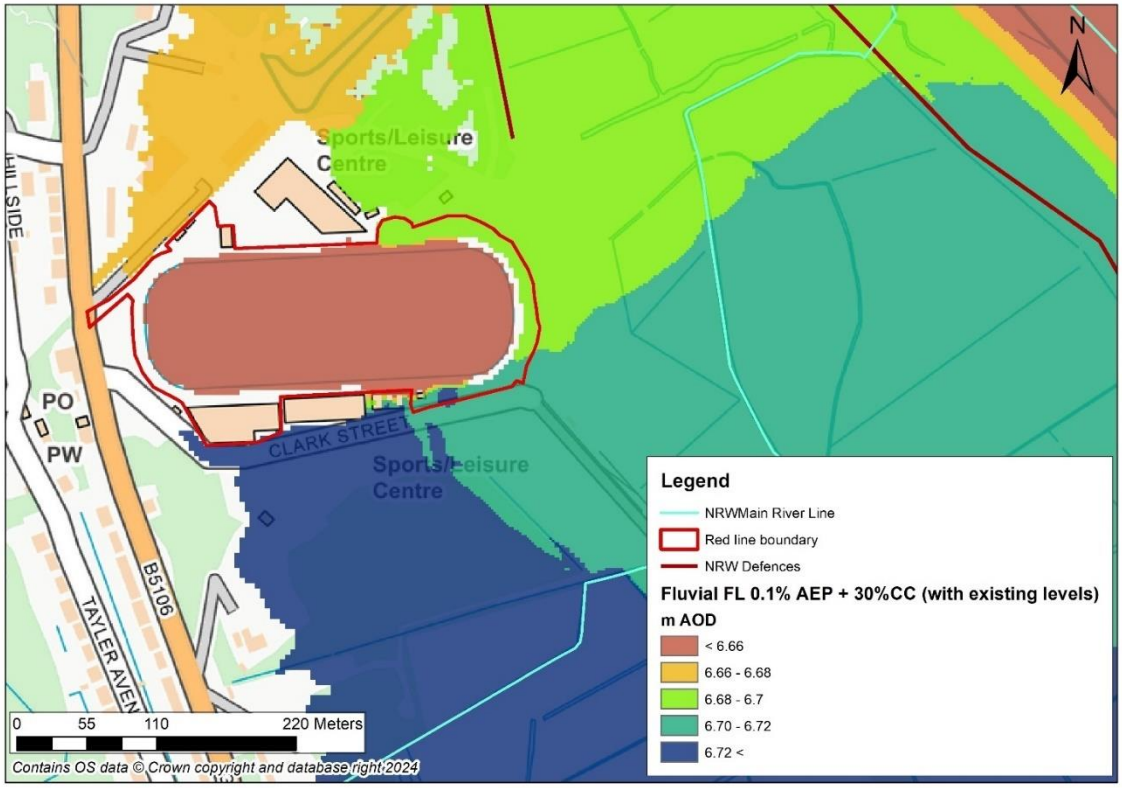


Figure 6-5 Extreme 0.1%+CC AEP fluvial event peak flood level map - baseline/current levels (some flooding).

6.2 Tidal events

The 2024 modelling indicates the Adventure Parc Snowdonia site will not flood during the 0.5% AEP + CC, the 0.1% AEP and the extreme 0.1% AEP climate change tidal events (Figure 6-6, Figure 6-7 and Figure 6-8 respectively).

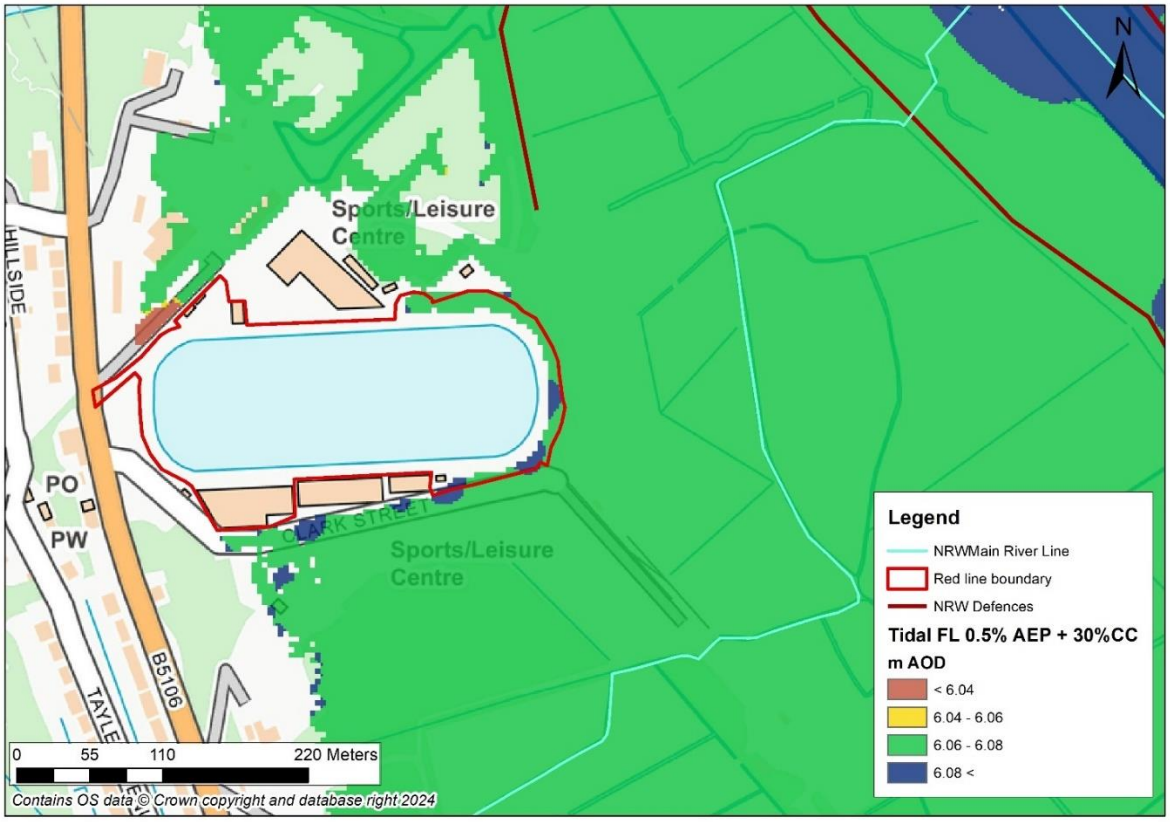


Figure 6-6 0.5% AEP with climate change tidal event peak flood map (no site flooding).

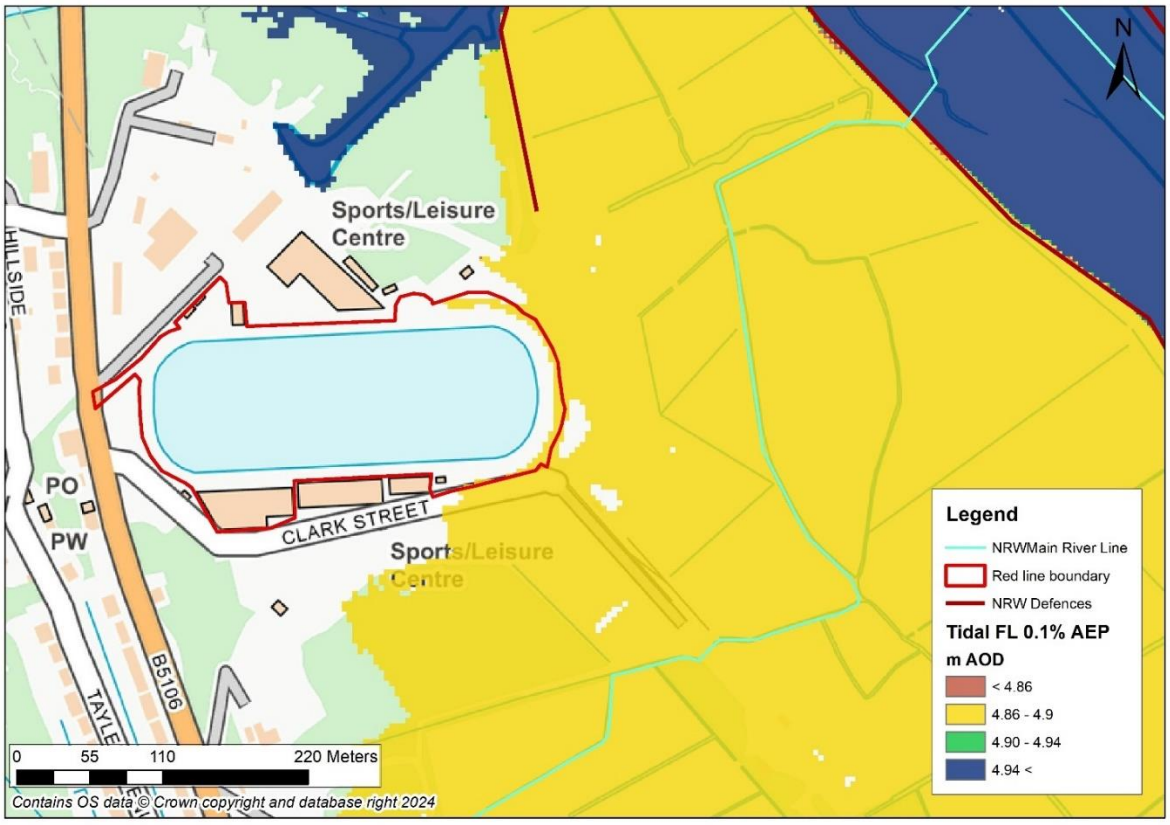


Figure 6-7 0.1% AEP tidal event peak flood level map (no site flooding).

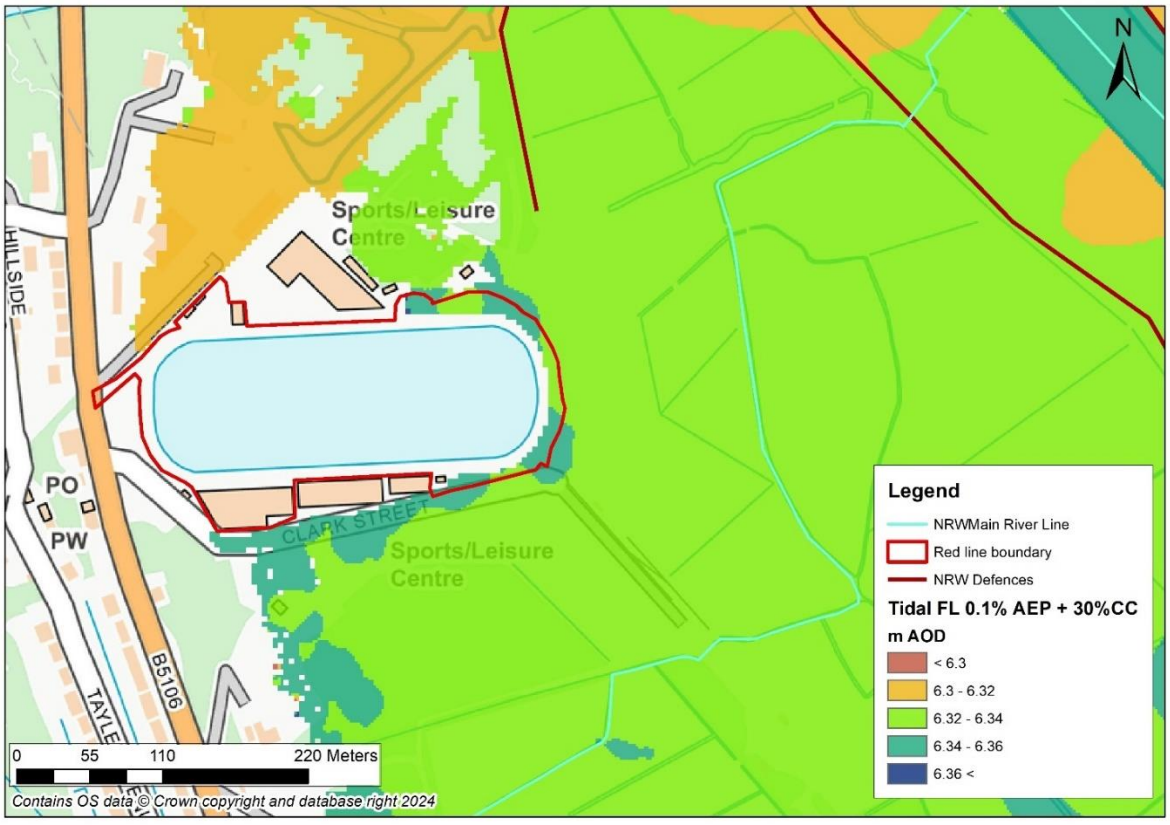


Figure 6-8 0.1% with climate change AEP tidal event peak flood map (no site flooding).

6.3 Implications for holiday lodges

On the basis that modelling demonstrates that the Adventure Parc Snowdonia site does not flood then the proposed lodges and development will not be at risk of flooding. This latest modelling is based on updated hydrology and residual risk mapping associated with the 0.1% with climate change AEP event scenario. Client development proposals are included as an Appendix to this FCA.

Mapping confirms the site is not at risk of flooding, reconfirming the basis of the 2014 Planning Approval. Redevelopment proposals build on the established 2014 Planning Approval and now also meet the emerging acceptability criterion of TAN 15 2021.

6.4 Offsite impact

Since all site levels were previously agreed upon 2014, there will be no change in offsite impacts, as the site will simply be restored to these established levels.

6.5 Access and egress

Consideration has been given to access and egress. The site does not flood during extreme flood events so, even the worst-case scenario of the 0.1% with climate change AEP event, access and egress can still be maintained for all residential buildings through the southern footpath, the crest of which remains free from flood water. This path is illustrated in Figure 6-9. The Adventure Parc Snowdonia management team may consider the need for any early evacuation procedures as part of the site management plan.

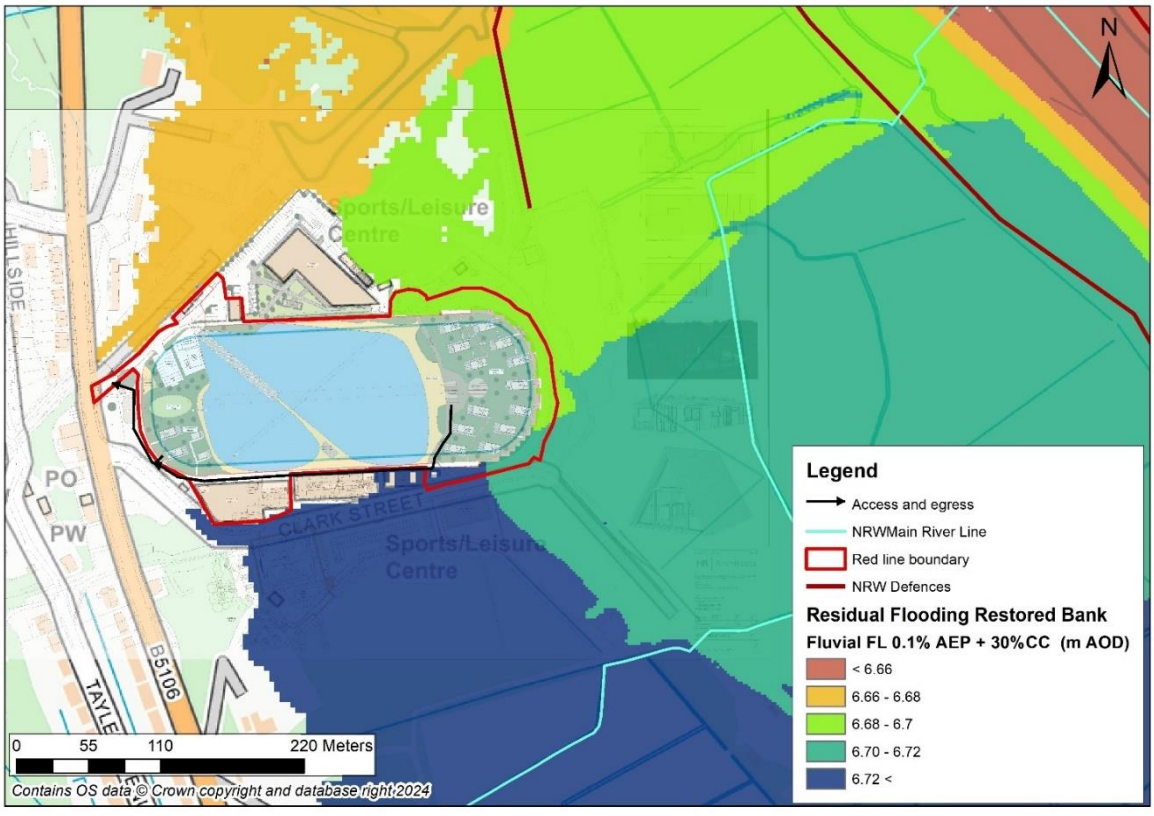


Figure 6-9 Access and egress pathway under extreme events.

7 Sensitivity Testing Afon Conwy Breach Failure

7.1 Introduction

The Afon Conwy flood defences are capable of overtopping and should not be considered viable defences for the lifetime of this development. Therefore, like the 2014 modelling assessment, further breach sensitivity modelling has been undertaken to reconfirm any potential implications to the Adventure Parc Snowdonia site of these defences failing.

A fuller discussion of the modelling and results is included in the associated Hydraulic Modelling Appendix Report for the site. The same two breaches were modelled as in the 2014 FCA and the breach locations are shown as Figure 7-1.

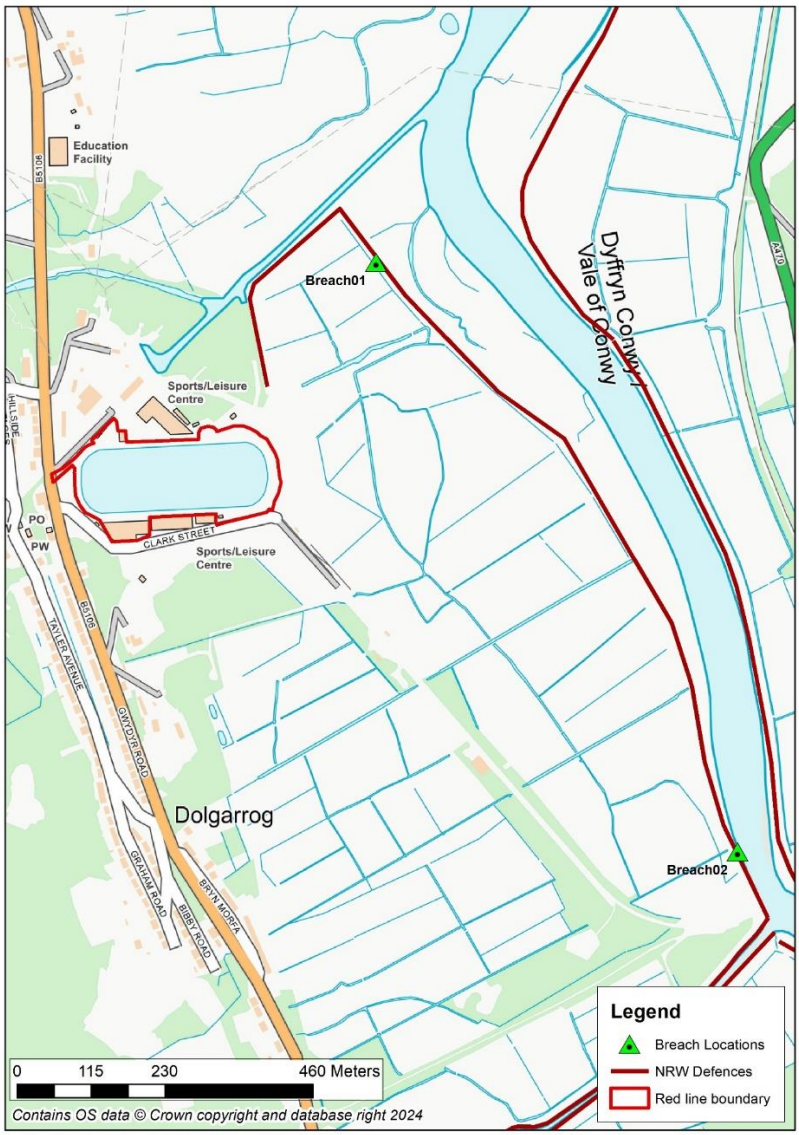


Figure 7-1 Breach Locations

7.2 Afon Conwy breach mapping tidal

Under tidal breach conditions for the extreme 0.1% with climate change AEP event there is no inundation of the Adventure Parc Snowdonia site based on current ground and bund levels (Figure 7-2).

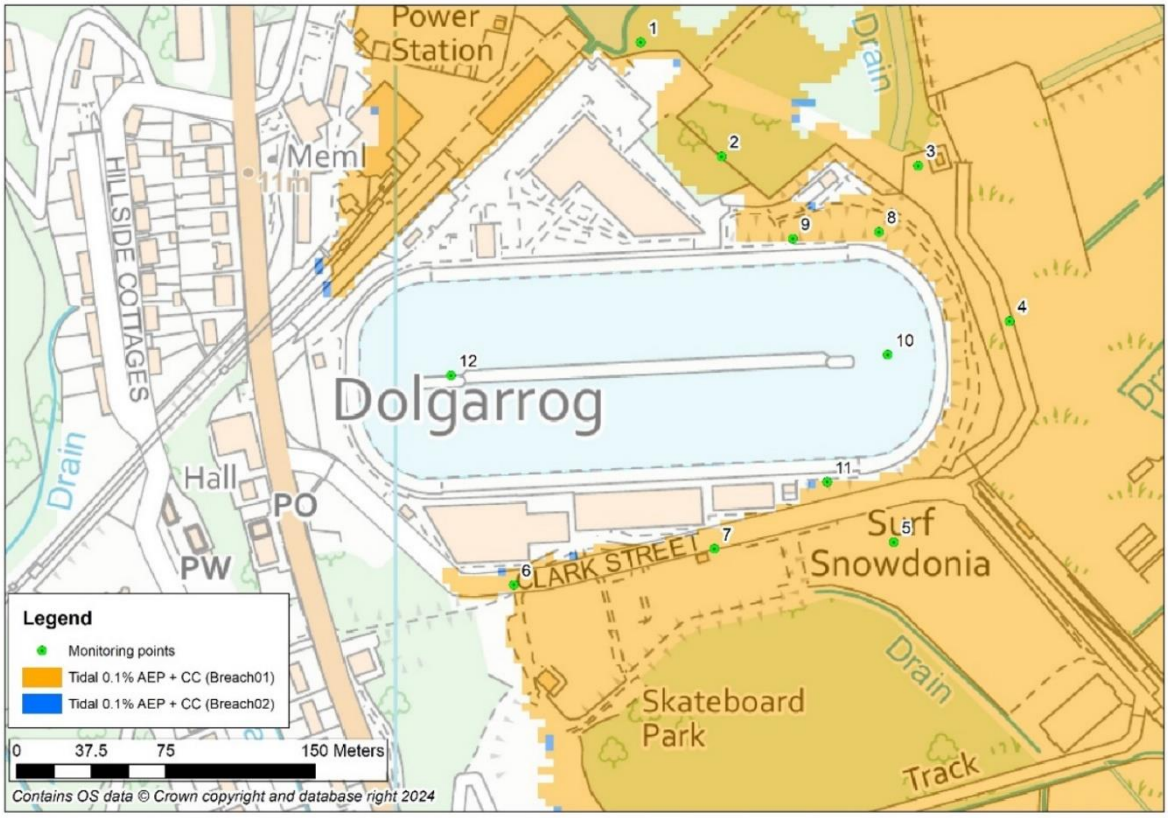


Figure 7-2 Modelled tidal flood outlines with site at existing levels

7.3 Afon Conwy breach mapping fluvial

Under fluvial breach conditions for the extreme 0.1% with climate change AEP event there is no inundation of the Adventure Parc Snowdonia site based on the approved 6.86m AOD levels being reinstated (Figure 7-3).

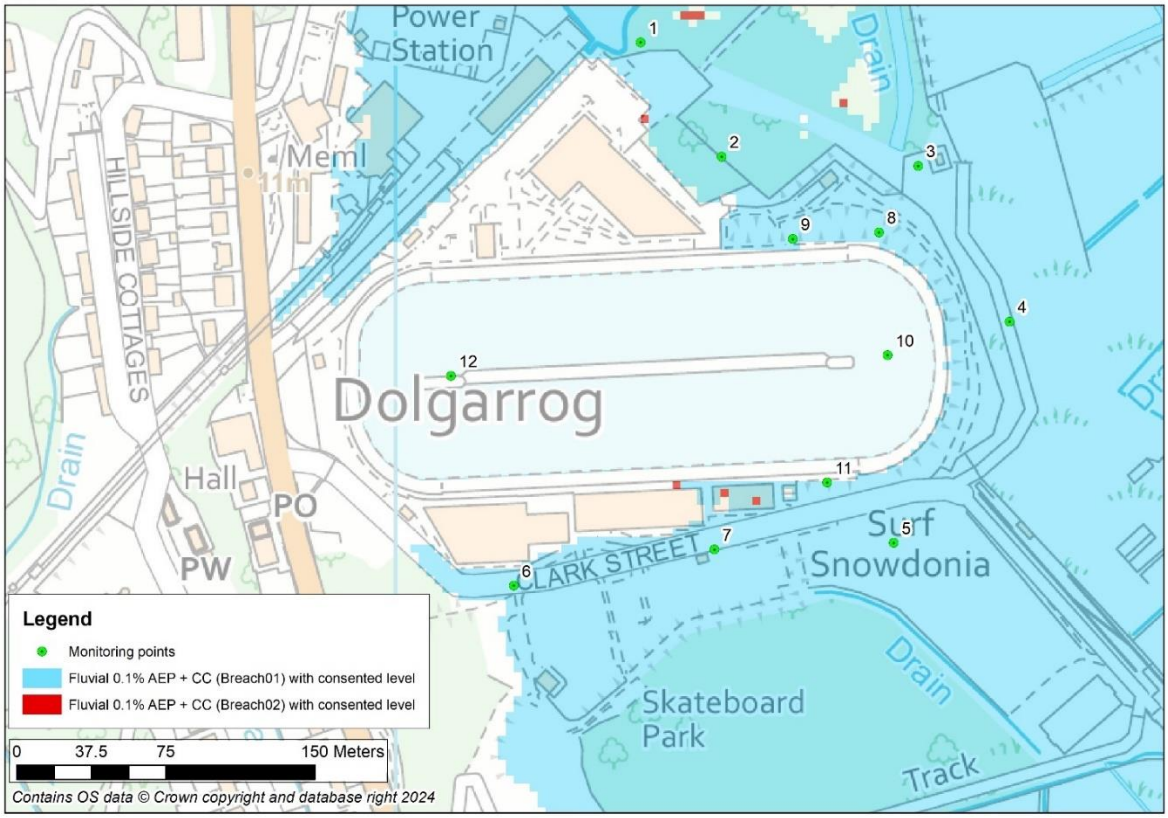


Figure 7-3 Modelled fluvial flood outlines with site at consented levels

8 Conclusion and Discussion

This FCA is a comprehensive assessment of flood risk to the Adventure Parc Snowdonia site. Proposed adaptation of the site includes the installation of new wave generation technology, the installation of 21 holiday lodges and refurbishment of the activity centre.

The previous design for the lagoon, (Figure 3-2) was put forward and accepted with the supporting "Surf Snowdonia at Dolgarrog" FCA from 2014. The design included raised land levels and a bund around the partial perimeter of the lagoon to manage flood risk. The lagoon was also equipped with an overflow drain to the northwest of the site. The raised bund and ground levels, lagoon design, construction and inspections were all reviewed by a Reservoir Panel Engineer with certification and documents available from Global Shed Ventures UK Ltd. This layout reflects the agreed 2014 Planning Approval for the Surf Snowdonia site. Subsequent stages of development within the original site boundary permitted the construction of the Hilton Garden Inn Snowdonia and leisure pods (the leisure pods since removed).

Based on emerging TAN15 (2021) guidance, further modelling has been completed for this FCA. Full details on the latest 2024 modelling are included in the accompanying modelling report and summarised in Section 6 of this FCA.

It should be noted that some settlement has occurred since land raising following the 2014 Planning Approval. The applicant has completed survey to confirm crest and land levels that form the basis of the raised defences and land at the Adventure Parc Snowdonia site. Prior to any construction phase, the applicant will reestablish the agreed minimum land/ defences level of 6.86m AOD.

For completeness, an updated modelling assessment has been undertaken (refer to the associated flood modelling report for full details). Based on this modelling, it is noted that all tidal and fluvial events up to a 0.1% AEP event do not cause flooding based on baseline current levels.

When localised ground levels are reinstated to 6.86m AOD, the latest modelling demonstrates no flooding during the design 0.1% with climate change AEP event.

In summary, the updated modelling demonstrates that the site would remain free from flooding during the:

- 1 % AEP event + CC fluvial event,
- 0.1% AEP fluvial and
- Extreme 0.1% AEP + CC fluvial events (with agreed minimum land level of 6.86m AOD)
- 0.5 % AEP + CC tidal event,
- 0.1% AEP tidal; and,
- 0.1% AEP tidal event + CC.

The Afon Conwy flood defences are capable of overtopping and should not be considered a viable defence for the lifetime of this development. Like the 2014 modelling assessment,

further breach sensitivity modelling has been undertaken to reconfirm any potential implications of breach failure to the Adventure Parc Snowdonia site. Breach failure of the Afon Conwy does not result in flooding to the site at consented levels during the 0.1% with climate change tidal and fluvial events.

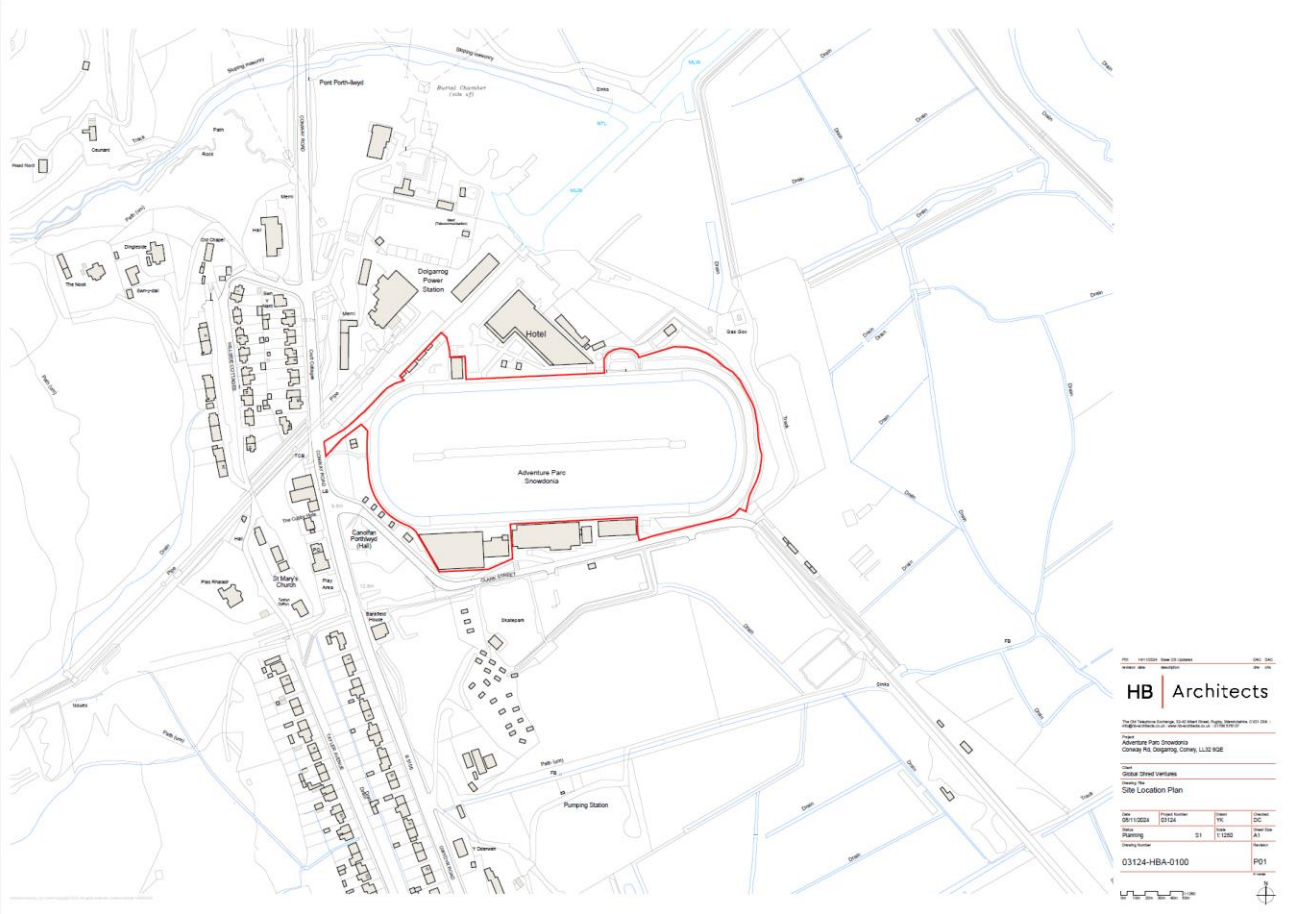
The site under the TAN 15 (2004) DAM maps is located within Flood Zones B and C2. However, the raised ground and bunding at the Adventure Parc Snowdonia site, as previously agreed for the 2014 Planning Approval means that the site is now served by significant infrastructure, including flood defences (C1). C1, as defined by updated modelling is used to indicate that development can take place subject to application of justification test, including acceptability of consequences. Modelling indicates that the constructed defences will prevent the Adventure Parc Snowdonia site from flooding. Access and egress can be maintained during all design events.

The Afon Conwy is considered the significant flood risk in the area. Flood risk is managed by perimeter defences and raised land.

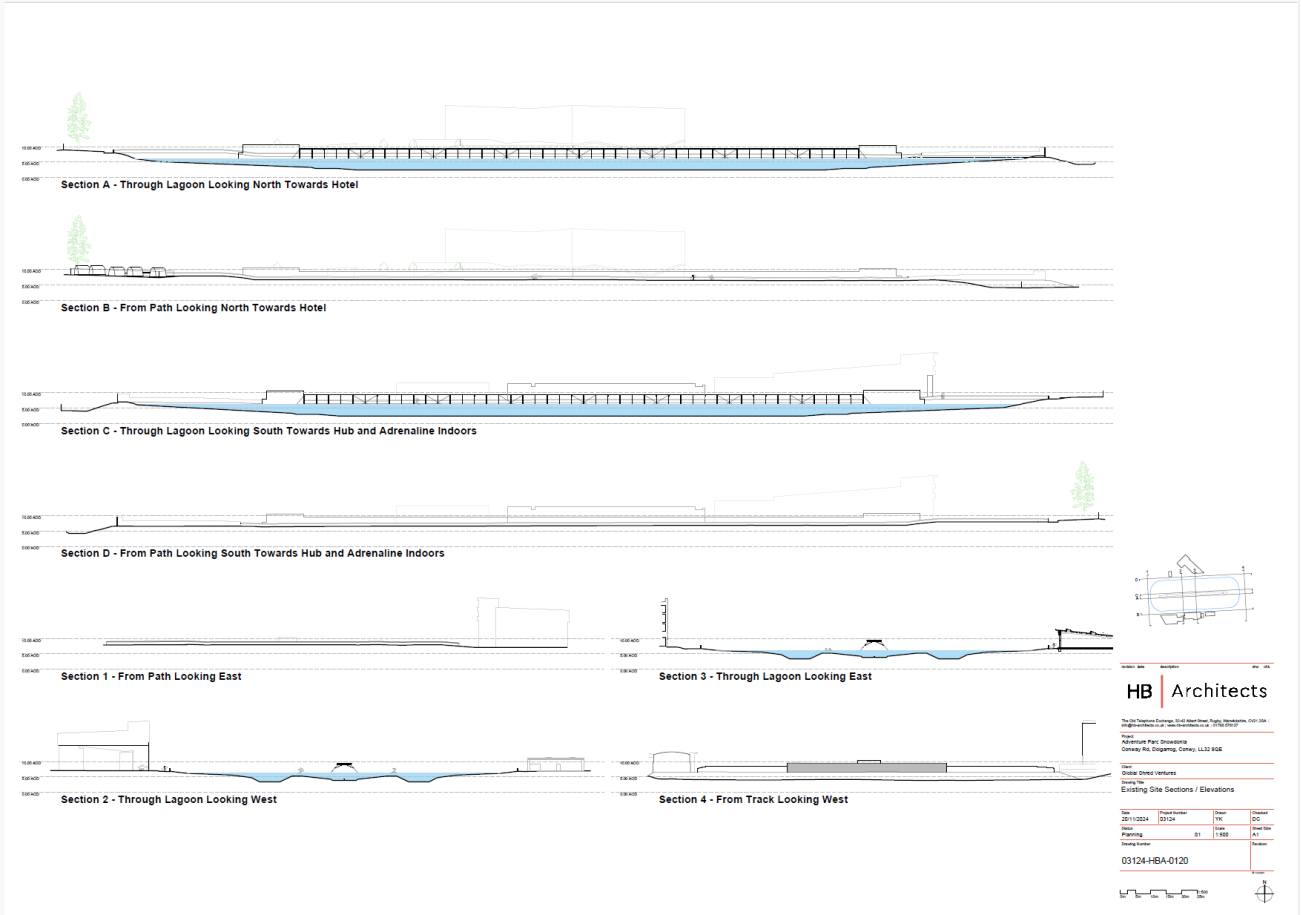
Redevelopment of the Adventure Parc Snowdonia site is a reuse of the existing facility. Modelling demonstrates that redevelopment is not at risk of flooding during an extreme 0.1% with climate change AEP event. Redevelopment in accordance with proposals for the Adventure Parc Snowdonia site are not at flood risk.

A Appendix: Site Drawings

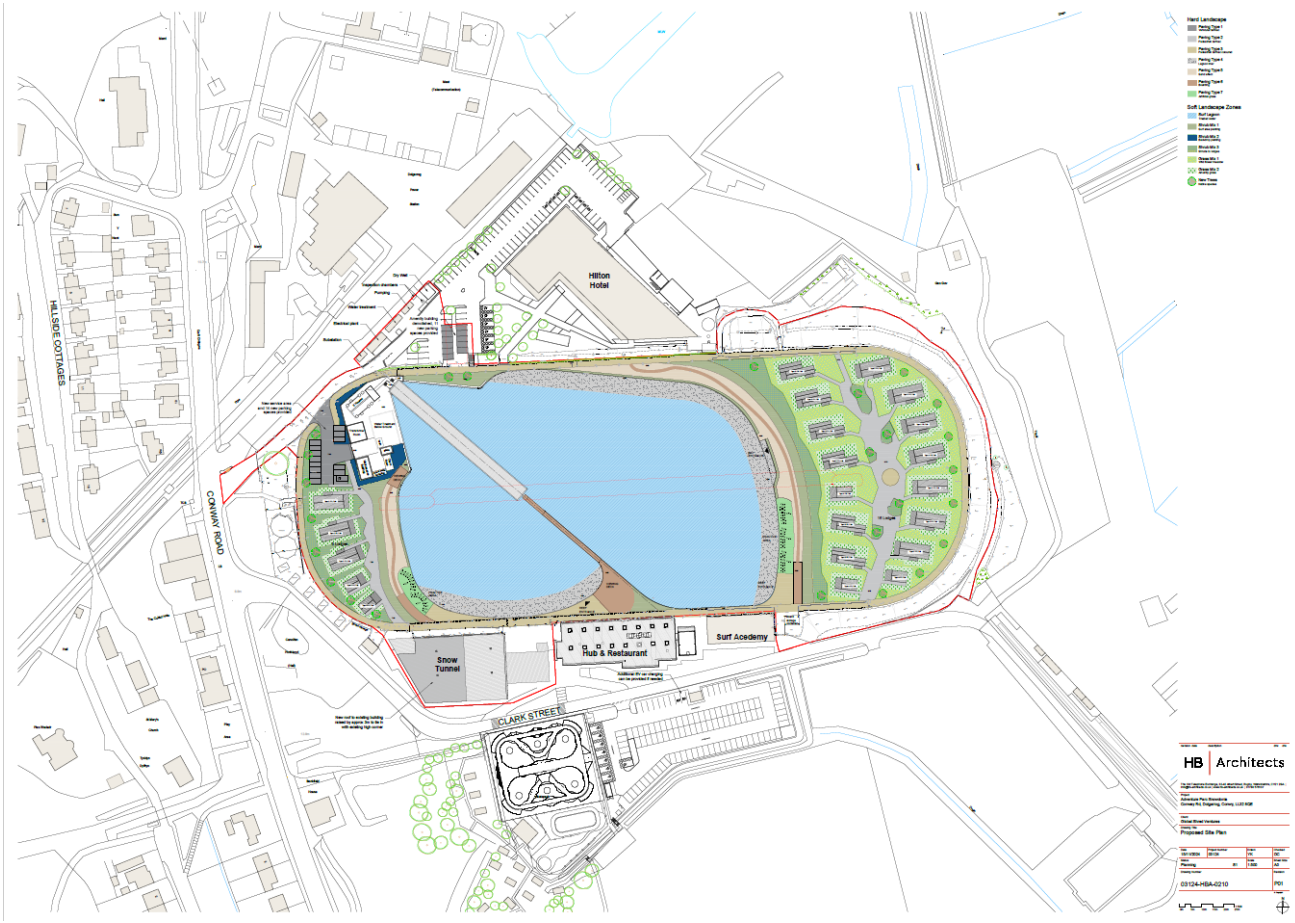
A.1 Site Location Plan



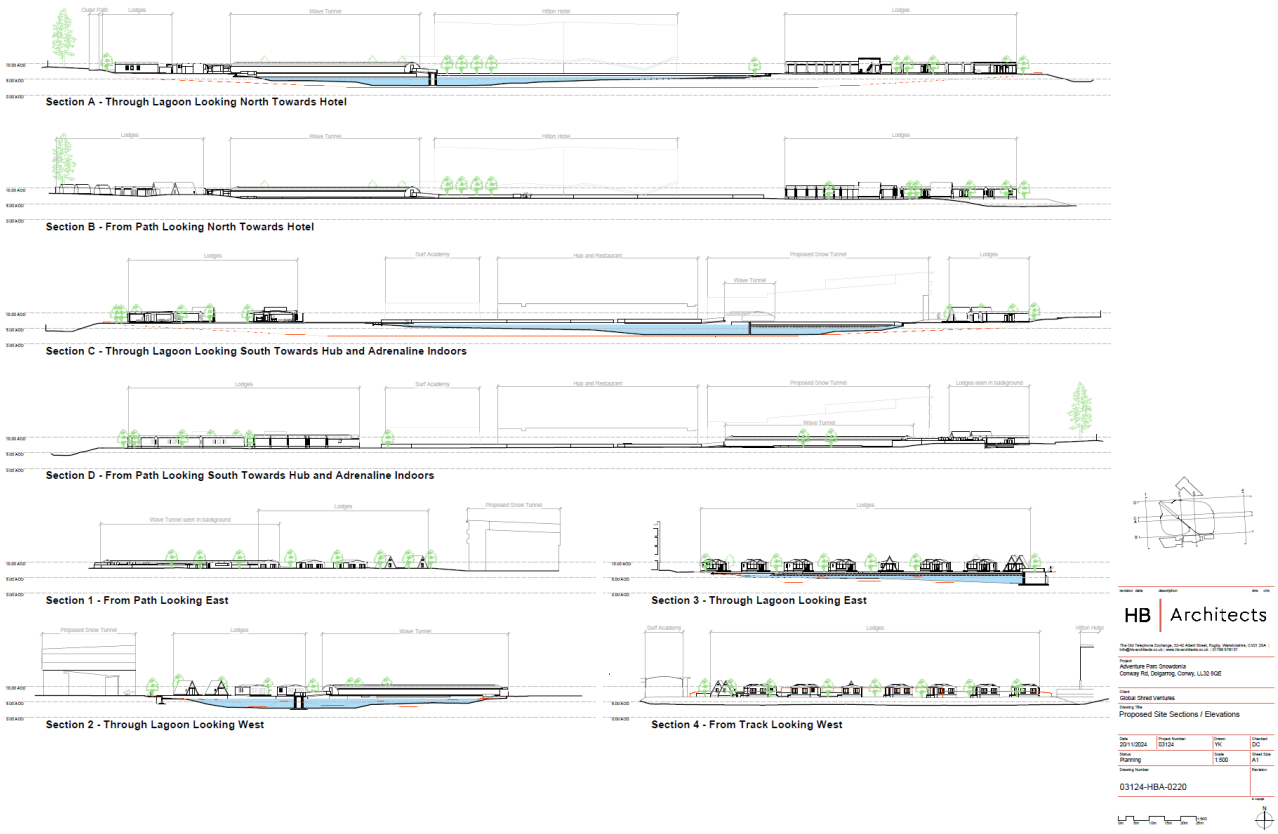
A.2 Existing site cross sections



A.3 Proposed site plan

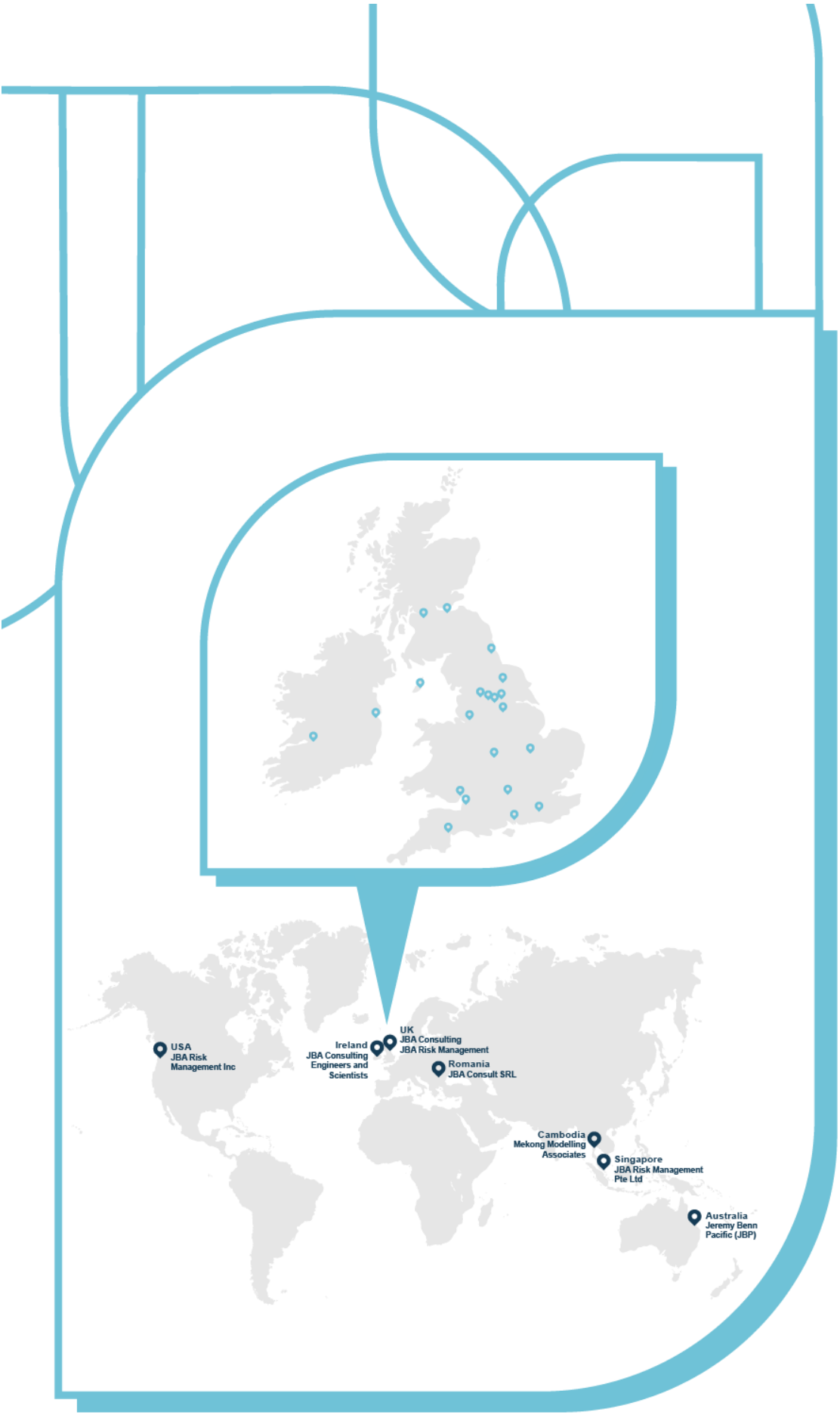


A.4 Proposed site cross sections



B Appendix: Technical Modelling

Supplied As Standalone Pdf Report



JBA consulting

Offices at

Bristol
Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Leeds
Limerick
Newcastle upon Tyne
Newport
Peterborough
Portsmouth
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
Follow us:

Jeremy Benn Associates Limited
Registered in England
3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
ISO 27001:2013
ISO 45001:2018

CHAS Accredited Contractor CHAS.co.uk