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Cardiff Council Strategic Flood Consequences Assessment - Cardiff Central Enterprise Zone (14)

Version 1

Prepared for
Cardiff Council

Date
May 2026

Document Status

Issue date	May 2026
Issued to	Cardiff Council
BIM reference	RSX-JBA-XX-XX-RP-HM-0014-A1-P02-Cardiff_Central_Enterprise_Zone
Revision	A1-P02
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Contract

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This report describes work commissioned by Cardiff Council, by an instruction dated 23/01/2026. The Client's representative for the contract was Stuart Williams of Cardiff Council. Bethany of JBA Consulting carried out this work.

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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 Report was undertaken between January and May 2026 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

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.

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1 Introduction

JBA Consulting has been commissioned by Cardiff Council to prepare an independent Flood Risk Appraisal as part of a Stage 2 Strategic Flood Consequences Assessment (SFCA) for sites considered for allocation in its Replacement Local Development Plan.

This assessment will evaluate the risk of flooding from all sources to 'Cardiff Central Enterprise Zone', the proposed development site, as well as the appropriateness of development at the site in accordance with Welsh Government policy, as outlined in Technical Advice Note 15 (TAN15). Furthermore, recommendations will be provided, where appropriate, to mitigate the risk of flooding at the proposed development site as well as recommendations for further works.

2 Site Description

The key characteristics of the site are summarised in Table 2-1 and the location and site boundary are shown in Figure 2-1.

Table 2-1 Site Summary

Site name	Cardiff Central Enterprise Zone
Site ID	14
Site area (ha)	79.09
Existing land use	Brownfield land
OS NGR	ST 18204 75687
Access location	A4160

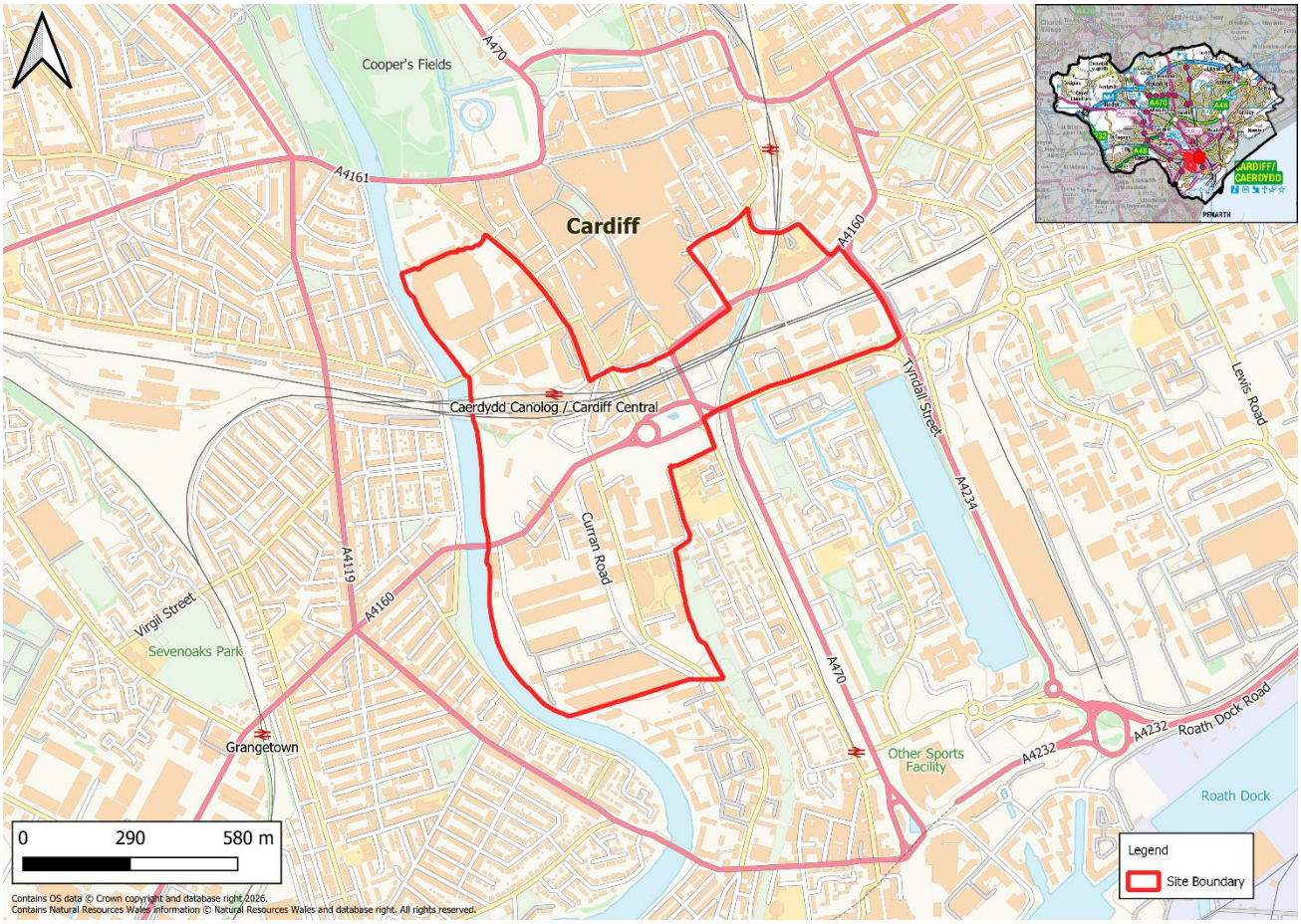

Figure 2-1: Proposed development site

2.1 Development proposals

The proposals at this site are for residential development. The site is located on brownfield land and is classified as a Highly Vulnerable Development.

No proposed site layout has been provided to inform this appraisal.

2.2 Topography

The Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data[1] across the site has been reviewed and is shown in Figure 2-2.

The LiDAR data shows that elevations range between 6.56mAOD and 12.17mAOD at the site. The lowest elevations are associated with the Principality Stadium. Additionally, topographic depressions are present in the centre of the site around the A4160 Penarth Road, Bute Street, and Tyndall Street. Higher elevations are shown along the railway lines at Cardiff Central Station and the railway line in the east of the site.

1 https://datamap.gov.wales/maps/lidar-data-download/

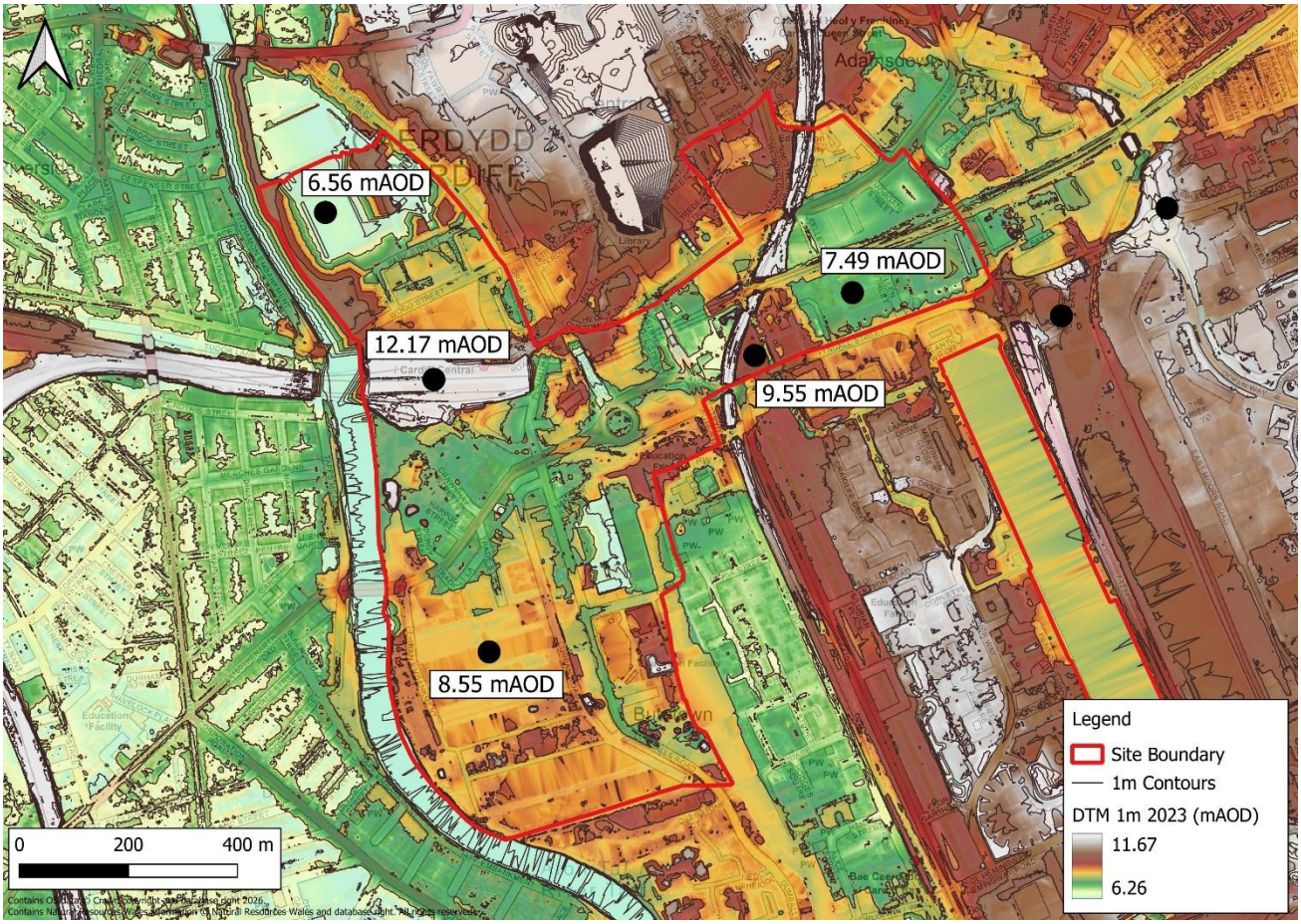

Figure 2-2: 1m Lidar

2.3 Watercourses and Flood Defences

Figure 2-3 shows the locations of the nearest NRW Main Rivers and ordinary watercourses.

The River Taff is an NRW-designated Main River, located adjacent to the western boundary of the site. The River Taff flows in a southerly direction, before discharging into Cardiff Bay. The River Taff benefits from several NRW flood defences along its banks, including embankments, high ground and flood defence walls.

In addition, the Dock Feeder Canal flows in a southerly direction through the western extent of the site.

The site is located approximately 1.3km north of Cardiff Bay. Tidal flooding is mitigated by the Cardiff Bay Barrage which creates a 2km^2 freshwater waterbody, protecting the bay and central areas of Cardiff. The site is partially located within an area that benefits from this defence, as shown in Figure 2-3.

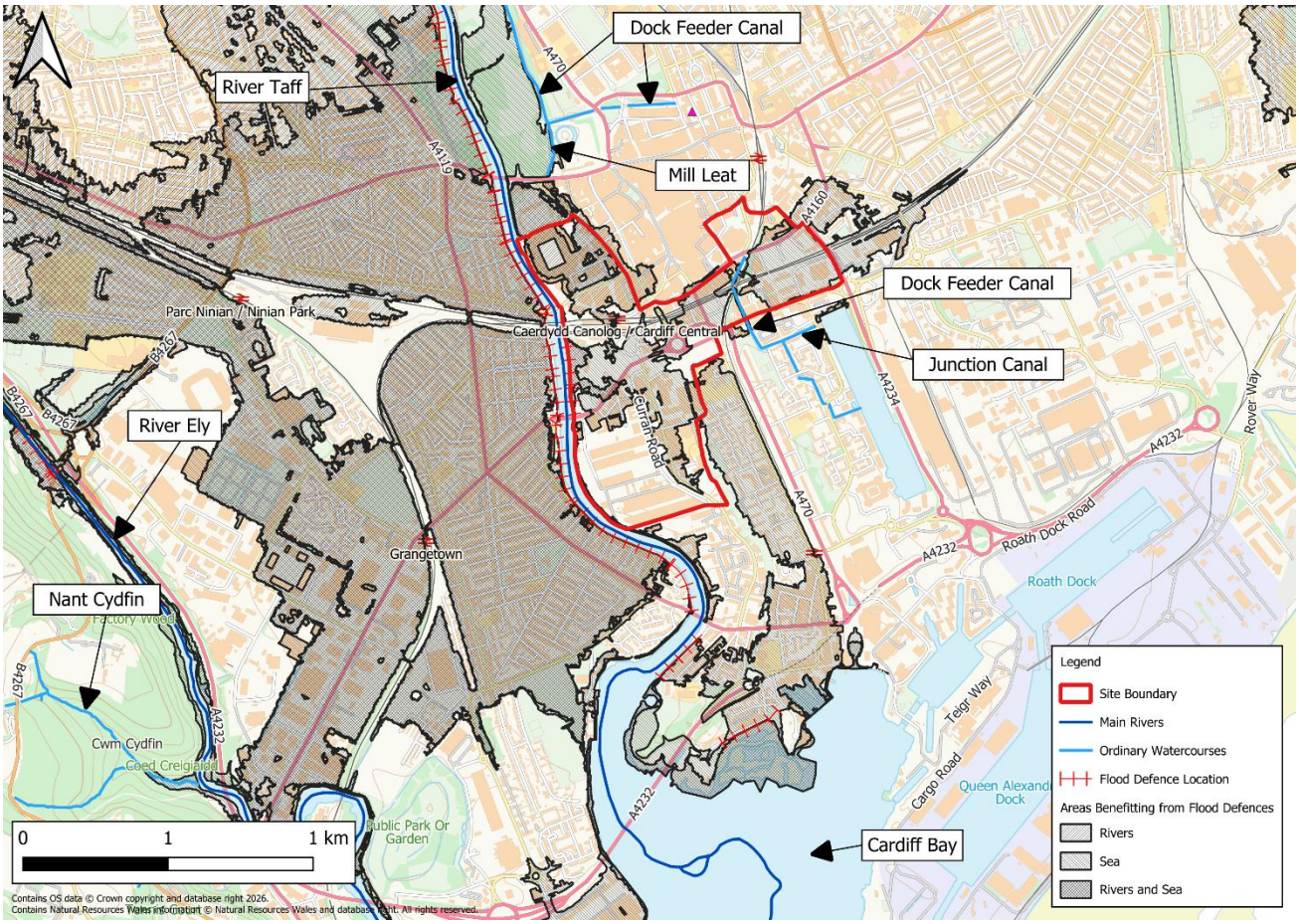

Figure 2-3: Watercourses and Defences

3 Planning Policy and Flood Risk

TAN-15 provides a framework within which flood risk arising from rivers, the sea and surface water can be assessed. TAN-15 adopts a risk-based approach, which emphasises the ability to avoid or minimise risk depending on the type of development proposed.

The following table identified the form of development, vulnerability classification and Flood Map for Planning classification (as defined in TAN-15) for the proposed development site.

Table 3-1 TAN-15 Development Classification Summary

TAN-15 Classification	Classification
Development Proposal	Residential development
Form of Development	Redevelopment
Vulnerability Classification	Highly Vulnerable
Flood Map for Planning - Rivers	Flood Zones 2 and 3 (Figure 3-1)
Flood Map for Planning - Sea	Flood Zones 2 and 3 (Figure 3-2)
Flood Map for Planning - Surface Water and Small Watercourses	Flood Zones 2 and 3 (Figure 3-3)

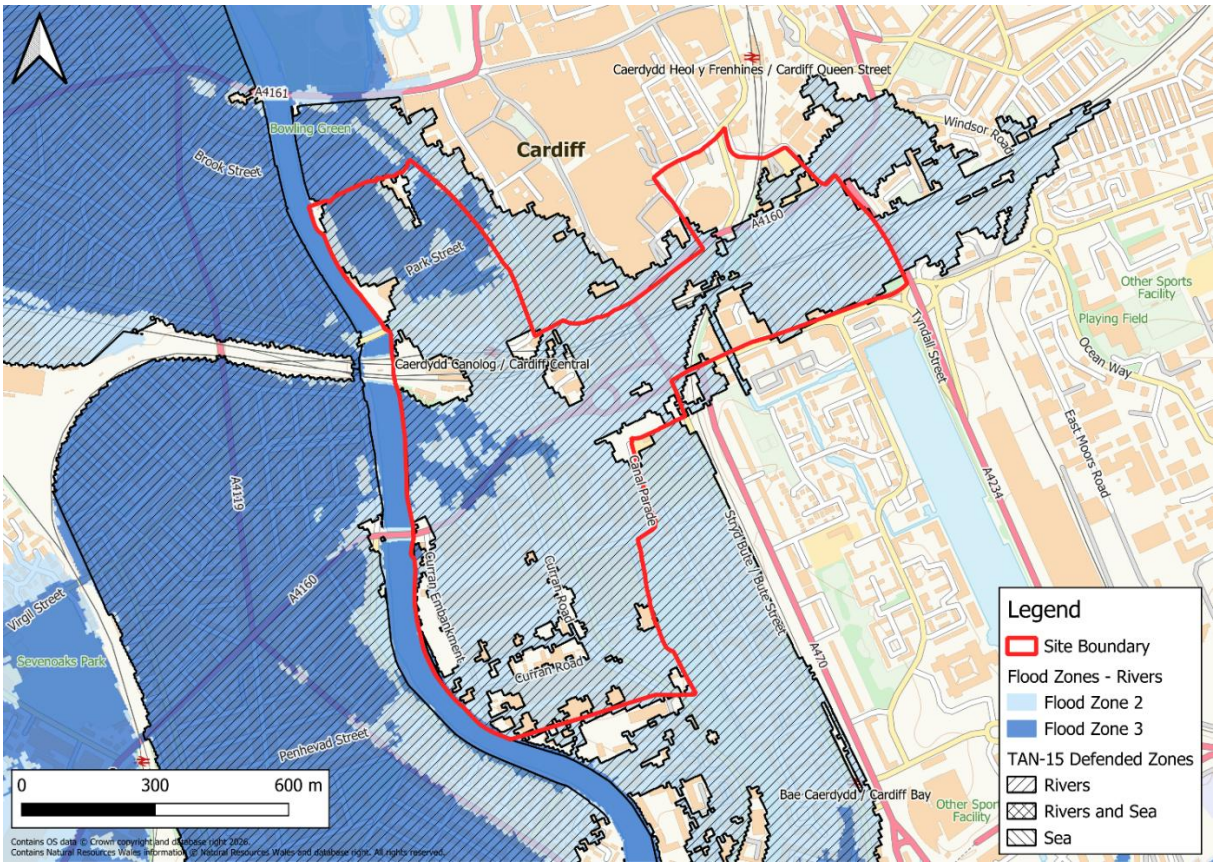

Figure 3-1:Flood Map for Planning - Rivers

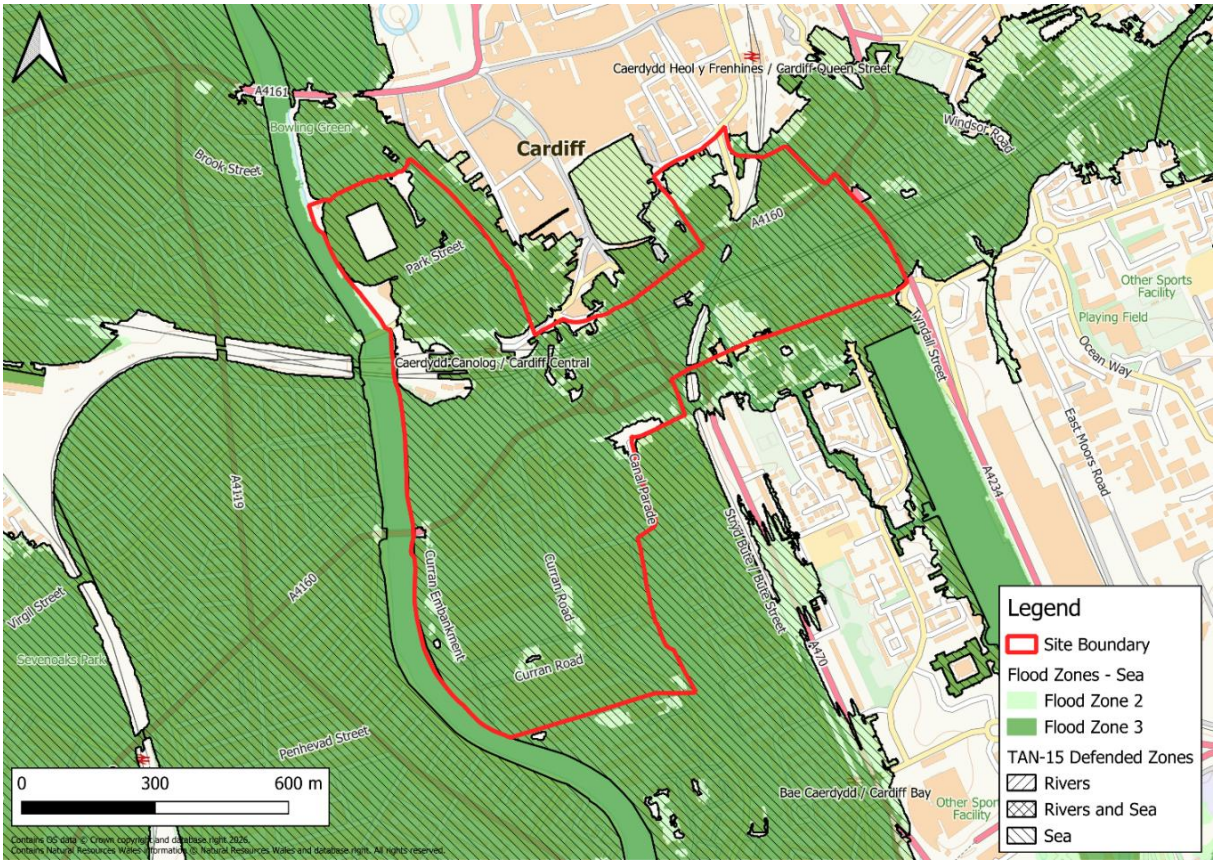

Figure 3-2: Flood Map for Planning - Sea

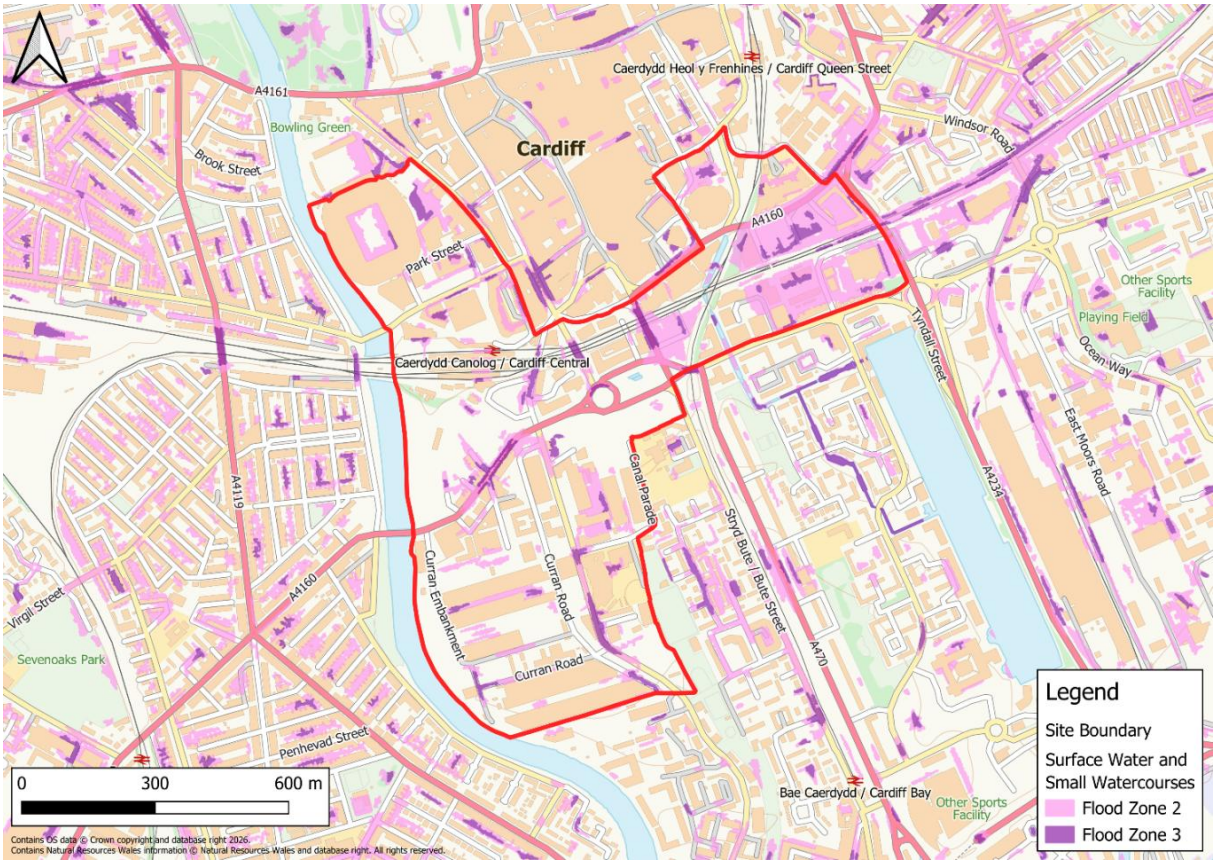

Figure 3-3: Flood Map for Planning - Surface Water and Small Watercourses

4 Assessment of Flood Risk

The latest available information on flood risk at the site, published by Natural Resources Wales (NRW) and datasets used in the SFCA 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's location within Flood Zones 2 and 3 of the FMfP for Rivers indicated that the site is at a **moderate to high** risk of flooding from this source. **Fluvial flood risk is further assessed in Section 4-1**.
Flood Risk from the Sea	✓	The site is at a **low** risk of flooding from this source. **Tidal flood risk is further assessed in Section 4-2**.
Flood Risk from Surface Water and Small Watercourses	✓	The site's location within Flood Zones 2 and 3 of the FMfP for Surface Water and Small Watercourses indicates that the site is at a **moderate to high** risk of flooding from this source. **Surface Water and Small Watercourse flood risk is further assessed in Section 4-3**.
Flood Risk from Groundwater	✓	JBA's Groundwater risk of emergence map shows that the site is predominantly located in an area of 'Very Low' risk of groundwater emergence. However, the eastern part of the site is shown to be at 'moderate' and 'high' risk of groundwater emergence. **Groundwater flood risk is further assessed in Section 4-4.**
Flood Risk from Reservoirs	✓	The NRW Flood Map for Planning shows that the site is located in an area at risk of reservoir flooding. **Reservoir flood risk is further assessed in Section 4-5**.
Flood Risk from Sewers	✓	The Cardiff SFCA has identified there to be 62 sewer flood incidents within the Cathays electoral ward. Therefore, it is concluded that the risk of flooding is **moderate.**

4.1 Flood Risk from Rivers

4.1.1 Baseline flood risk

The Flood Map for Planning - Flood Risk from Rivers (Figure 3-1) indicates that the development site is located within Flood Zones 2 and 3 for Rivers.

The proposed development site is located within an area covered by the River Taff and Ely hydraulic model. The baseline model was initially prepared by Mott MacDonald in 2013 and has been updated by JBA for a series of site-specific assessments, most recently in 2024.

Figure 4-1 shows the site and access roads are flood free from fluvial sources during the 1% AEP plus climate change event. Flood water is confined within Bute Park to the north of the A4161.

The flood risk at the site during the 0.1% AEP plus climate change event is illustrated in Figure 4-2. Flood depths are highest in the northern extent, with flood depths of up to 3.88m predicted close to the Principality Stadium and Cardiff Arms Park. Generally, flood depths are lower in the southern extent of the site, where ground levels are higher. South of the Cardiff Central Station, depths are shown to exceed 1.2m, with the greatest depths found to the west of Canal Parade at 2.92m. Some areas in the far southwest of the site adjacent to Curran Road, and areas in the northeast close to Churchill Way, remain flood-free during this event.

Maximum water levels within the site reach 9.85mAOD during the 0.1% AEP plus climate change scenario.

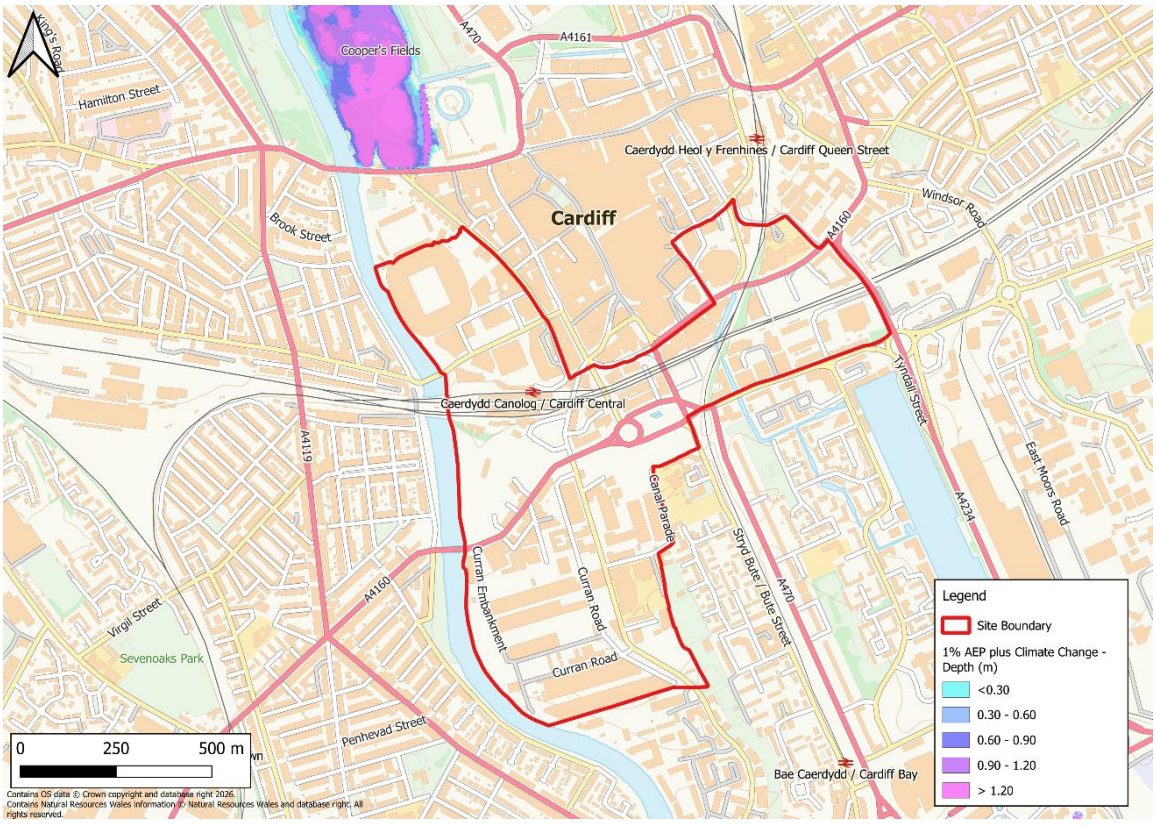

Figure 4-1: 1% AEP plus Climate Change - Flood depths - River Taff and Ely Model

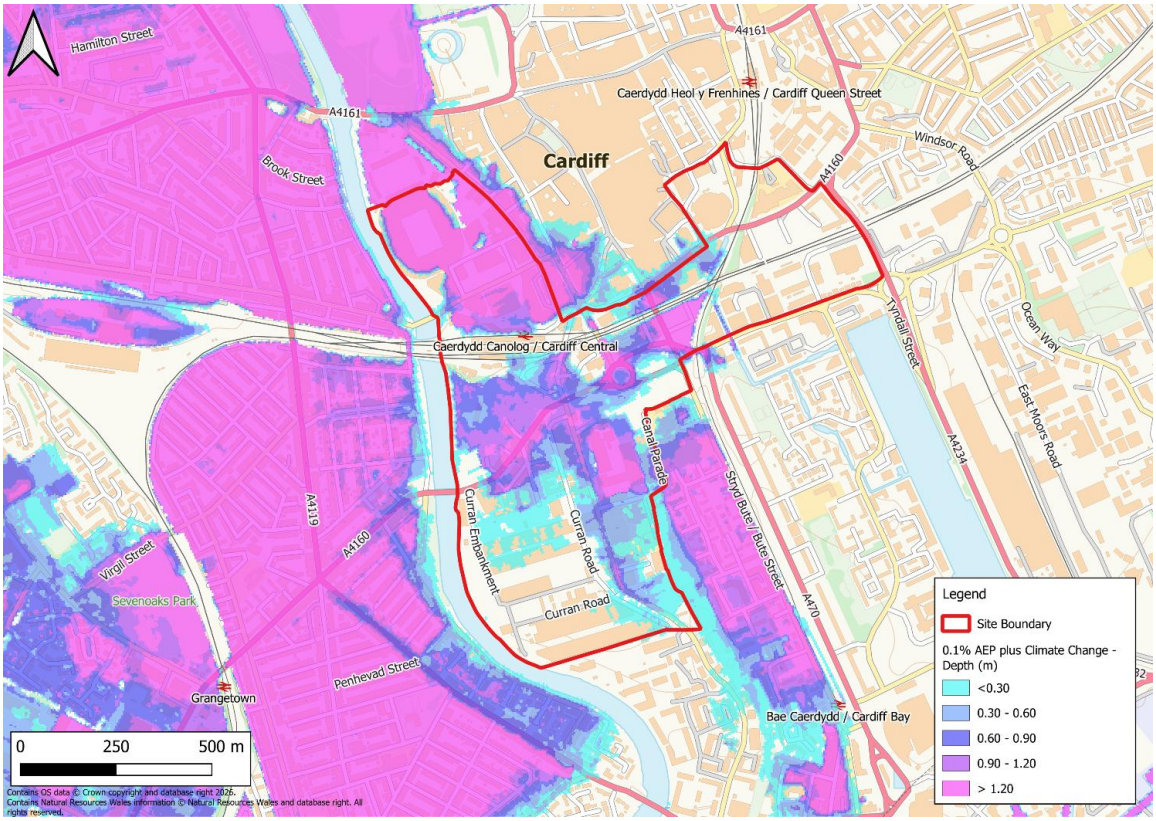

Figure 4-2: 0.1% AEP plus Climate Change - Flood depths - River Taff and Ely Model

4.1.2 Breach flood risk

As the site currently benefits from being in a TAN-15 defended zone, breach modelling has been undertaken in accordance with Section 10.26 of TAN-15.

To understand the residual risk of breaching the fluvial defences on the banks of the River Taff, three breach locations have been assessed and modelled separately. The three breach locations were chosen as the model results identified that these are some of the first defence locations susceptible to overtopping and therefore may be most prone to failure. The breach locations have been discussed and agreed with NRW. The modelled breach locations are shown in Figure 4-3.

During the 1% AEP plus climate change event, the results demonstrate that the site remains flood-free under all three breach scenarios and have therefore not been presented graphically.

Figure 4-4 shows the peak flood depths for Breach 1 0.1% AEP plus climate change scenario. Breach 1 is located on the left bank of the River Taff, approximately 2.9km north-west of the site. The flood extent increases slightly in the south of the site, close to Curran Road. Maximum flood depths remain similar to the baseline, reaching 3.8m around the Principality Stadium. The maximum water level on site increases to 9.92mAOD during this scenario. The peak flood depths for Breach 2 0.1% AEP plus climate change scenario are presented in Figure 4-5. Breach 2 is located on the right bank of the River Taff,

approximately 2.4km north-west of the site. The breach 2 results show that maximum extents and depths are broadly similar to the baseline, with a slight increase shown around Curran Road. The maximum water level decreases to 9.80mAOD. This is attributed to flow being diverted through the breach on the right bank upstream of the site. As water is released onto the floodplain along the right bank, there is a reduction in the volume of flow downstream within the channel. Consequently, overtopping along the left bank is reduced, resulting in a slight reduction in peak water levels at the site.

Figure 4-6 shows the peak flood depths for the Breach 3 scenario during the 0.1% AEP plus climate change event. Breach 3 is located on the right bank of the River Taff, approximately 1.3km north of the site. The results show that the flood extent decreases slightly relative to the baseline, particularly to the existing development south of Trade Street. The maximum flood level reaches 9.83mAOD during the Breach 3 0.1% AEP plus climate change scenario. Similarly to the Breach 2 scenario, this is due to the site's location on the left bank of the River Taff and the breach occurring on the right bank.

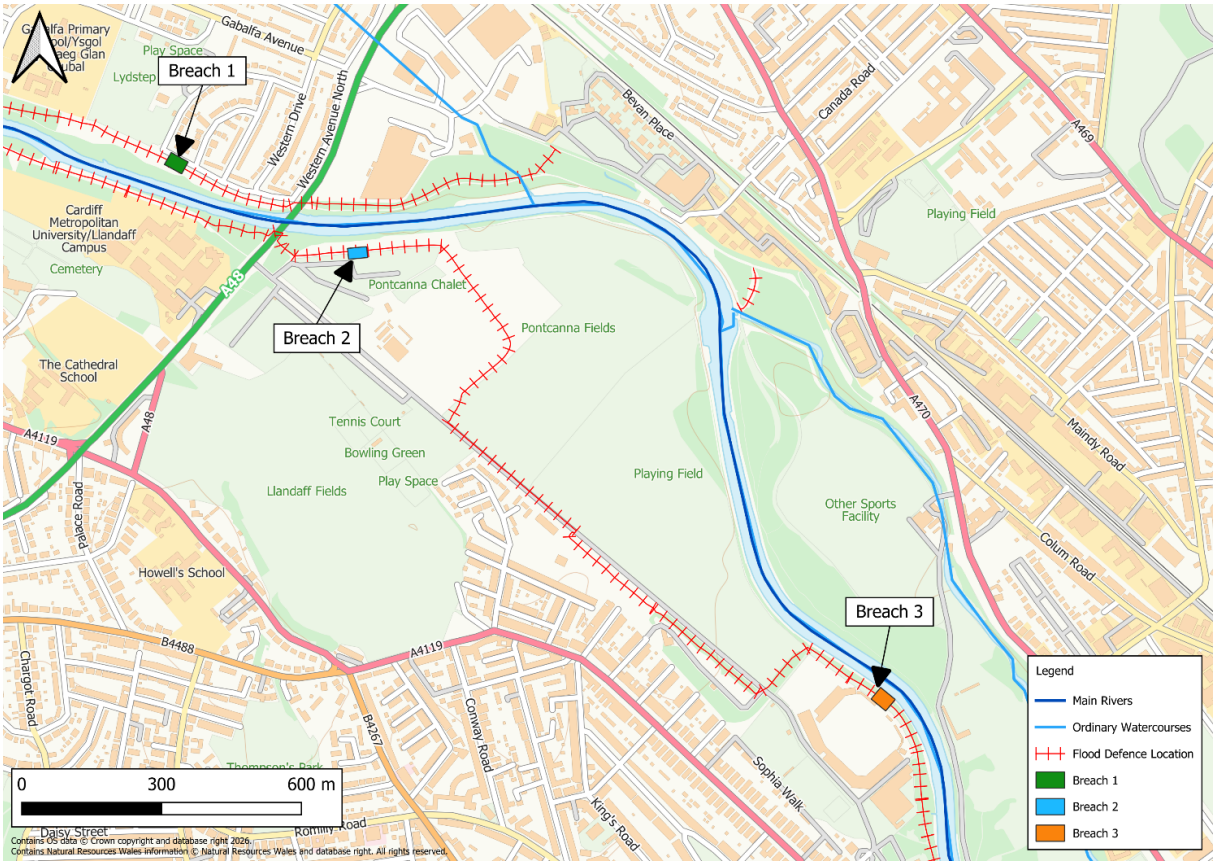

Figure 4-3: River Taff and Ely model breach locations

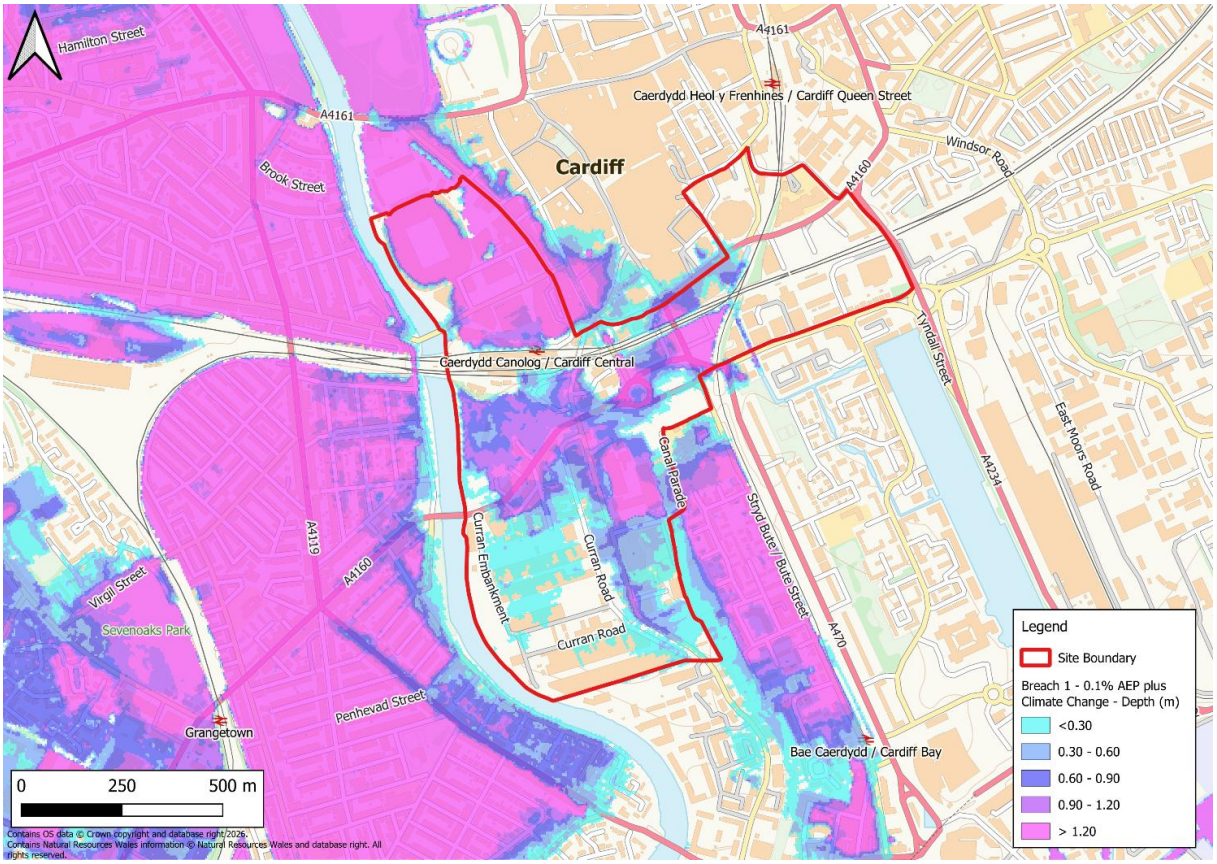

Figure 4-4: Breach 1 0.1% AEP plus Climate Change - Flood depths - Taff and Ely Model

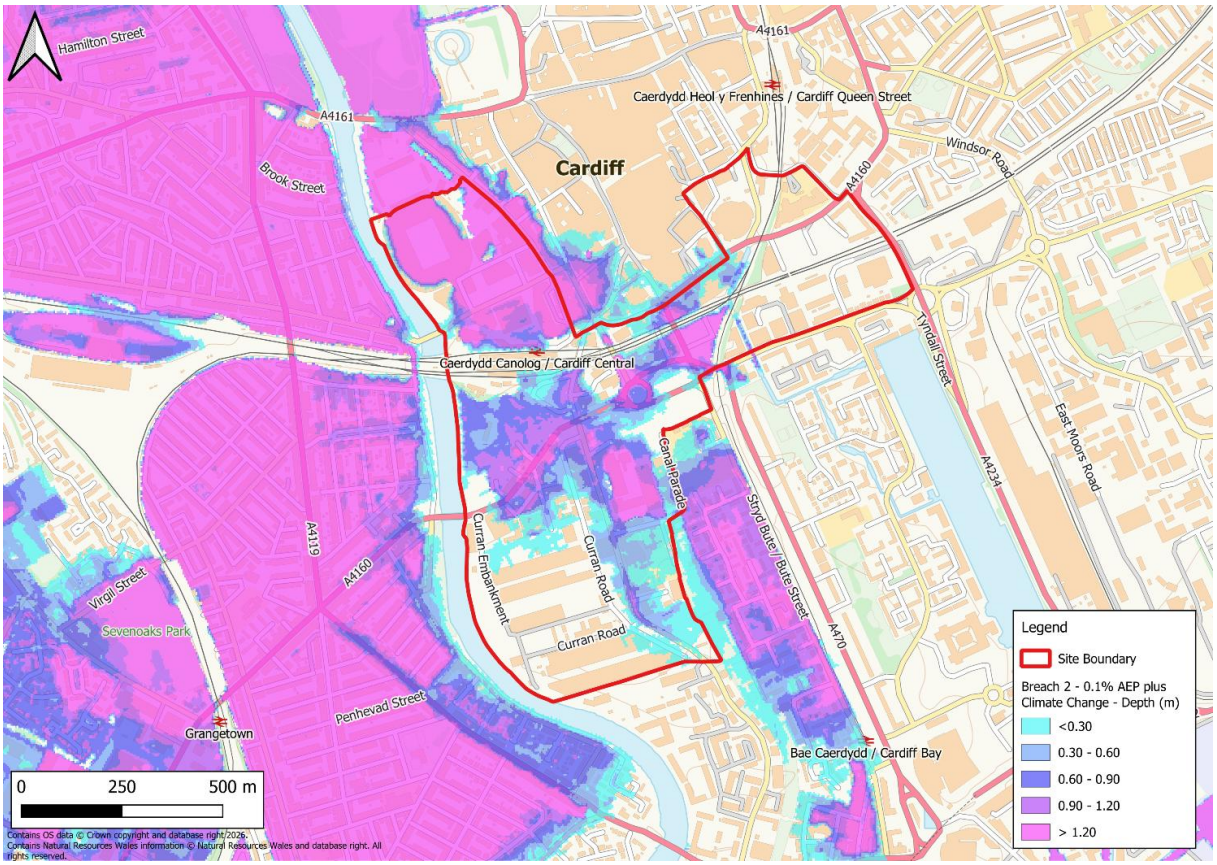

Figure 4-5: Breach 2 0.1% AEP plus Climate Change - Flood depths - Taff and Ely Model

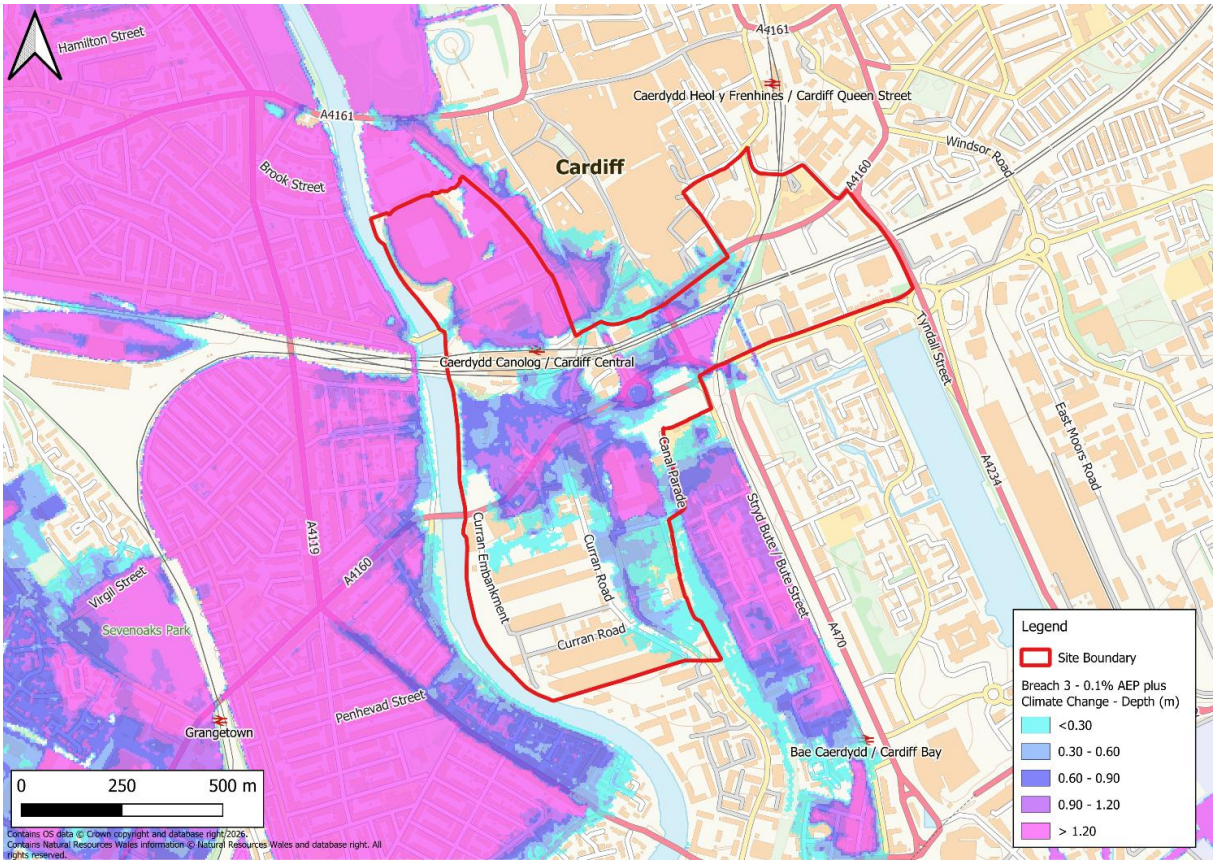

Figure 4-6: Breach 3 0.1% AEP plus Climate Change - Flood depths - Taff and Ely Model

4.2 Flood Risk from the Sea

The Flood Map for Planning - Flood Risk from the Sea (Figure 3-1) indicates that the development site is located within the TAN-15 Defended Zone for the Sea and Flood Zone 3. The site is located within a TAN-15 Defended Zone due to the area being protected from the Cardiff Bay tidal barrage, as detailed in Section 2.3. The Cardiff Bay Barrage provides substantial tidal protection to Cardiff with a standard of protection greater than that required to protect against the 0.1% AEP plus climate change event. As such no further assessment is considered necessary and the tidal flood risk to the site is concluded to be very low.

4.3 Flood Risk from Surface Water

The FMfP - Surface Water and Small Watercourses (Figure 3-3) indicates that the site is mostly located within Flood Zone 1 for this flood source. Localised areas of the site are shown within Flood Zones 2 and 3, associated with topographic depressions.

In the absence of detailed hydraulic modelling of the site, the NRW National Flood Hazard Mapping (NFHM) has been used to provide a further assessment of surface water and small watercourse flood risk to the site. The NFHM is used to define the FMfP surface water and small watercourses Flood Zones, but inspection of the NFHM data provides additional information on flood depth, velocities and hazard, and provides greater insight into the

mechanisms and accuracy of the flood mapping. During the 1% AEP plus climate change event, the development site is predominantly flood free, as shown in Figure 4-7. Localised areas of surface water ponding are shown, associated with roads and topographic depressions. Flood depths reach a maximum of 1.40m during the 1% AEP plus climate change event. The greatest flood depths are found along Bute Street and St Mary's Street in the central part of the site. This is likely to be associated with where roads pass under the railway tracks, resulting in a localised decrease in ground levels.

In the extreme event, the areas of ponding along Bute Street and St Mary's Street increase to maximum depths of 1.94m. Additionally, a much larger area in the eastern extent of the site is at risk of flooding in this event, reaching depths of 1.19m. This is caused by a surface water flow path that originates outside the site boundary along Adam Street (A4160). The flow path travels along Adam Street in a south-westerly direction into the site and ponds within an area of lower topography between the railway, the A4160, and Tyndall Street.

It is envisaged that the surface water overland flow path can be managed through good site layout design and should be retained on site.

Surface water flood risk within the rest of site is predominantly associated with local topographic depressions. Ponding within the site can likely be managed through the implementation of SuDS in line with the Statutory Standards for SuDS in Wales.

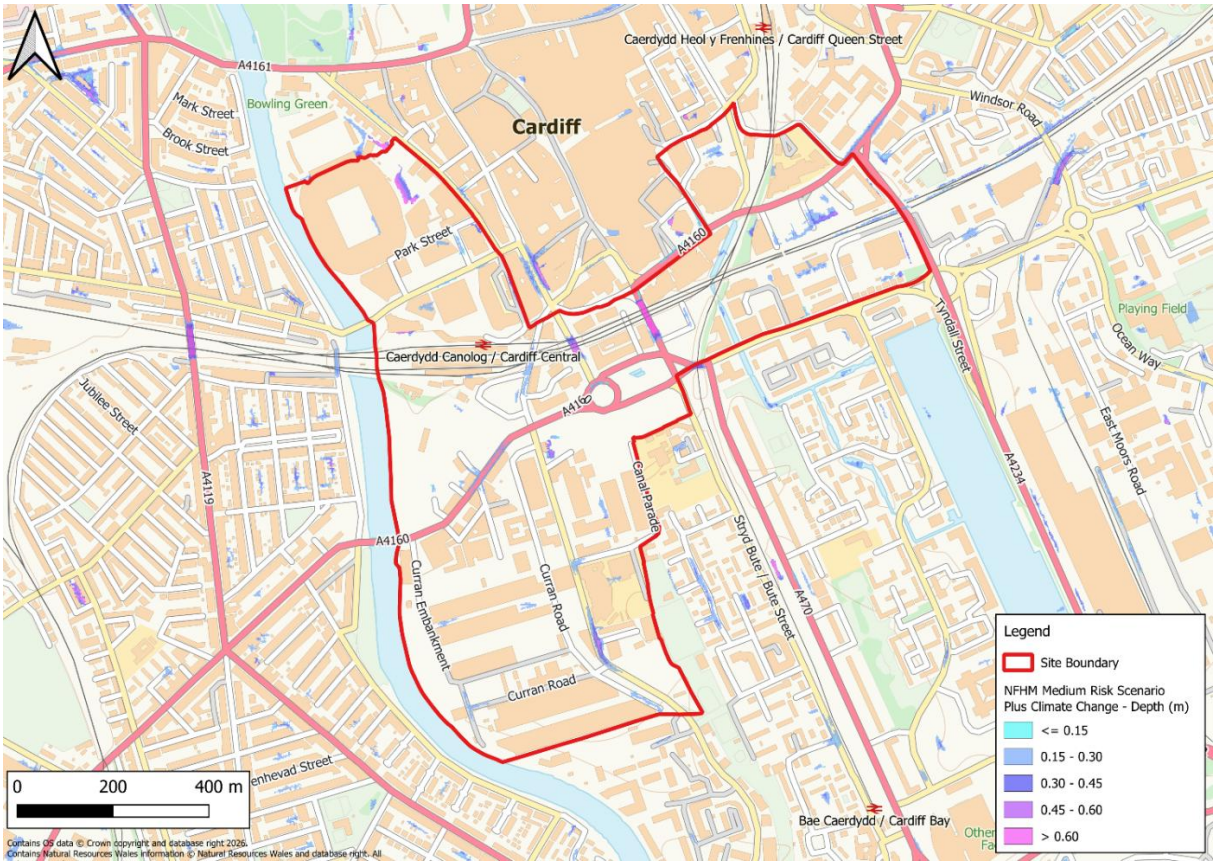

Figure 4-7: Flood Risk from Surface Water - 1% AEP + Climate Change - Flood depths

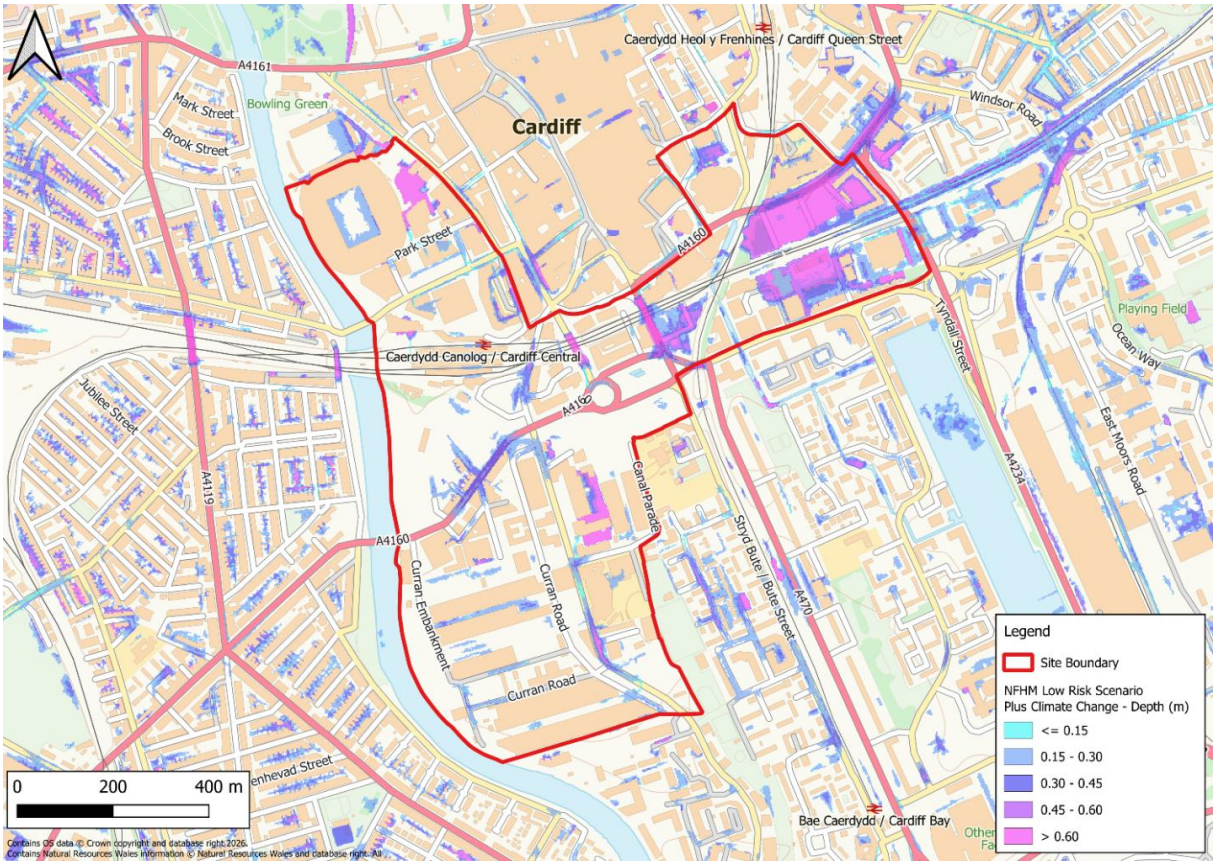

Figure 4-8: Flood Risk from Surface Water - 0.1% AEP + Climate Change - Flood depths

4.4 Flood Risk from Groundwater

Figure 4-7 shows JBA's Groundwater Emergence Map, which indicates that most of the site is at 'very low' risk from groundwater emergence. The eastern extent of the site is at a 'moderate' risk, with groundwater levels indicated to be between 0.025m and 0.5m below the ground surface. A smaller area within the eastern part of the site is at 'high' risk of groundwater flooding, with levels either at or very near (within 0.025m of) the ground surface.

It is recommended that any site-specific assessment considers the potential for groundwater emergence across the site. This assessment should be informed by a programme of groundwater monitoring, ideally conducted over a 12-month period to capture seasonal variations, as well as detailed site-specific ground investigations.

Understanding the groundwater regime is particularly important where Sustainable Drainage Systems (SuDS) are proposed. Infiltrating SuDS features, such as soakaways or infiltration basins, typically require a minimum 1-metre clearance between the base of the asset and the highest recorded groundwater level. Failure to meet this requirement could compromise the effectiveness of infiltration-based drainage and may necessitate alternative SuDS solutions.

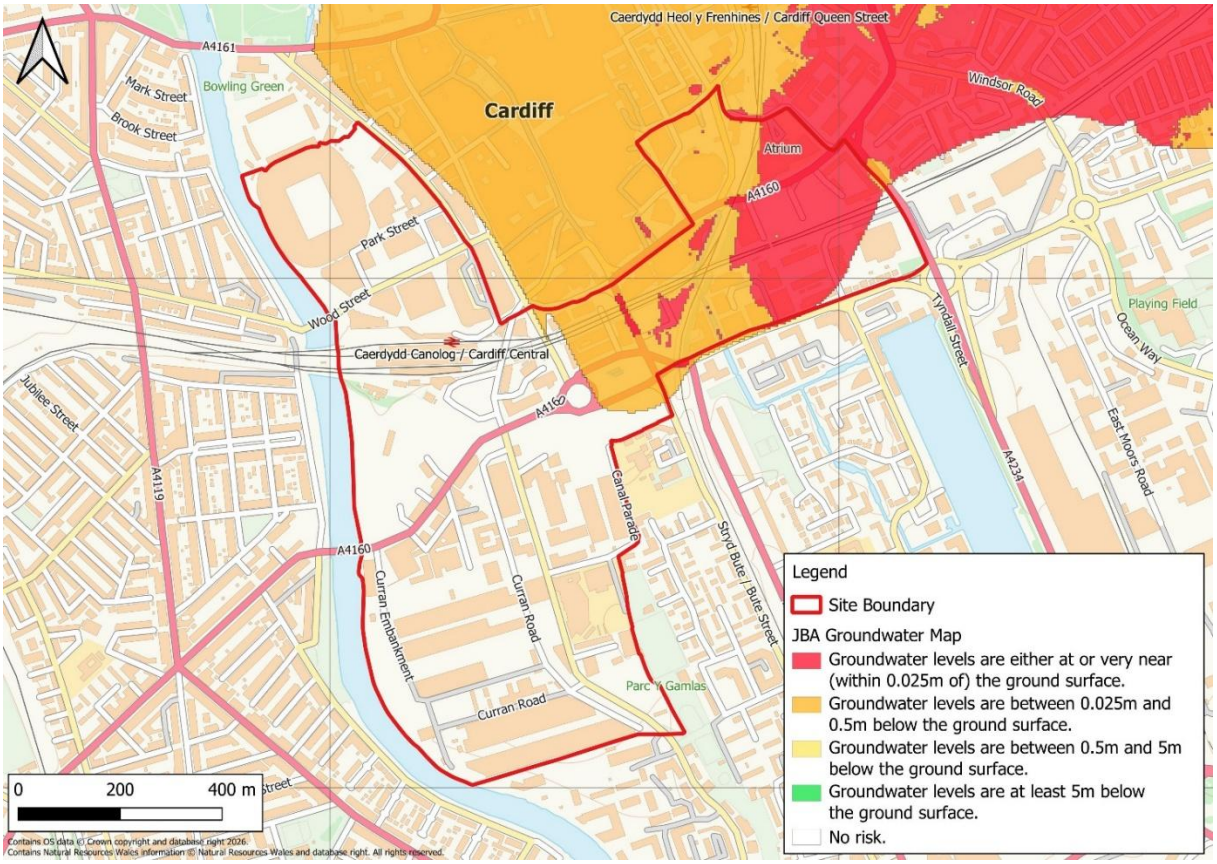

Figure 4-9: Risk of Flooding from Groundwater

4.5 Flood Risk from Reservoirs

Figure 4-8 below shows the reservoir flood extent within the site. This indicates that most of the site is at risk of reservoir flooding. The risk of flooding is associated with a number of reservoirs, including the Pontsticill, Beacons, Cantref and Llwyn-On reservoirs.

However, the regulated nature of reservoir management means that a failure event is very unlikely. It should also be noted that reservoir failures are rare and there has been no loss of life in the UK from reservoir flooding since 1925.

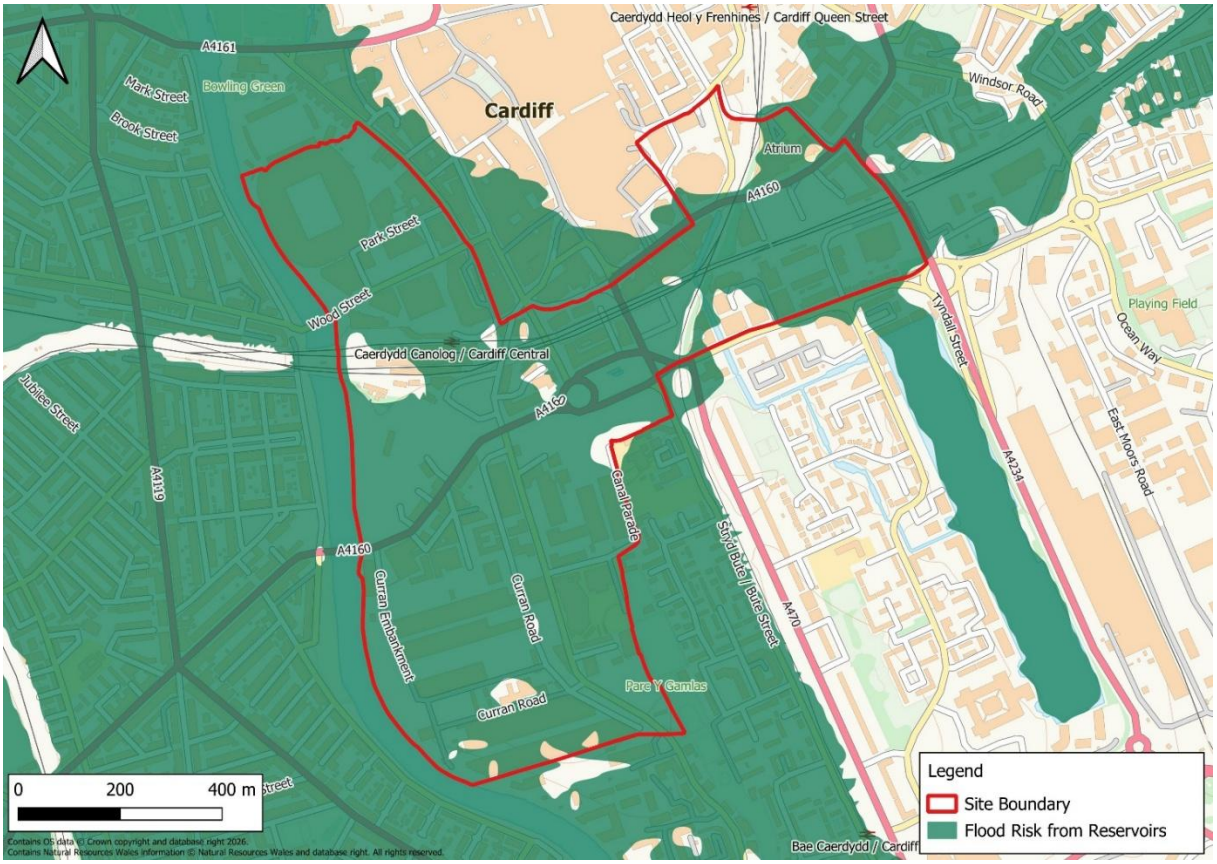

Figure 4-10: Reservoir flood extent

5 Application of Flood Zones to Development Management Decisions

When considering a site for development, Section 10 (Flooding and the plan-led system) and Figures 5 (flood frequency) and 6 (tolerable conditions) of Section 11 of TAN-15 outline the requirements for the type of development permitted in any given flood zone.

The site is affected by flood risk from fluvial, tidal and surface water and small watercourse sources, which are reflected in the mapped Flood Zones across the site. Where a site falls into two or more flood zones the planning authority must make an assessment of the proposal, taking into account each of its proposed land uses, against each of the flood zones to which it applies, in accordance with the criteria requirements of this TAN.

5.1 Flood Risk from Rivers

The site is predominantly located in Flood Zone 2, with the western extent partially located within Flood Zone 3 of the FMfP for Rivers. It is possible to allocate sites within Flood Zone 2 where the proposals assist the implementation of the strategy of the LDP to regenerate or revitalise existing settlements or to achieve key economic or environmental objectives. Section 10.18 of TAN-15 states:

"In Zone 2 allocations may be made for new development and redevelopment of any vulnerability that is necessary to implement the strategy of an LDP, a strategy to regenerate or revitalise existing settlements or to achieve key economic or environmental objectives, provided that a Strategic Flood Consequences Assessment has identified an acceptable level of risk."

Across the site, a sequential approach to development should be applied, locating the majority of built form development within Flood Zones 1 and 2 where tolerable depths of flooding can be achieved in the extreme event. This sequential approach to development is supported within Section 15.5 of TAN-15:

"Where a site falls into two or more flood zones the planning authority must make an assessment of the proposal, taking into account each of its proposed land uses, against each of the flood zones to which it applies, in accordance with the criteria requirements of this TAN."

Risks associated with fluvial flooding are significant for the most extreme event, exceeding indicative depths of acceptable flooding during the 0.1% AEP plus climate change event. As 'redevelopment', proposals may be considered more favourably given the site location, and the opportunities to increase the resilience of existing infrastructure in this area. Proposals should avoid an intensification of development or increase in risk across the site.

In order for the site to be deemed appropriate for residential purposes, mitigation measures shall need to be considered and supported by detailed flood modelling, presented in a site specific FCA for any future redevelopment proposals. It shall be for the LPA and NRW to

determine if proposals are acceptable, and the degree to which the flexibility offered by TAN15 to redevelopment proposals can be applied.

Areas within Flood Zone 3 are considered suitable for water-compatible uses, including areas of open space. The location of SuDS is unlikely to be permissible within this location, though this shall be dependent on flood frequencies and storage requirements within the required design events.

Access and Egress is a key consideration for proposed developments under TAN15. Access and egress are possible during the 0.1% AEP plus climate change event via the A4160.

5.2 Flood Risk from the Sea

The proposed development is located within a TAN-15 Defended Zone for the Sea and Flood Zone 3. The presence of the site within the TAN-15 Defended Zone supplants the sites' location within Flood Zones 3, regardless of the source of risk.

The site is located on brownfield land and is therefore considered as redevelopment.

For a proposed redevelopment site within a TAN-15 Defended Zone, Section 10.17 of TAN15 states:

"On brownfield sites redevelopment proposals should not over intensify use neither should they reduce the area's ability to absorb flood water nor cause problems with flooding elsewhere. All applications should consider opportunities to incorporate flood resilient design as appropriate and any proposal involving highly vulnerable development must be compliant with the tolerable conditions set out in section 11."

Sites within the TAN-15 Defended Zone should also meet the acceptability criteria, as set out in Section 11 of TAN-15. The site is at low risk of tidal flooding due to protection from the Cardiff Bay Tidal Barrage. The Cardiff Bay Barrage provides substantial tidal protection to Cardiff with a standard of protection greater than that required to protect against the 0.1% AEP plus climate change event. As such no further assessment in the form of breach is considered necessary and the tidal flood risk to the site is not expected to be a constraint to development. The development is therefore also not expected to impact third parties. e proposed development has a very low risk of flooding, despite its location with the TAN-15 Defended Zone.

5.3 Flood Risk from Surface Water and Small Watercourses

The site is predominantly located within Flood Zone 1 of the FMfP for surface water and small watercourses, where all forms of development are permissible.

Localised areas of surface water ponding on the site are located within Flood Zones 2 and 3 of the FMfP, associated with topographic low points.

Sections 10 and 11 of TAN-15 do not explicitly apply to the surface water and small watercourse zones in which this proposed development site lies. Instead, it is for the

applicant to demonstrate alignment with the risk-based principles of TAN15 and the general acceptability criteria of Section 11.4 to ensure the following conditions are met:

- No increase in flooding elsewhere
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures agreed and in place
- Flood resistant and resilient design
- Acceptable consequences for type of use (see detailed guidance below):

The overland flow path in the eastern extent of the site should be retained. It is considered that surface water ponding within topographic depressions in the rest of the site can be managed through the implementation of SuDS in line with the Statutory Standards for SuDS in Wales.

The broadscale nature of surface water mapping may result in an overestimation of risk where local urban drainage networks are not included in modelling. Site-specific assessments should be undertaken to further establish the actual risk of surface water flooding across the development site.

Access and egress are key considerations within TAN-15. Access and egress are possible via the A4160 during the extreme event.

6 Summary and recommendations

The site is at low to very low risk of groundwater and sewer flooding.

The site is located within the TAN-15 Defended Zone for the Sea and Flood Zone 3. The site is protected from tidal flooding by the Cardiff Bay Tidal Barrage; therefore, the risk of tidal flooding is low.

The site is predominantly within Flood Zone 1 for surface water and small watercourses, with only small, localised areas located within Flood Zones 2 and 3, associated with topographic depressions.

The site is also located within Flood Zone 2 of the FMfP for rivers.

As the site is located in Flood Zones 2 and 3 and the TAN-15 Defended Zone of the FMfP, it will require a Flood Consequences Assessment (FCA) to assess the risk to the development proposals.

Given the risk of fluvial flooding to the site, re-development may be difficult. In order for the site to be deemed appropriate for residential purposes, mitigation measures shall need to be considered and supported by detailed flood modelling, presented in a site specific FCA for any future redevelopment proposals. It shall be for the LPA and NRW to determine if proposals are acceptable.

The following recommendations are made for the site:

- Any planning application for the site should be accompanied by a site-specific FCA which demonstrates how the proposals meet the requirements of TAN-15.
- A sequential approach to masterplanning is required to direct development towards those areas in Flood Zone 1. Any development within areas of Flood Zone 2 or 3 are likely to require a detailed hydraulic assessment demonstrating the impact of proposals on both the site, and third parties.
- Surface water flood risk on the site should be managed via SuDS techniques, which are implemented in line with the Statutory Standards for SuDS in Wales.
- A Drainage Statement shall be required demonstrating how surface water shall be managed on site, in line with the Statutory Standards for SuDS in Wales, and TAN-15.
- Access and egress in all fluvial design events will need to be carefully considered to facilitate flood free movement in the event of a flood.

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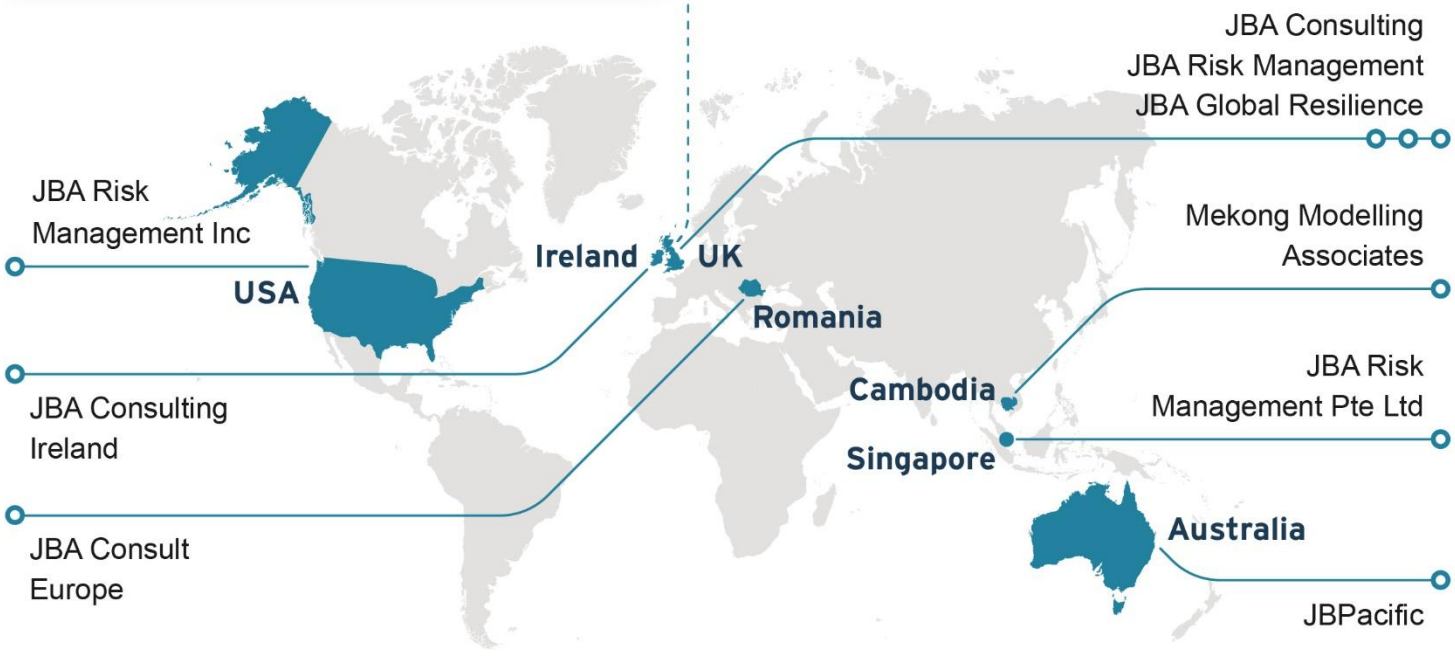

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