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Level 2 Strategic Flood Risk Assessment

Site HEA265; EA036

Prepared for: Southend-on-Sea City Council

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for HEA265; EA036. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Southend-on-Sea City Council Level 1 SFRA and read the Southend-on-Sea City Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Terminal Close
- Site area: 1.49ha
- Existing site use: Brownfield, existing industrial/commercial buildings onsite
- Proposed site use: Residential mixed-use development

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

Topography is lowest in the northwest of the site, where lowest ground level is 6.06mAOD. Ground level slopes upwards towards the southeast of the site to 8.25mAOD.



Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation comprised of clay, silt and sand.
- Superficial - River Terrace Deposits comprised of sand and gravel.

Soils at the site consist of freely draining slightly acid loamy soils.

The likely impact of these on drainage within the site is discussed within Section 5.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located within the east of the study area. The site drains directly to the Thames Estuary.

2.2 Existing drainage features

Based on online mapping, there are no existing drainage features within the site. However, as the existing land use is brownfield, there is likely to be existing drainage infrastructure present within the site.

The site is located approximately 280m northwest of the Thames Estuary.

2.3 Fluvial and tidal

2.3.1 EA's Flood Map for Planning

Based on the EA's Flood Map for Planning (FMfP) (accessed 21 April 2026) and Flood Zone 3b (functional floodplain), defined as set out in the Southend-on-Sea Level 1 SFRA, the site is not shown to be at risk of flooding based on the EA FMfP and is located entirely within Flood Zone 1.

2.3.2 Fluvial

There are no existing watercourses within or surrounding the site and no known fluvial risk to the site. The risk to the site is from tidal flooding, discussed in Sections 2.3.3 and 2.3.4.

2.3.3 Tidal - present day (2026 epoch)

As part of this SFRA, the existing EA hydraulic models of Southend and the Crouch and Roach estuary developed as part of the 2014 Essex, Suffolk and Norfolk Coastal modelling project were combined to cover the study area and have been used to assess the tidal risk across the study area.

The site is not shown to be at risk from present day tidal flooding in the undefended and defended scenarios, according to the FMfP and local flood modelling.

2.3.4 Tidal - future risk (2126 epoch)

The EA’s FMfP Flood Zones plus Climate Change layer shows areas of the site likely to be at increased flood risk in future. The northwestern half of the site is shown to be at risk.

The combined tidal hydraulic model created as part of this SFRA (see Section 2.3.3 for further details) was uplifted for the 2126 epoch for the higher central and upper end climate change scenarios.

As shown in Figure 2-1 and Figure 2-2, the model extent shows a significantly smaller area to be at risk than that represented in the FMfP. Only a small area in the northwestern corner is impacted during the 0.1% AEP plus Upper End (95%) defended and undefended scenarios. The northeastern extent of the site is shown to be impacted by flooding which does not exceed 0.3m in depth, 0.25m/s in velocity and poses a 'Very Low Hazard'.

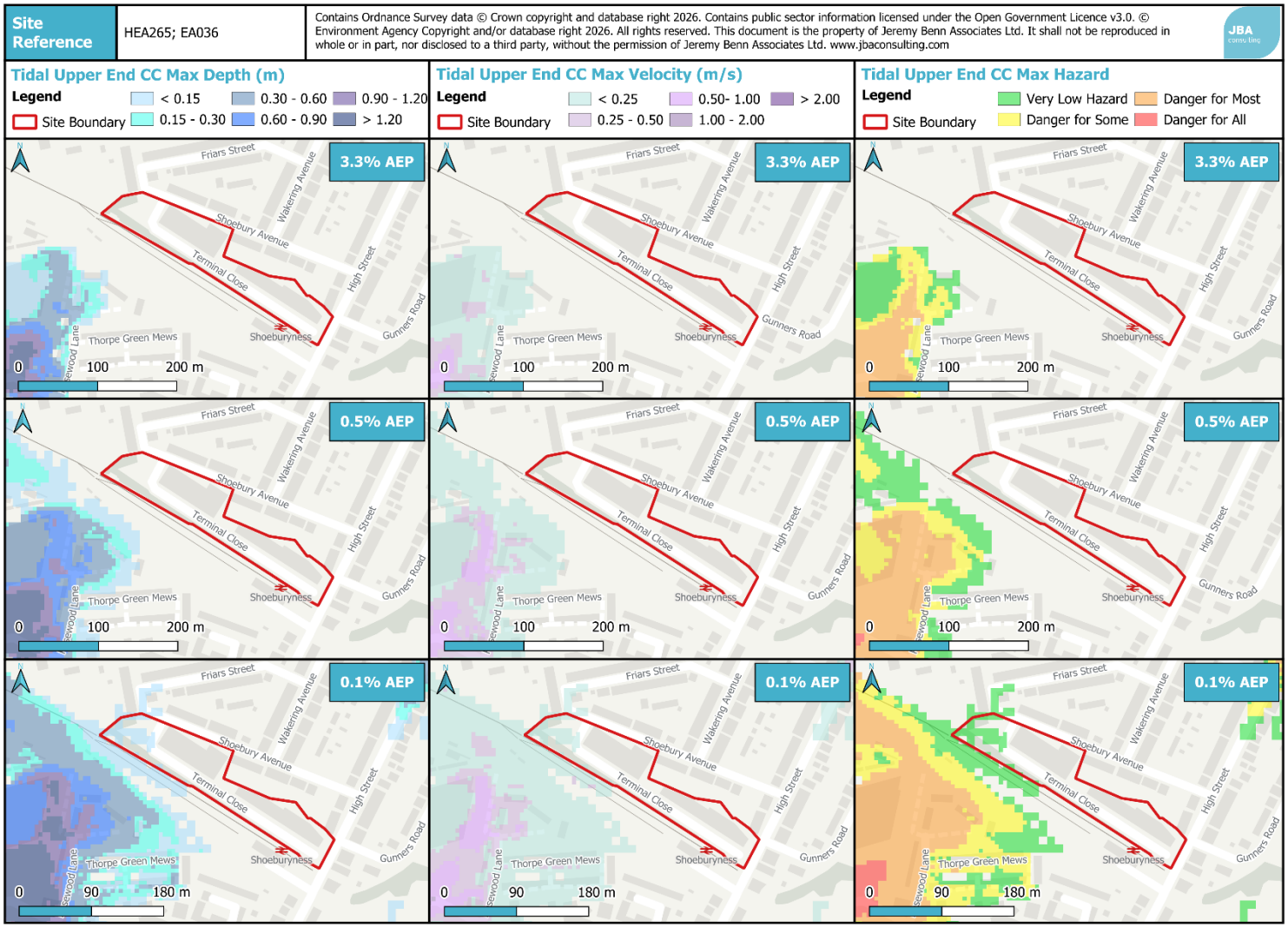


Figure 2-1 Tidal risk for the 3.3%, 0.5% and 0.1% upper end climate change defended scenarios

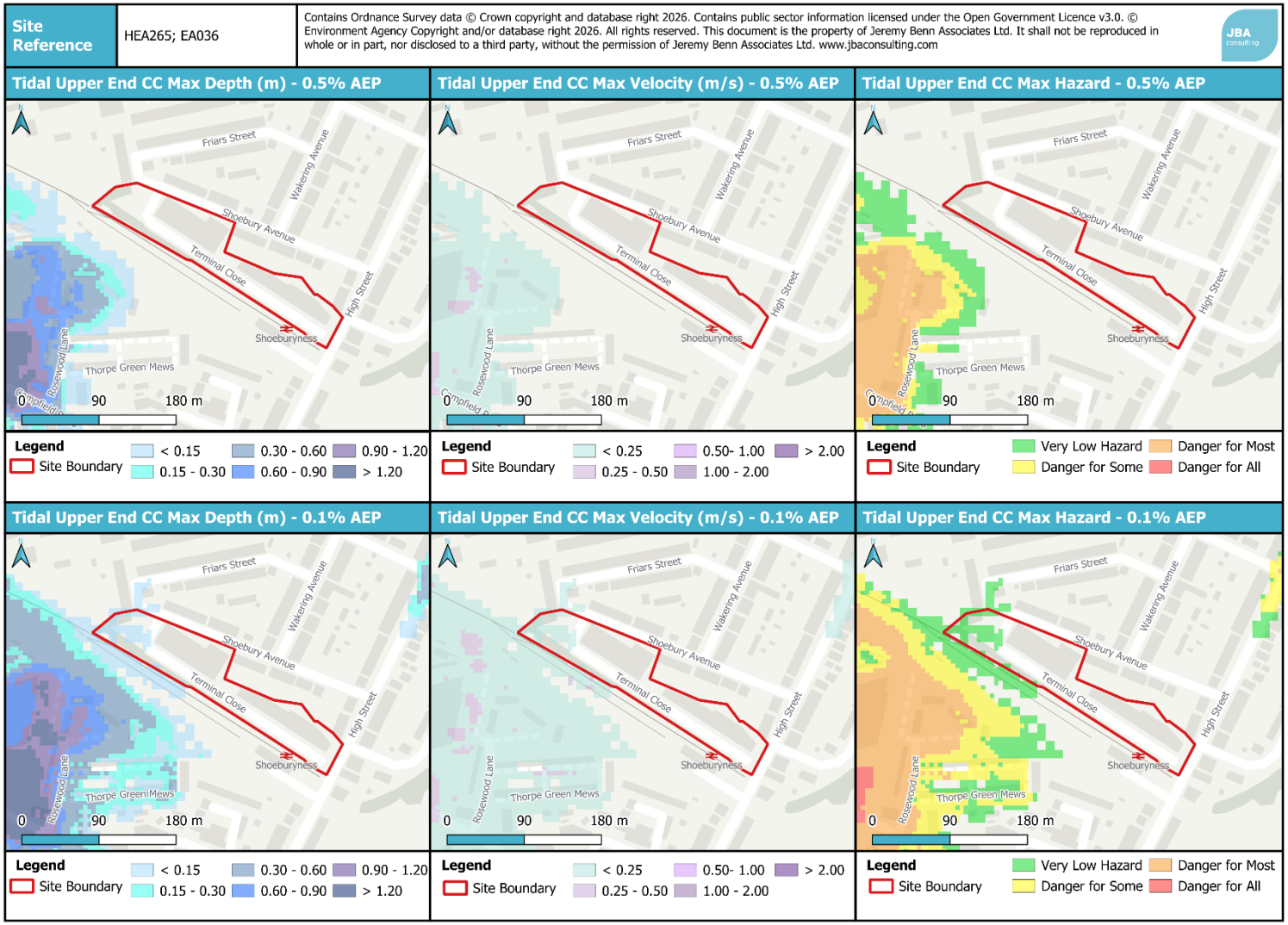


Figure 2-2: Tidal risk for the 3.3%, 0.5% and 0.1% upper end climate change undefended scenarios

2.4 Surface water

2.4.1 Available data

The EA's FMfP Surface Water Spatial Planning Dataset, released in May 2026, has been used within this assessment to inform the extent and depth of the present day and future surface water risk. Climate change outputs are available for the 3.3%, 1%, and 0.1% AEP events with the Upper End climate change allowance for the 2070s epoch.

Velocity and hazard data is not currently available within this dataset, therefore the Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment to inform the velocity and hazard of the present day surface water risk. There is currently no available velocity or hazard information to use to assess future surface water risk.

Descriptions refer to the maximum depth, velocity, and hazard values experienced in each area of the site within a given event.

2.4.2 Present day

Figure 2-3 shows the surface water flood risk at the site.

There are two main areas of surface water ponding within the site; along the northwestern extern of Terminal Close and a smaller area of high risk in the centre of the site.

Figure 2-4 shows the depth, velocity, and hazard across the site in each event. Flood depths on Terminal Close remain below 0.3m in depth during the 3.3% and 1% AEP events. Flooding may increase up to 0.6m in depth during the 0.1% AEP event. Flood depths in the centre of the site are predicted to remain below 0.15m in depth during the 3.3% AEP event and below 0.3m in the 1% and 0.1% AEP events.

Flooding on Terminal Close remains below 0.5m/s in velocity during the 3.3% and 1% AEP events and below 1.0 m/s in velocity during the 0.1% AEP event. Velocities in the centre of the site are predicted to remain below 0.25m/s in the 3.3%, 1% and 0.1% AEP events.

Flooding on Terminal Close is predicted to pose a 'Danger for Some' during the 0.1% AEP event. All other surface water flooding in the site is predicted to pose a 'Very Low Hazard'.

Table 2-1: Present day surface water flood risk based on the EA's FMfP Surface Water Spatial Planning dataset (extent, depth) and RoFSW dataset (velocity, hazard).

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	3	10	17
Maximum depth (m)	0.15 - 0.30	0.15 - 0.30	0.30 - 0.60
Maximum velocity (m/s)	0.25 - 0.50	0.25 - 0.50	0.50 - 1.00
Maximum hazard classification	Very Low Hazard	Very Low Hazard	Danger for Some

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP includes the 3.3% AEP percentage).*

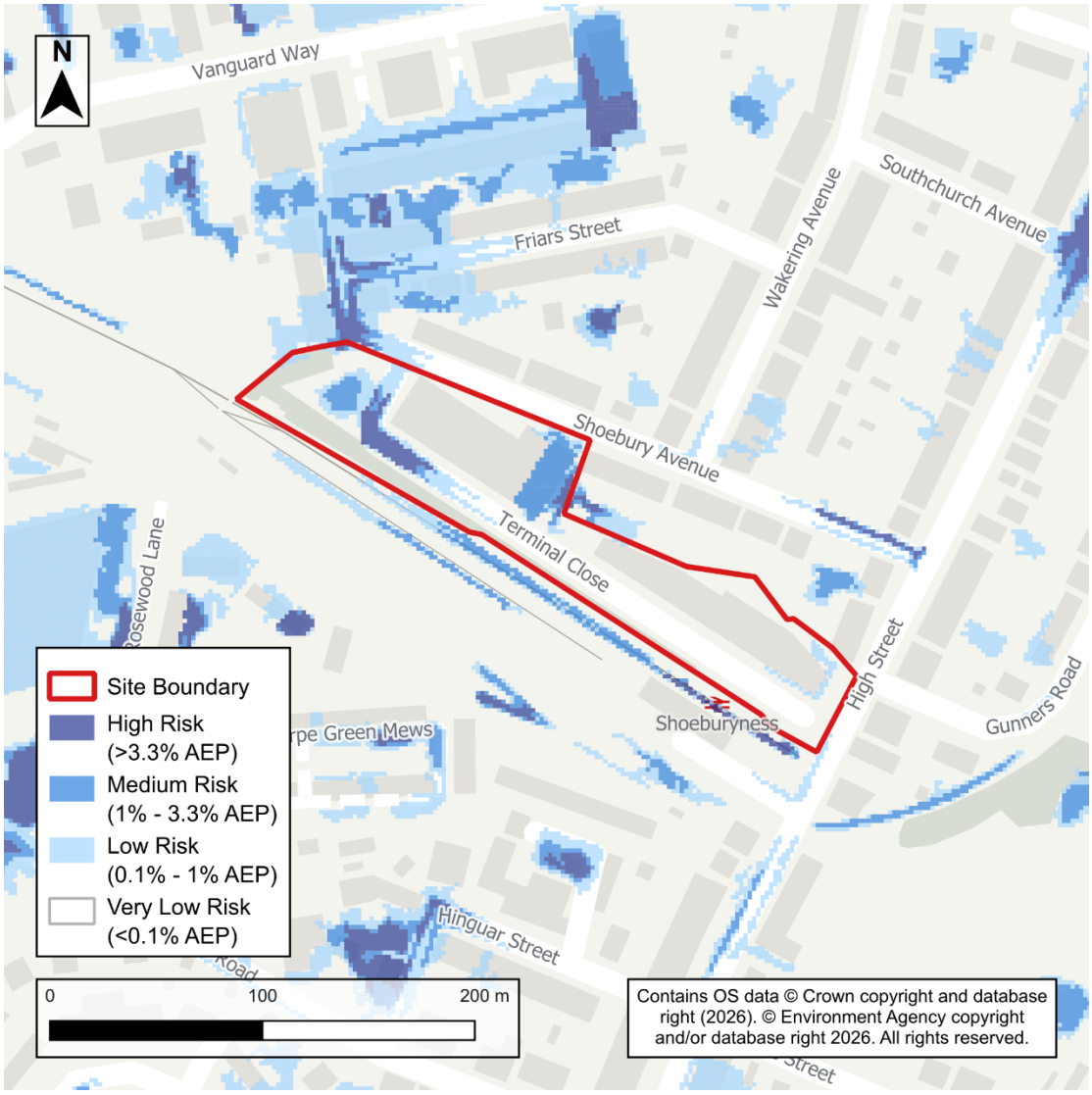


Figure 2-3: Present day surface water risk, based on the EA FMfP Surface Water Spatial Planning dataset.

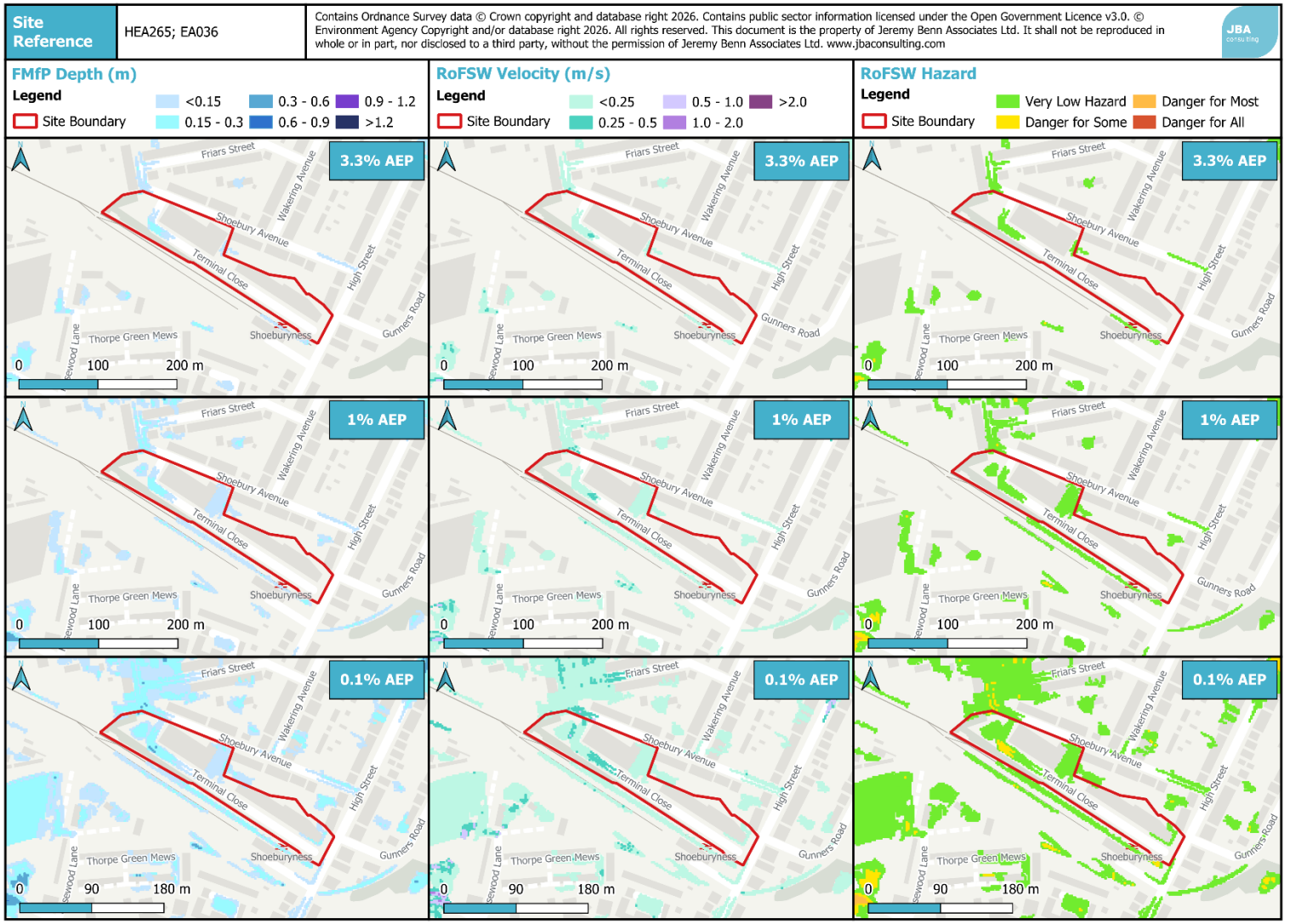


Figure 2-4 Surface water extents and depths for the 3.3%, 1%, and 0.1% AEP climate change events .

2.4.3 Climate change - 2070s Upper End

The extents and depths are shown in Figure 2-5.

Flooding during the 3.3% AEP climate change event closely resembles that in the 1% AEP present day event. Flood extent increase slightly in size for the 1% AEP climate change event compared to the respective present day event and there is a significant increase in flood extents during the 0.1% climate change event when compared against both the 1% AEP climate change and 0.1% AEP present day events, particularly along Terminal Close towards the southwest and the area at risk in the centre of the site approximately doubles in size.

The area of flooding predicted to exceed 0.15m in depth during the 1% AEP present day event increases slightly in size when taking into account a climate change uplift, as does the area predicted to exceed 0.30m in depth during the 0.1% AEP event.

Table 2-2: Comparison of surface water flood risk between the present day and climate change scenarios based on the EA's FMfP Surface Water Spatial Planning.

Event	1% AEP	1% AEP plus 2070s Upper End Climate Change
Percentage of sites at risk* (%)	10	14
Maximum depth (m)	0.15 - 0.30	0.15 - 0.30

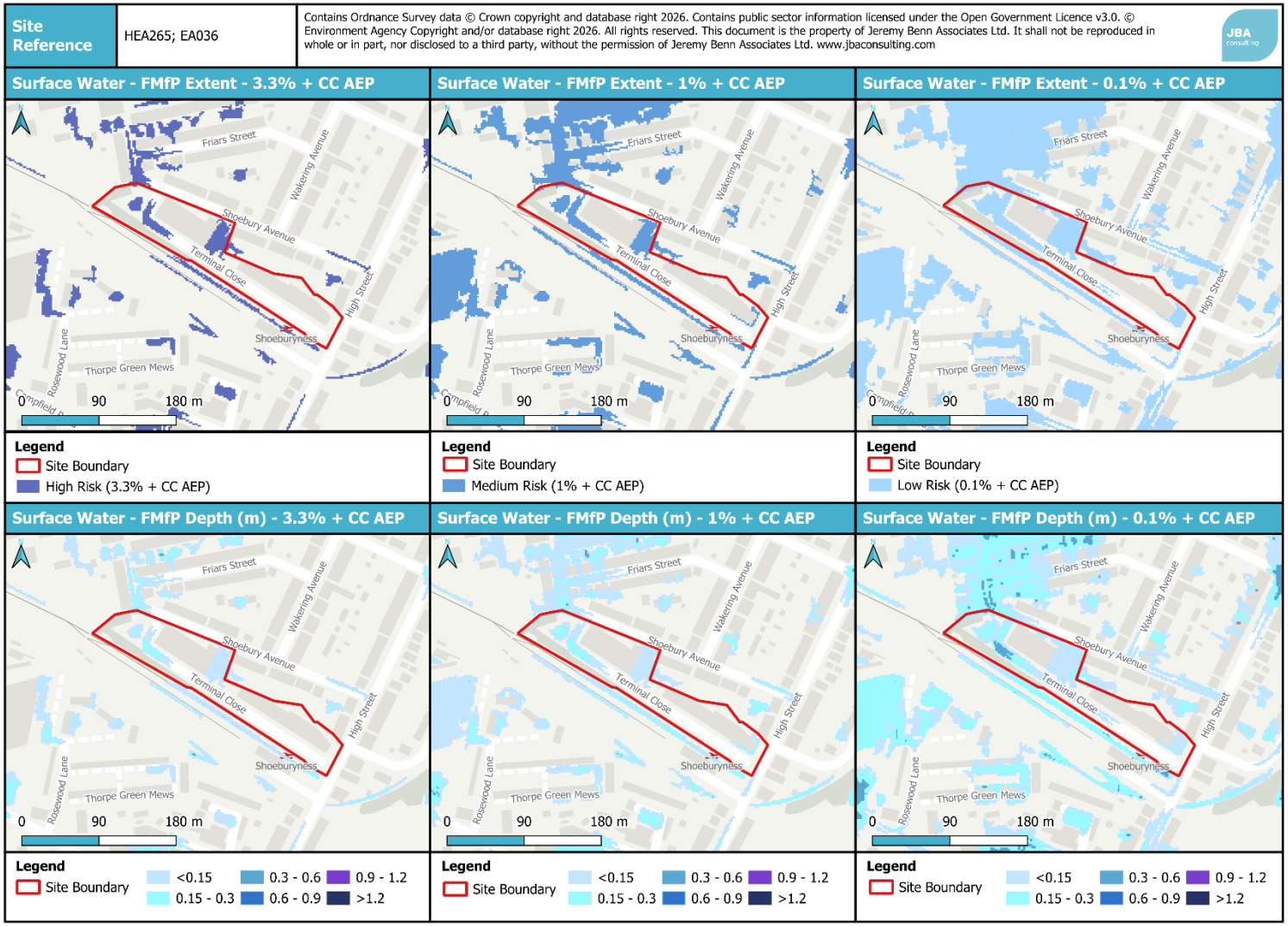


Figure 2-5: Surface water extents and depths for the 3.3%, 1%, and 0.1% AEP climate change events .

2.5 Groundwater

As shown in Figure 2-6, the JBA Groundwater Emergence Map shows that most of the site has groundwater levels between 0.5m and 5m below the ground surface in a 1% AEP groundwater flood event. In this area there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

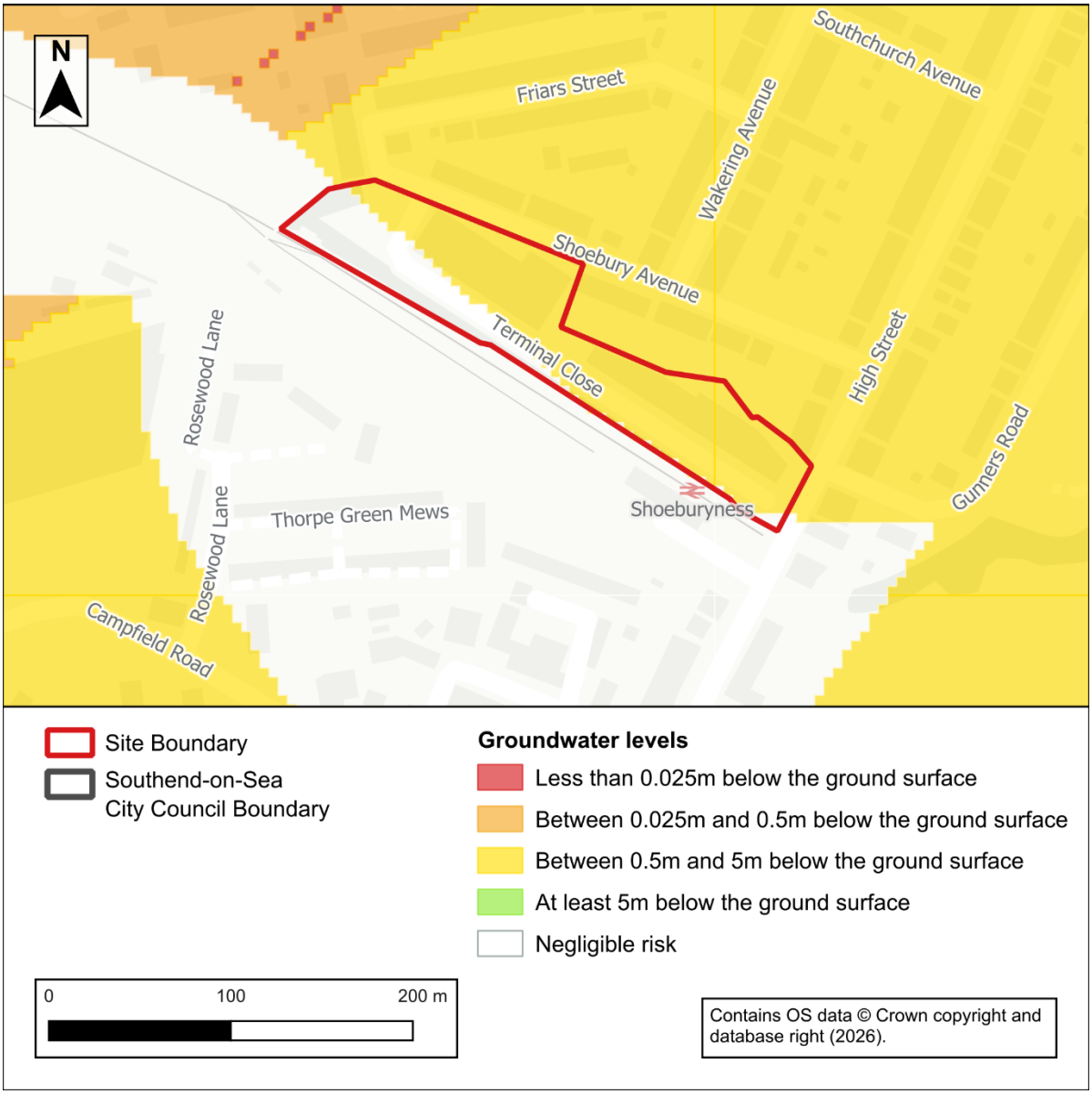


Figure 2-6: Predicted groundwater levels across the site in a 1% AEP groundwater flood event, based on the JBA Groundwater Emergence Map.

2.6 Sewers

Anglian Water provided their DG5 dataset, which identifies internal and external historic sewer flooding records between 2022 and 2026.

There are no recorded sewer incidents in or within close proximity to the site.

The available data should always be supplemented by direct consultation with Anglian Water to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

2.7 Flood history

The EA's Historic Flood Map shows no records of flooding at the site.

Data provided by Essex County Fire and Rescue Service shows no records of flooding at the site.

3 Flood risk management infrastructure

3.1 Defences

Although there are tidal flood defences present along Shorebury Common Beach to the south of the site, the site is not shown to benefit from these defences. The site is only shown to be at risk of tidal flooding in the climate change scenarios and the risk to the site is very similar between the undefended and defended scenarios.

3.2 Residual risk

Breach modelling has been carried out for the 3.3%, 1%, and 0.1% AEP events for present day and climate change scenarios for the higher central and upper end scenarios for the 2126 epoch. Three breach scenarios were considered. Details of the breaches are provided in Appendix D.

The site is shown to be impacted in all three breaches, but only in the 0.1% AEP plus upper end climate change scenarios. The maximum depth, velocity and hazard within the site are the same for the three scenarios (as shown in Table 3-1).

Table 3-1 provides the approximate rate of onset (time between the breach and the first flooding experienced at the site) and the maximum duration of the flooding at the site. This shows the breaches provide a lead time of around 13 to 15 hours, with a maximum duration of around 31 hours.

Table 3-1: Maximum depth, velocity, hazard, and rate of onset and duration of flooding for each breach scenario where the site is shown to be at risk of tidal flooding.

Breach	Event	Maximum depth (m) (2dp)	Maximum velocity (m/s) (2dp)	Maximum hazard (2dp)	Rate of onset (hours) (1dp)	Maximum flooding duration (hours) (1dp)
1	0.1% AEP Upper End CC	0.09	0.23	0.58	15.0	31.1
2	0.1% AEP Upper End CC	0.09	0.23	0.58	13.3	31.1
3	0.1% AEP Upper End CC	0.09	0.23	0.58	13.5	31.1

4 Emergency planning

4.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

4.2 Access and escape

Safe access and escape will need to be demonstrated in the 1% AEP plus climate change surface water events and the 0.5% AEP plus climate change tidal event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

4.2.1 Potential access

The site can be accessed via Shoebury Avenue to the north and the High Street to the southwest.

4.2.2 Fluvial and tidal

Fluvial risk to the site is considered to be low and unlikely to impede access and escape.

The site and the surrounding roads are not shown to be impacted during the defended and undefended 0.5% plus climate change scenarios. Therefore, access and escape should not be impeded.

4.2.3 Surface water

Access and escape via Shoebury Avenue and High Street should still be possible during the 1% AEP plus climate change scenario due to the areas shown at risk to be isolated and mostly shallow (less than 0.15m or less than 0.3m) within and along roads in close proximity to the site.

4.3 Dry islands

The site is not located on a dry island.

5 Requirements for drainage control and impact mitigation

5.1 Broadscale assessment of possible SuDS

Surface water at the site should be discharged in accordance with the drainage hierarchy as set out in the National standards for SuDS (gov.uk). SuDS that provide opportunities to deliver multiple benefits including volume control, water quality, amenity, and biodiversity should be prioritised. SuDS proposals should be discussed with relevant stakeholders (Local Planning Authority (LPA), Lead Local Flood Authority (LLFA), and the EA) at an early stage to understand possible constraints.

The site is partially located within the Shoebury Critical Drainage Area. The CDAs currently designated were identified in the Southend-on-Sea SWMP 2015 (southend.gov.uk). Any development within these CDAs will need demonstrate an adequate surface water drainage system which is maintainable for the lifetime of the development within a site specific FRA. Developers will need to provide details of the long term maintenance of the surface water drainage system. Developers should collaborate with the LLFA to identify all sources of flood risk, help reduce risk to existing communities, and explore grant funding opportunities for these wider improvements. Furthermore, growth allocations should take CDAs into account when assessing site suitability for development, ensuring that flood risk is properly managed and mitigated during planning.

Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

The following factors should be considered when assessing whether infiltration is suitable at the site:

- Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
- BGS data indicates that the underlying geology is clay, silt and sand which is likely to have highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is not located within a historic landfill site.

If it is proposed to discharge runoff to a sewer system, the condition and capacity or the receiving asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Surface water outfalls that discharge into the Thames Estuary may be susceptible to tide locking due to high water levels. The impacts of tide locking will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

5.2 Opportunities for wider sustainability benefits and integrated flood risk management

The following are opportunities for wider sustainability benefits and integrated flood risk management at the site:

- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.

6 NPPF and planning implications

6.1 Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential led mixed use development as 'More Vulnerable.

The Exception Test is not required for this site because the entire site is not shown to be at fluvial or tidal risk within the EA's FMfP.

6.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- within Flood Zone 1 with a site area of 1 hectare or more
- within 'Flood Zones plus Climate Change', showing it is at increased risk of flooding from rivers or sea in future
- within Flood Zone 1 and the flood map for planning shows it is at risk of flooding from surface water, now or in future
- in an area identified as having critical drainage problems
- within Flood Zone 1 where the LPA's strategic flood risk assessment (SFRA) shows it will be at increased risk of flooding during its lifetime
- that increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the LPA, LLFA, Anglian Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Southend-on-Sea City Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

6.3 Guidance for site design and making development safe

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% AEP surface events and the 0.5% AEP tidal event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and escape should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

7 Conclusions

Summary of the key areas of flood risk across the site:

- **Tidal**: A small section in the northwest of the site is only shown to be at tidal risk during the modelled 0.1% AEP plus Upper End (95%) defended and undefended scenarios. However, the EA's FMfP Flood Zones plus Climate Change layer shows the whole northwestern half of the site to be at risk.
- **Residual**: The site is at residual risk of tidal flooding due to breach or overtopping of the tidal defences, but only during the 0.1% AEP plus Upper End (95%) defended and undefended scenarios
- **Surface water**: There is notable surface water ponding predicted at the site in the present day, showing an increase with climate change, however depths, velocities and hazards are predicted to remain relatively low.

The following points should be considered in development of this site:

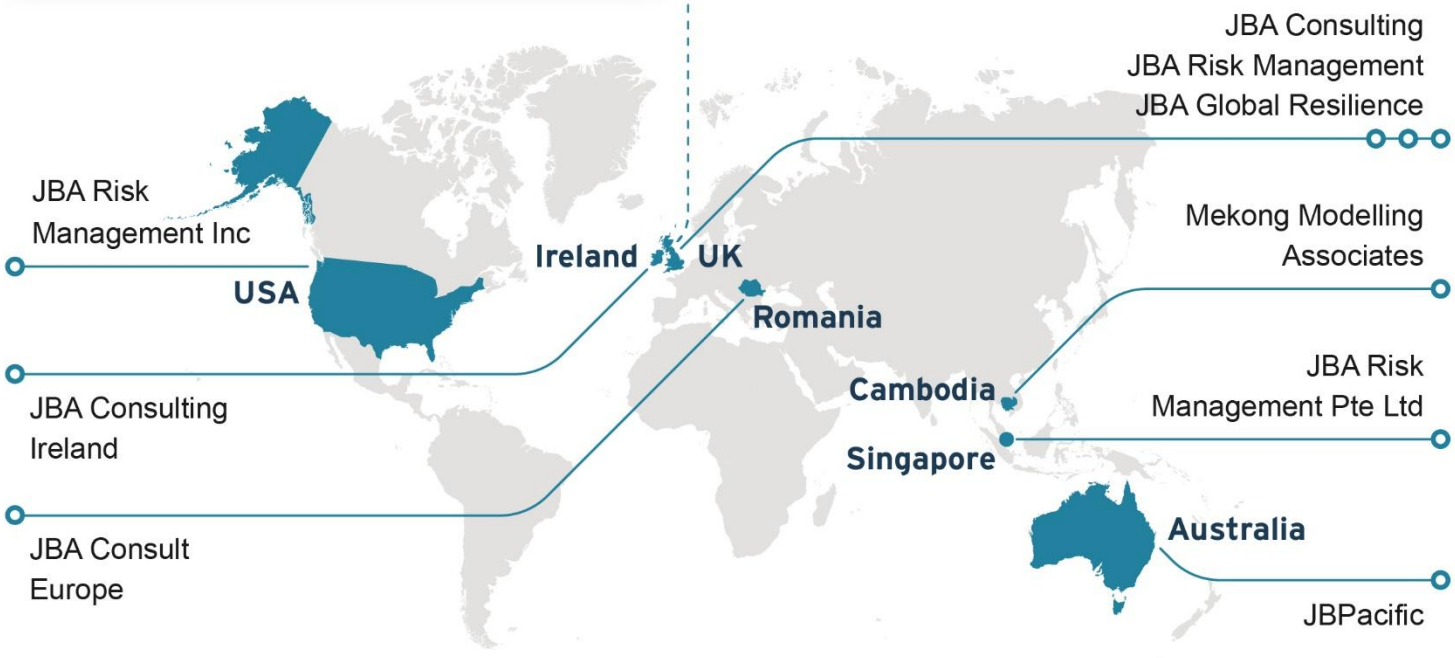
- The Exception Test is not required for this site because the entire site is not shown to be at fluvial or tidal risk within the EA's FMfP
- A site-specific FRA should be undertaken, which assess all sources of flood risk.
- Safe access and escape should be considered in the design tidal and surface water events. Developers should demonstrate that safe access and escape routes can be achieved; however, any raising of access and escape routes must make sure that floodwater is not displaced elsewhere. This assessment has demonstrated that safe access and escape are likely to be possible based on the flood risk shown within this assessment.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling. Infiltration testing should be undertaken to confirm the groundwater levels and appropriateness of SuDS, to inform a sustainable drainage strategy in line with the SuDS hierarchy.
- Anglian Water should be consulted at an early stage on drainage proposals for the site to identify any potential constraints or existing sewer flooding issues that may not have been identified through this high level assessment.

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