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Level 2 Strategic Flood Risk Assessment

Site HEA271; EA014

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 Site HEA271; EA014. 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: Vanguard Way, Shoeburyness
- Site area: 12.8ha
- Existing site use: Brownfield, existing industrial and commercial buildings
- Proposed site use: Employment

1.2 Topography

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

Topography shows low-lying elevations across the site. Minimum elevations are approximately 5.2mAOD at the eastern site boundary and maximum elevations of 8.4mAOD are in the open green space in the west of the site.

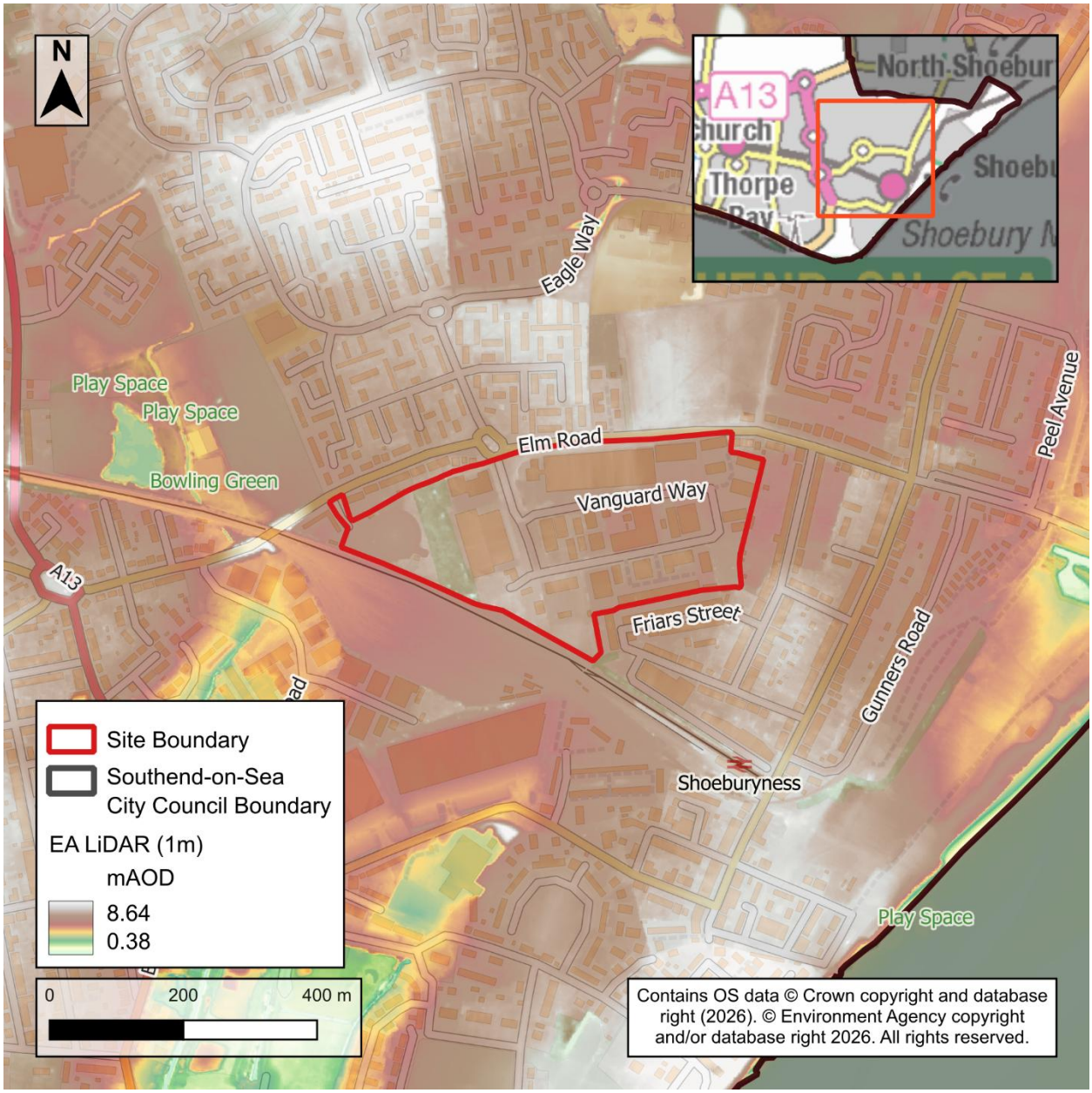


Figure 1-1: Topography of the site.

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:

- Predominantly freely draining slightly acid loamy soils.
- Loamy soils with naturally high groundwater in the northwest corner.

The likely impact of the geology and soils 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 and drains directly to the Thames Estuary.

The Thames Estuary is located approximately 2km south of the site. There is a culverted watercourse approximately 200m west of the site.

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.

2.3 Fluvial and tidal

2.3.1 EA's Flood Map for Planning

Based on the EA's Flood Map for Planning (FMfP) Flood Zones (accessed 21 April 2026) and Flood Zone 3b (functional floodplain), defined in the Southend-on-Sea Level 1 SFRA, the site is located wholly within Flood Zone 1 and therefore not shown to be at fluvial or tidal risk in the present day, based on the EA's FMfP.

2.3.2 Fluvial - present day

The EA's FMfP has been used within this assessment to assess fluvial risk as there is no detailed hydraulic modelling currently available for this site. Flood Zone 3b has been defined using the Rivers and Sea 3.3% AEP defended extent. There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment.

The site is located wholly within Flood Zone 1 and therefore not shown to be at fluvial risk based on the EA's FMfP.

2.3.3 Fluvial - climate change

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 2.3.4 and 2.3.5.

2.3.4 Tidal - present day (2026 epoch)

As part of this SFRA, the existing EA detailed 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. The updated model has been used to assess the tidal risk to the site.

Most of the site is not shown to be at risk from tidal flooding. The site is not shown to be at risk during the defended tidal events or in the 0.5% AEP undefended tidal event.

However, Figure 2-2 shows that during the 0.1% AEP undefended tidal event, the flood extent encroaches into a small area at the northwest site boundary. Flood depths within the site are below 0.15m, flood velocity is less than 0.25m/s, and hazard is classified as a 'Very Low Hazard'.

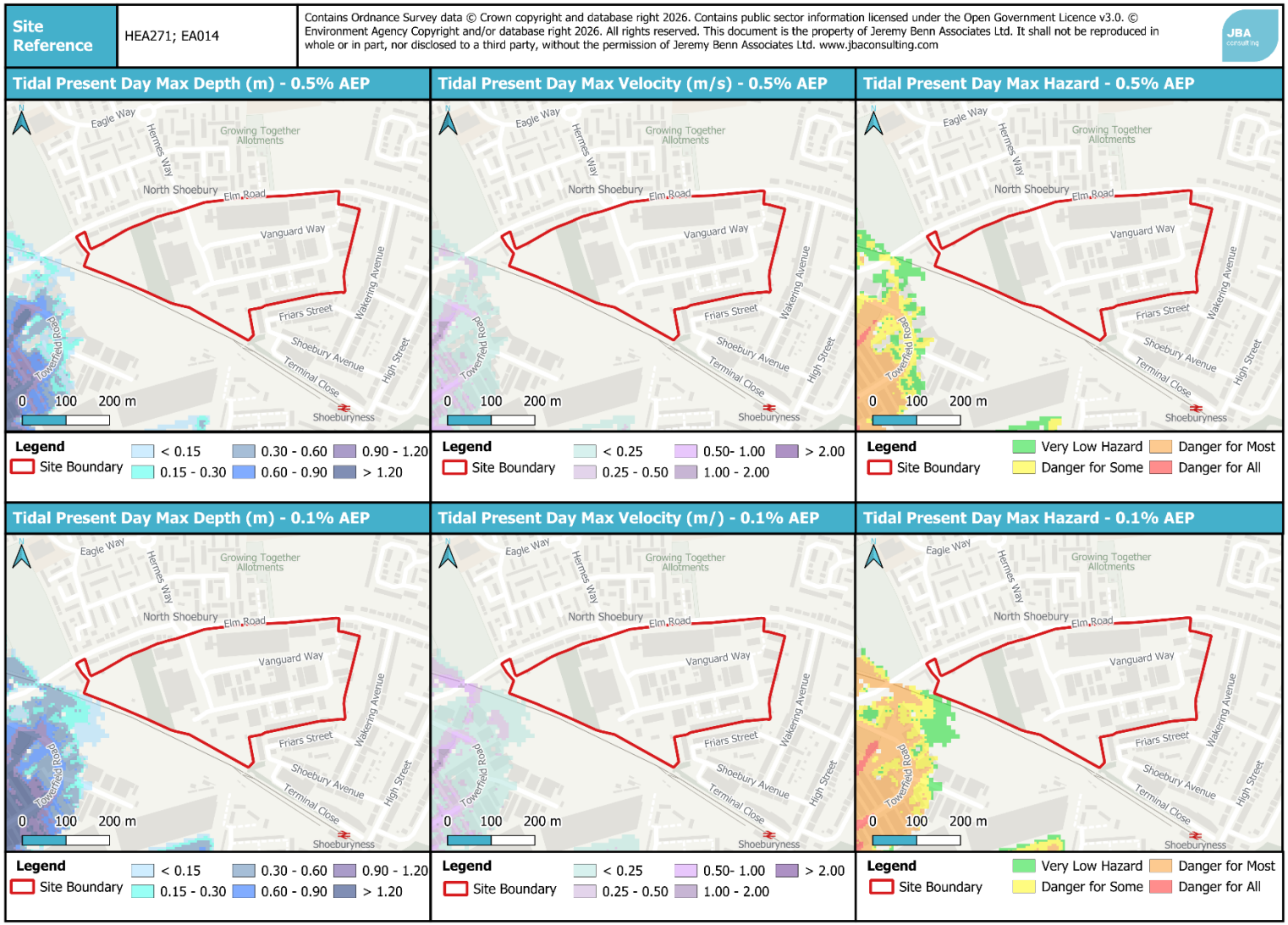


Figure 2-1: Present day tidal modelling for the 0.5% AEP and 0.1% AEP undefended events.

2.3.5 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. Most of the site is shown to be at risk with tidal risk approaching the site from both the east and west.

The combined tidal hydraulic model created as part of this SFRA (see Section 2.3.4 for further details) was uplifted for the 2126 epoch for the higher central and upper end climate change scenarios.

The model extent shows a significantly smaller proportion of the site to be at risk than that shown in the FMfP Flood Zones plus Climate Change layer. The flood extent across all scenarios is confined to the northwest of the site.

Undefended

Figure 2-2 and Figure 2-3 show the undefended future tidal risk to the site. The site is shown to be at risk in both the 0.5% AEP and 0.1% AEP higher central and upper end climate change events.

During the 0.5% AEP higher central climate change event, there is minimal flood risk within the western site boundary. The flood extent shows depths of less than 0.15m, velocities of less than 0.25m/s and the maximum hazard classification is ' Very Low Hazard'. The 0.5% AEP upper end climate change event shows an increase in flood extent in the northwest of the site where flood depths increase to between 0.3m and 0.6m and hazard increases to 'Danger for Most' directly along the southwest site boundary. The maximum flood velocity remains less than 0.25m/s.

During the 0.1% higher central climate change event, the flood extent increases in the northwest corner of the site and along most the western site boundary to further encroach towards the centre of the site. The maximum flood depths are between 0.6m and 0.9m and flood hazard is classified as a 'Danger for Most' within the western boundary, but flood velocities do not exceed 0.25m/s across the site. In the 0.1% AEP upper end climate change event the flood extent increases to inundate the entire northwest corner of the site and the entire western boundary. The predominant depth band across the extent increases from less than 0.15m to between 0.3m and 0.6m and the maximum predicted flood depths are between 0.6m and 0.9m within the western boundary. Flood velocities increase to between 0.25m/s and 0.50m/s in the northwest corner and a greater proportion of the flood extent is classified as a 'Danger for Most'.

Defended

Figure 2-4 and Figure 2-5 show the defended future tidal risk to the site.

The site is not shown to be at risk during the present day defended scenarios, but risk is shown to increase at the site in the climate change scenarios.

During the 3.3% AEP higher central climate change tidal flood event, the flood extent minorly encroaches on the western site boundary showing flood depths of less than 0.15m, velocities between 0.25m/s and 0.5m/s, and maximum hazard classification of 'Danger for

Most'. The flood extent during the 3.3% AEP upper end climate change event slightly increases at the western boundary and shows the same velocity and hazard as the 3.3% AEP higher central climate change event. Maximum flood depths increase to between 0.3m and 0.6m.

The flood extent during the 0.5% AEP higher central and upper end climate change events is shown to be smaller than the undefended extent. Flood risk is confined to the western site boundary and shows maximum flood depths between 0.3m and 0.6m and maximum flood velocities of less than 0.25m/s during the higher central climate change event. The predominant flood depths across the site are less than 0.15m, velocities do not exceed 0.25m/s and hazard is classified as a 'Very Low Hazard'. However, the 0.5% AEP upper end climate change flood extent shows maximum flood depths between 0.60m and 0.9m and flood velocities between 0.5m/s and 1.0m/s in the northwest corner of the site. Maximum flood hazard is 'Danger for Most' during both events.

The 0.1% AEP higher central climate change event shows a similar flood extent to the 0.1% AEP higher central undefended extent. However, there is a slight increase in areas showing flood depths between 0.30m and 0.60m in the northwest corner of the site. Flood velocities increase to between 0.50m/s and 1.0m/s within the western boundary and the maximum hazard classification is Danger for Most. The 0.1% AEP upper end climate change event shows similar flood extent and depths as the undefended extent. Flood velocities are much lower in the defended extent and mostly do not exceed 0.25m/s, with the exception of small areas in the northwest corner of the site. Most of the extent is classified as a 'Danger for Most'.

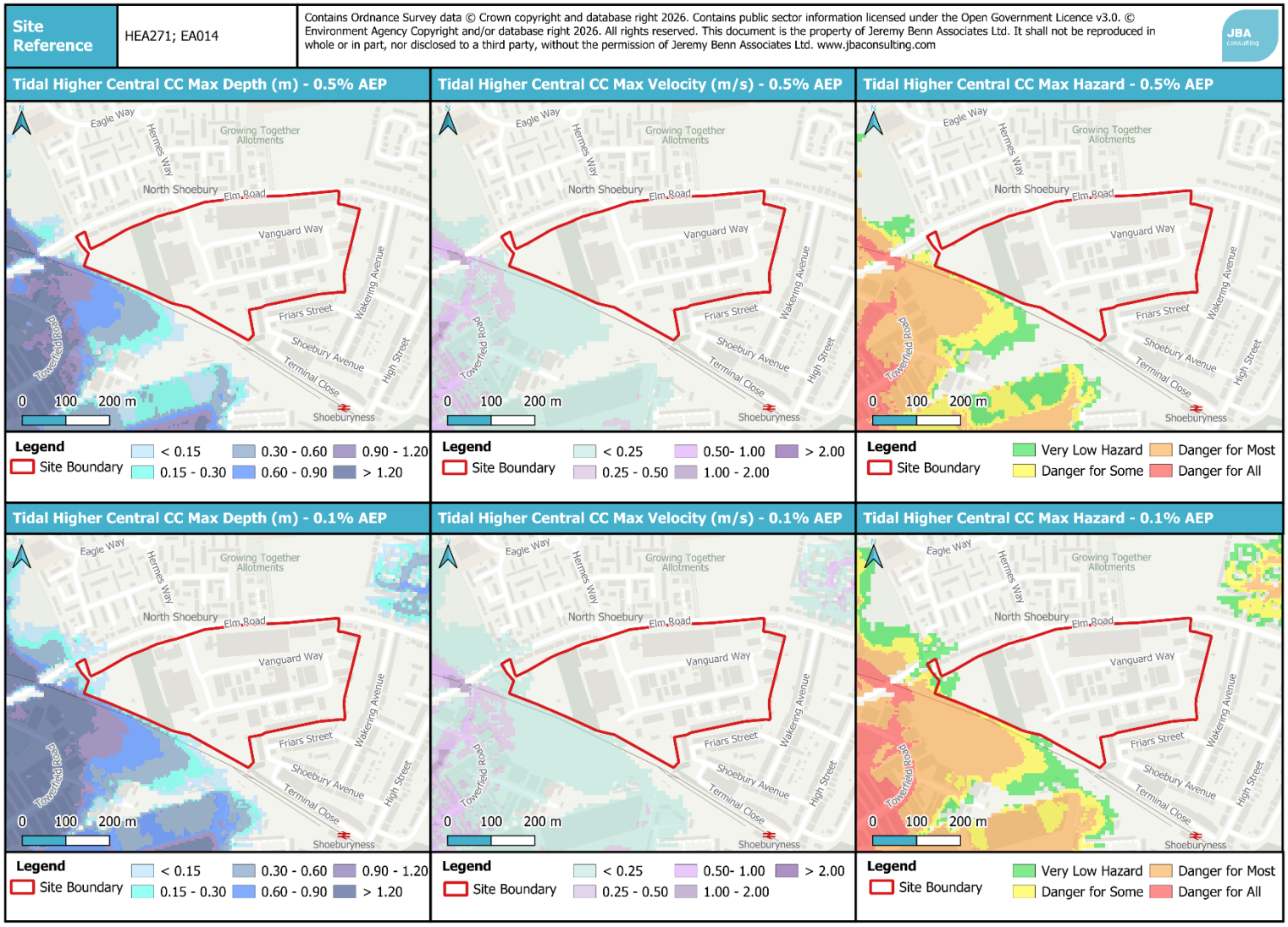


Figure 2-2: Tidal risk for the 0.5% AEP and 0.1% AEP higher central climate change undefended scenarios.

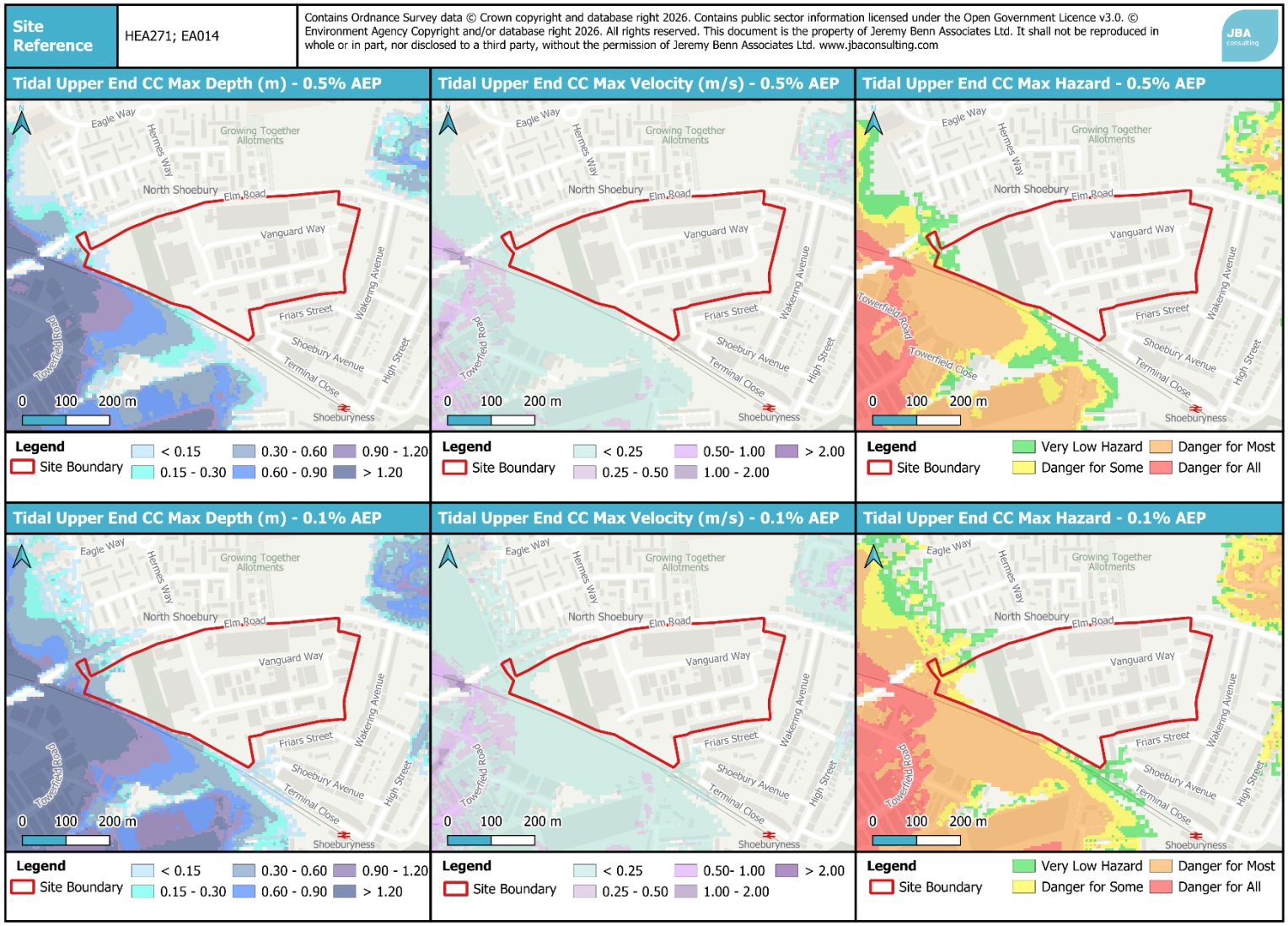


Figure 2-3: Tidal risk for the 0.5% AEP and 0.1% AEP upper end climate change undefended scenarios.

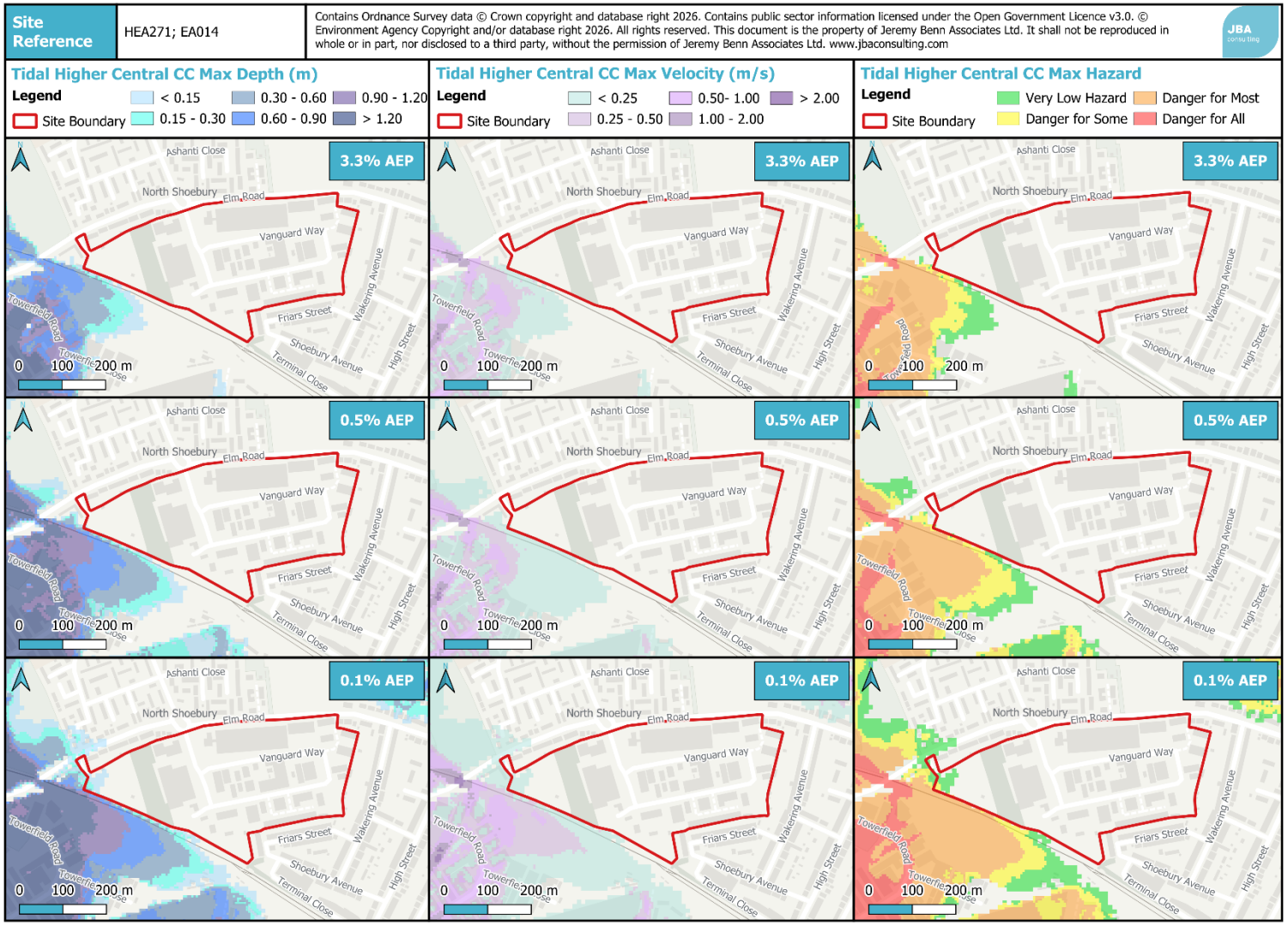


Figure 2-4: Tidal risk for the 3.3%, 0.5% AEP, and 0.1% AEP higher central climate change defended scenarios.

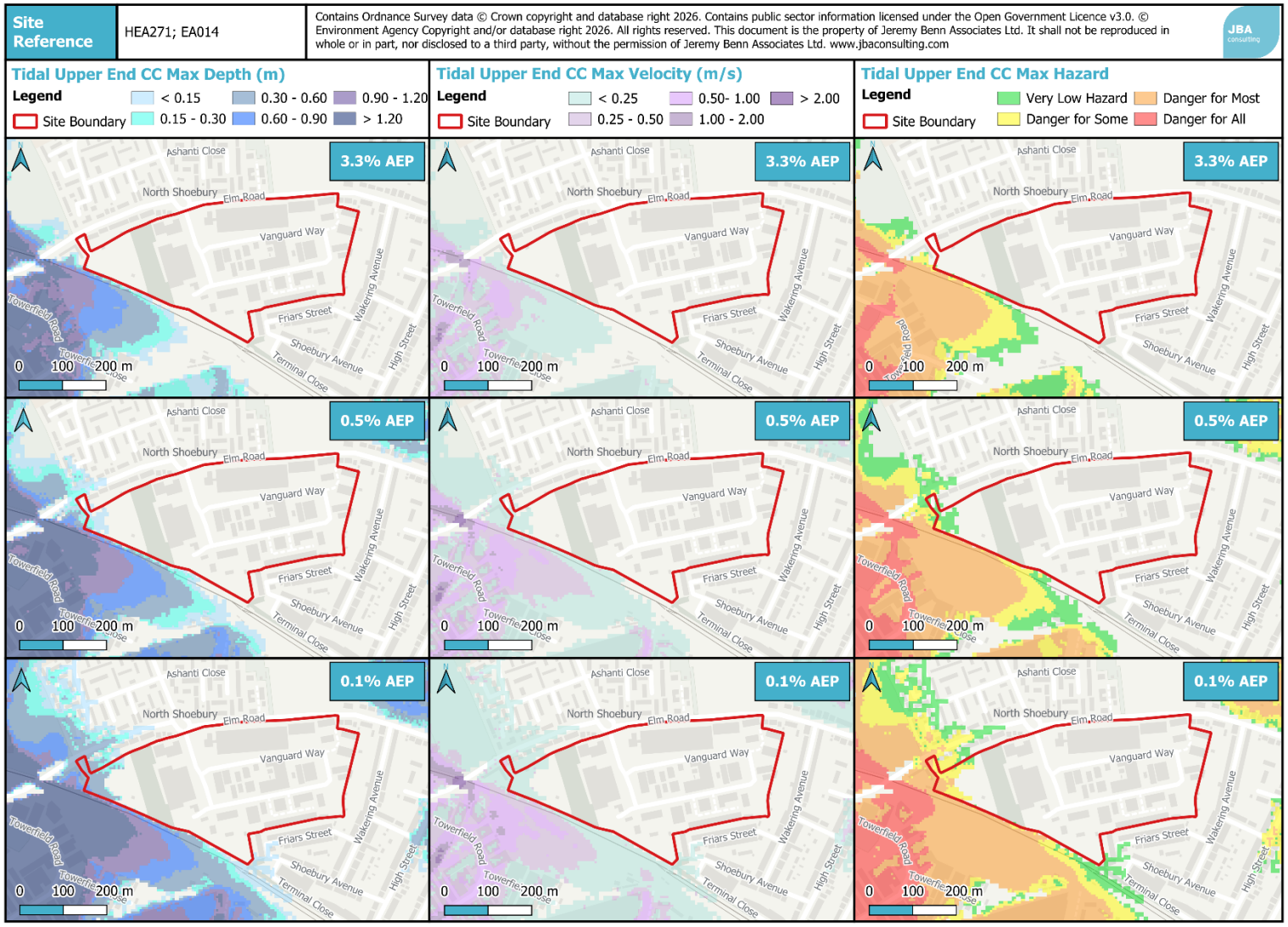


Figure 2-5: Tidal risk for the 3.3% AEP, 0.5% AEP and 0.1% AEP upper end climate change defended scenarios.

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.

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 2-6 shows the surface water flood risk at the site. Figure 2-7 shows the depth, velocity, and hazard across the site in each event.

During the 3.3% AEP event, there are small areas of ponding throughout the site which show predominant flood depths of less than 0.15m, flood velocity does not exceed 0.25m/s and hazard is classified as 'Very Low Hazard'. The minor flow path present on Vanguard Way shows the maximum depth, velocity and hazard shown in Table 2-3.

During the 1% AEP event, the flood extent increases across all areas of ponding present within the site. The greatest increase in flood extent is predicted in the east of the site on Vanguard Way. New areas of ponding emerge in the southeast adjacent to existing buildings. Additional areas of risk show flood depths of less than 0.15m. An increased proportion of the flood extent shows flood velocities of 0.25m/s and flood hazard increases to a 'Danger for Most' in the flow path on the north of Vanguard Way and in the southeast corner of the site.

During the 0.1% AEP event, the flood extent increases across all areas of ponding. The flood extent in the east of the site shows the greatest increase and ponding is shown to either inundate the extent of buildings or increase at their periphery. The flow path present in the north of Vanguard Way and in the southeast corner of the site shows increased flood depths between 0.6m and 0.9m. Ponding in the southeast of the site shows the increased depth and velocity shown in Table 2-3 and flood hazard remains a 'Danger for Most'. The flood extent is also shown to cover the extent of buildings in the west of the site and shows flood depths of less than 0.15m.

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	7	29
Maximum depth (m)	0.30 - 0.60	0.30 - 0.60	0.60 - 0.90
Maximum velocity (m/s)	0.50 - 1.00	0.50 - 1.00	1.00 - 2.00
Maximum hazard classification	Danger for Some	Danger for Most	Danger for Most

** 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).*

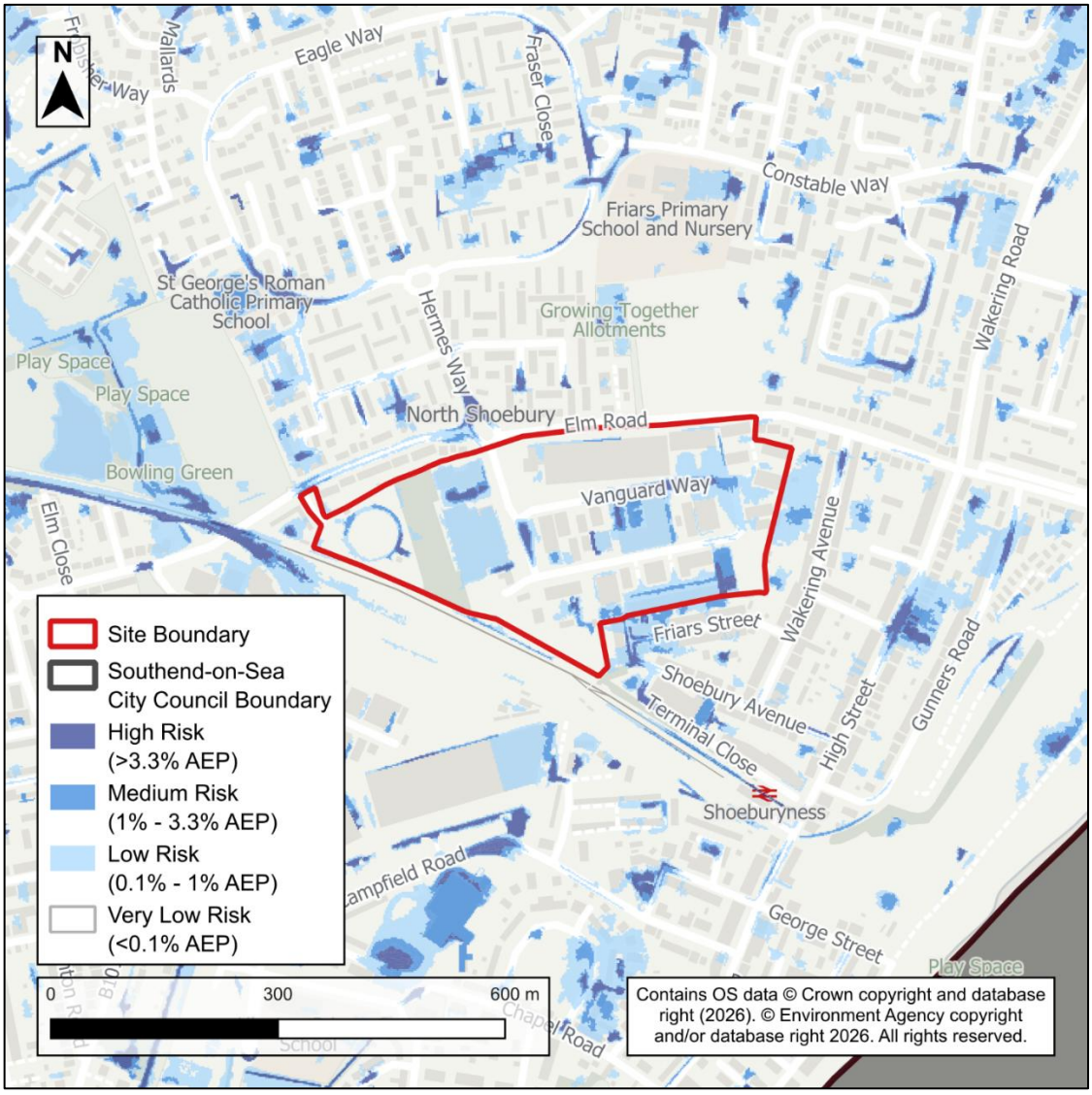


Figure 2-6: Present day surface water risk, based on the EA FMfP Surface Water Spatial Planning dataset

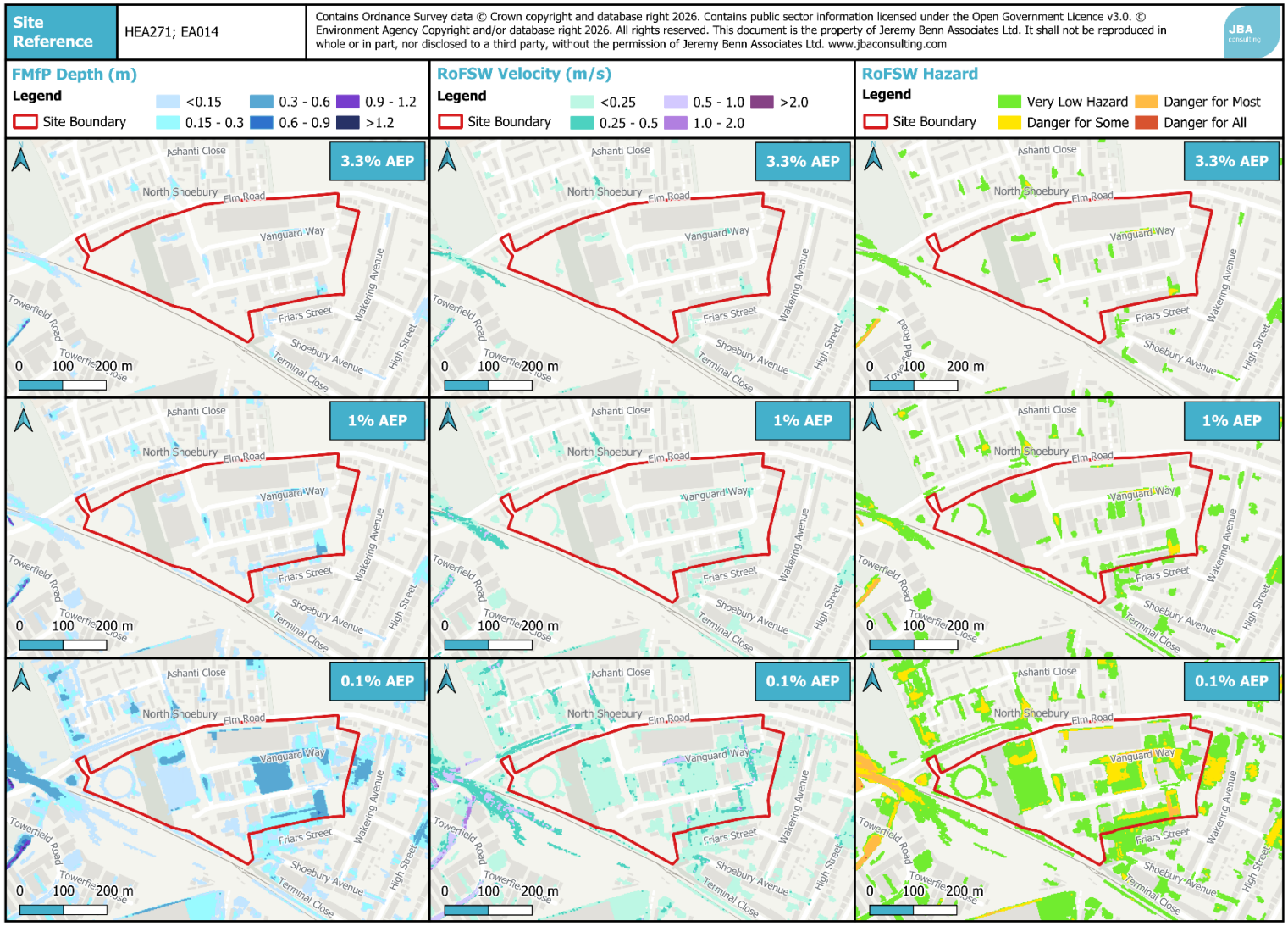


Figure 2-7: Surface water extents and depths for the 3.3%, 1%, and 0.1% AEP climate change events.

2.4.3 Climate change - 2070s Upper End

The extents and depths for the surface water 3.3%, 1%, and 0.1% AEP plus climate change events are shown in Figure 2-8.

Between the 3.3% AEP present day and climate change extents, the flood extent increases across all areas of ponding. New areas of risk also emerge in the west of the site. The new areas of ponding show flood depths between 0.15m and 0.3m.

Between the present day and the 1% AEP plus climate change flood event, the flood extent increases substantially across the site with a predominant depth band between 0.15m and 0.3m. Maximum flood depths at the minor flow path on Vanguard Way and in the southeast of the site are between 0.6m and 0.9m. New areas of risk in the west and the east follow the extent of buildings within the site.

Between the present day and climate changes 0.1% AEP events, flood risk increases across the site and appears to follow the extent of most buildings. Maximum depths increase to between 0.9m and 1.2m along Vanguard Way however most additional areas of risk show lower depths of less than 0.15m.

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* (%)	7	22
Maximum depth (m)	0.30 - 0.60	0.60 - 0.90

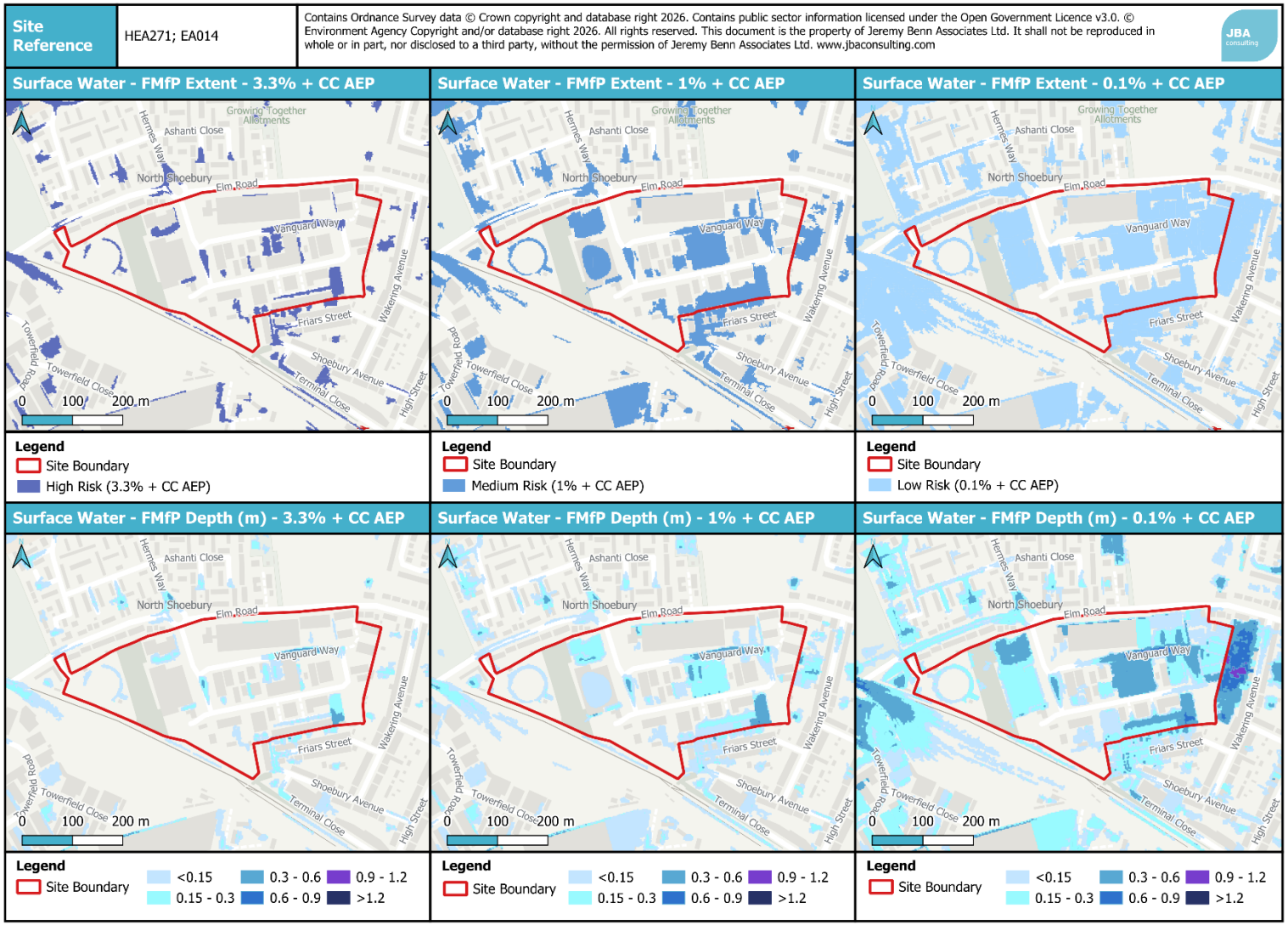


Figure 2-8: Surface water extents and depths for the 3.3%, 1%, and 0.1% AEP climate change events.

2.5 Groundwater

The JBA Groundwater Emergence Map, mapped in Figure 2-9, shows groundwater levels predicted to lie between 0.025m and 0.5m across most of the site within a 1% AEP groundwater flood event. There is a risk of groundwater flooding to both surface and subsurface assets, and the possibility of groundwater emerging at the surface locally. There are two areas, by both the northern and southern boundaries of the site, where there is a negligible risk of groundwater emergence due to the nature of the local geological deposits. By the eastern boundary, there is also an area where groundwater levels are between 0.5m and 5m below the ground surface.

Based on the surface water mapping and topography of the site it is likely that any groundwater that emerges will flow/pool to minimum elevations at the eastern site boundary or at lower elevations on Vanguard Way.

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.

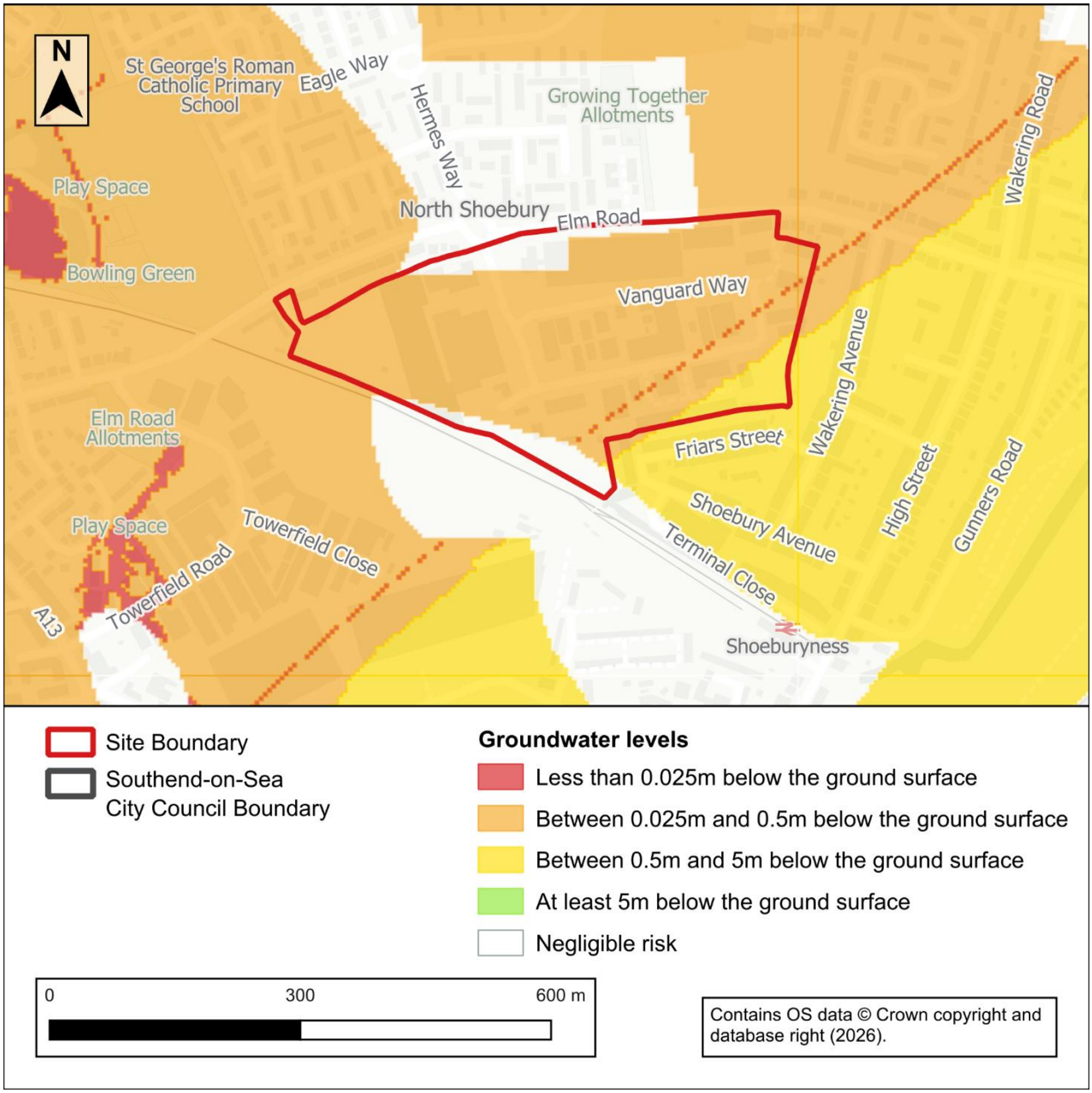


Figure 2-9: Predicted groundwater levels across the site in a 1% AEP groundwater flood event, based on the JBA Groundwater Emergence Map.

2.6 Sewers

Anglian Water provided a redacted GDPR compliant version of their DG5 dataset for the study area, which identifies internal and external historic sewer flooding records between 2022 and 2026.

There are no records of flooding within the site. However, there are five cases of external sewer flooding in the vicinity of the site. Three of these records are near Elm Road northwest of the site, one record is near to Growing Together Allotments, and the other east of the site by Wakering Avenue.

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, mapped in Figure 2-10, covers an area along the western site boundary. This shows historic flooding as a result of a tidal flood event in 1953.

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

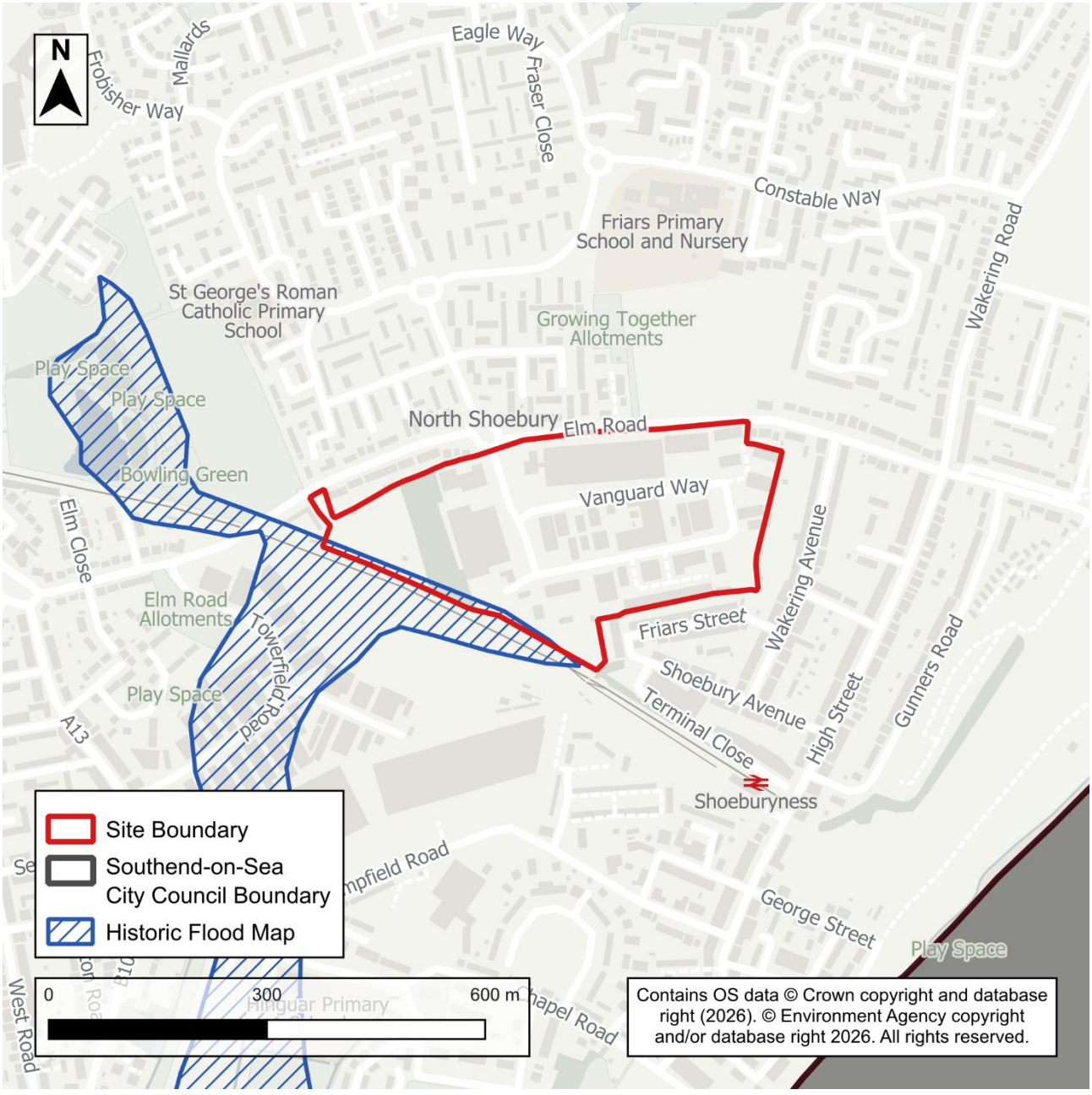


Figure 2-10: Historic flooding shown within the EA's Historic Flood Map.

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.

This site is shown to be impacted in all three breaches, during all modelled climate change scenarios.

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.

Breach one

The site is not predicted to be at risk in the present day scenarios. The 3.3% AEP higher central climate change scenario has a lead time of approximately 14 hours, with a maximum flooding duration of up to 30 hours. The larger events have a shorter lead time of 2 to 3 hours and a maximum duration of 40 to 50 hours.

Breach two

Breach two presents the greatest risk to the site. The site is not predicted to be at risk in the present day scenarios. Similarly to breach one, the 3.3% AEP higher central climate change scenario provide warning time with a rate of onset of 12 to 13 hours. However, larger events show a reduced rate of onset of up to 1 hour and maximum flooding duration increases across all events.

Breach three

The site is not at risk in the present-day scenarios. The rate of onset increases across all events, and the maximum flood duration decreases in the 3.3% and 0.5% AEP Higher End climate change events.

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	3.3% AEP Higher Central CC	0.04	0.32	1.26	14.7	29.7
1	3.3% AEP Upper End CC	0.22	0.38	1.48	3.1	49.9
1	0.5% AEP Higher Central CC	0.21	0.15	1.46	3.1	40.6
1	0.5% AEP Upper End CC	0.56	0.55	1.51	2.8	41.4
1	0.1% AEP Higher Central CC	0.53	0.51	1.49	2.9	41.3
1	0.1% AEP Upper End CC	0.90	0.41	1.53	2.8	38.8
2	3.3% AEP Higher Central CC	0.04	0.34	1.28	12.5	29.8
2	3.3% AEP Upper End CC	0.23	0.40	1.49	1.1	40.9
2	0.5% AEP Higher Central CC	0.22	0.22	1.47	1.1	40.7
2	0.5% AEP Upper End CC	0.56	0.55	1.51	1.0	41.4
2	0.1% AEP Higher Central CC	0.53	0.51	1.49	0.9	41.3
2	0.1% AEP Upper End CC	0.90	0.41	1.53	1.0	38.8
3	3.3% AEP Higher Central CC	0.04	0.32	1.26	12.9	29.7
3	3.3% AEP Upper End CC	0.22	0.38	1.48	1.4	40.9
3	0.5% AEP Higher Central CC	0.21	0.15	1.46	1.4	40.6
3	0.5% AEP Upper End CC	0.56	0.55	1.51	1.3	41.4
3	0.1% AEP Higher Central	0.53	0.51	1.49	1.2	41.3
3	0.1% AEP Upper End CC	0.90	0.41	1.53	1.3	38.8

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 event 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 main access to the site is via Vanguard Way, exiting the site onto Elm Road at the northern site boundary. There is also a second access point in the northwest to Elm Road.

Access and escape onto Elm Road in the immediate vicinity of the site is not shown to be impeded. Access and escape into the wider area is likely to be possible to the north in a tidal flood event but may be impeded during a surface water flood event due to ponding at the Elm Road and Hermes Way roundabout. The following sections discuss potential access and escape for each source of flood risk.

4.2.2 Tidal

The access point via Vanguard Way and Elm Road is shown to be at tidal flood risk in both the 0.5% AEP plus higher central and upper end climate change events. However, the flood extent on Elms Road is unlikely to restrict vehicular access and escape as it shows low flood depths of less than 0.15m, low flood velocities of less than 0.25m/s and is classified as a 'Very Low Hazard'. Access to the north via Hermes Way at the roundabout where Elm Road meets Vanguard Way should be feasible as this route remains mostly risk free.

Due to the tidal risk surrounding the site, a Flood Warning and Evacuation Plan may be required to be prepared which considers the likely onset and duration of flooding and demonstrates how residents can safely be evacuated and/or shelter safely in situ during design events.

4.2.3 Surface water

There is a surface water flow path present on Elms Road flowing parallel to the northwestern boundary however depths are shown to remain largely below 0.15m. A further flow path is present approximately 100m west of the site which shows maximum depths between 0.3m and 0.6m, however mapping shows that Elm Road continues as a road bridge over this flow path. There is flooding shown to reach between 0.3m and 0.6m in

depth present on the roundabout where Elm Road, Vanguard Way and Hermes Way meet which could impede safe access and escape.

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.

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.

The site is 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 potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

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

- Groundwater levels are indicated to be less than 0.5m below ground level during a 1% AEP event. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.

- 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 watercourse or 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:

- 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 employment development as 'Less Vulnerable'.

The Exception Test is not required for 'Less Vulnerable' development.

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 is:

- within Flood Zone 1 with a site area of 1 hectare or more
- at increased risk of flooding from rivers or sea in future
- in an area identified as having critical drainage problems
- at risk of flooding from surface water

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 site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the northwest of the site where there is a risk of tidal flooding.

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 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 water event 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:** The northwest of the site is shown to be at risk from tidal flooding in all modelled climate change scenarios. The site is shown to be protected by tidal defences in the present day but is shown to be at risk during the climate change events.
- **Residual:** The site is at residual risk of tidal flooding due to breach or overtopping of the tidal defences. Some breach scenarios provide very little warning time at the site.
- **Surface Water:** There is considerable surface water ponding predicted at the site in the present day, showing an increase with climate change shown the site. Surface water risk to the surrounding roads may impede some potential access and escape options.
- **Groundwater:** Groundwater levels are predicted to lie between 0.025m and 0.5m for the majority of the site. There is a risk of groundwater flooding to both surface and subsurface assets, and the possibility of groundwater emerging at the surface locally.

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

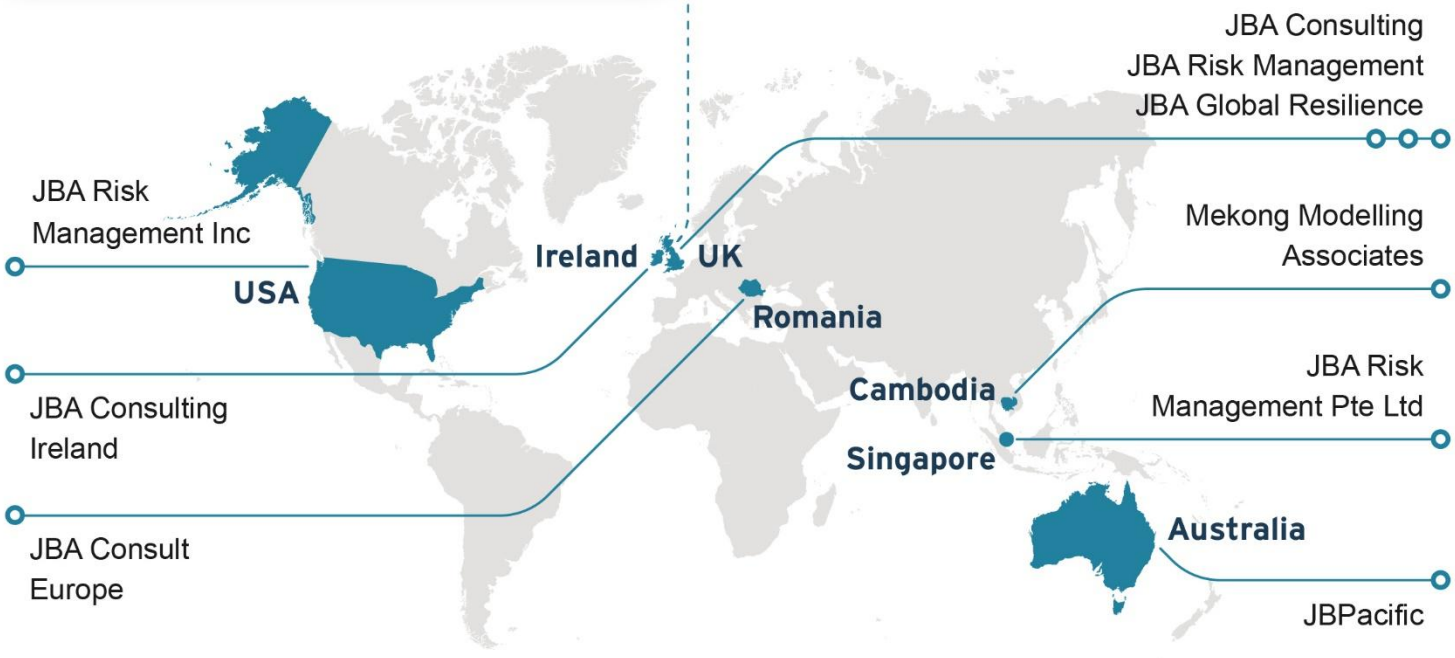
- A site-specific FRA should be undertaken, which assess all sources of flood risk.
- A sequential approach to site layout should be adopted with more vulnerable aspects of the development steered away from the areas of tidal risk in the northwest of the site.
- A carefully considered and integrated 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.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water event and the 0.5% AEP tidal event with an appropriate allowance for climate change. An initial assessment has found that access and escape onto Elm Road in the immediate vicinity of the site is not shown to be impeded. However, although access and escape to the north would be possible during a tidal flood event, it may be impeded during a surface water flood event due to ponding at the Elm Road and Hermes Way roundabout.
- 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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