www.jbaconsulting.com

Level 2 Strategic Flood Risk Assessment

Site HEA054; EA037

Prepared for: Southend-on-Sea City Council

Contents

1 Background 3

1.1 Site details 3
1.2 Topography 3
1.3 Geology and soils 4

2 Sources of flood risk 5

2.1 Location of site within the catchment 5
2.2 Existing drainage features 5
2.3 Fluvial and tidal 5
2.4 Surface water 15
2.5 Groundwater 20
2.6 Sewers 20
2.7 Flood history 20

3 Flood risk management infrastructure 21

3.1 Defences 21
3.2 Residual risk 22

4 Emergency planning 24

4.1 Flood warnings and alerts 24
4.2 Access and escape 24
4.3 Dry islands 25

5 Requirements for drainage control and impact mitigation 26

5.1 Broadscale assessment of possible SuDS 26
5.2 Opportunities for wider sustainability benefits and integrated flood risk management 27

6 NPPF and planning implications 28

6.1 Exception Test requirements 28
6.2 Requirements and guidance for site-specific Flood Risk Assessment 28
6.3 Guidance for site design and making development safe 28

7 Conclusions 30

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for HEA054; EA037. 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: Southend Central, Marine Plaza
- Site area: 1.10ha
- Existing site use: Brownfield, currently unused (demolished buildings)
- Proposed site use: Mixed-use (residential and commercial)

1.2 Topography

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

The highest ground level is 8.21mAOD in the north of the site. Ground level slopes downhill southwards to 3.5mAOD along the southern site boundary.

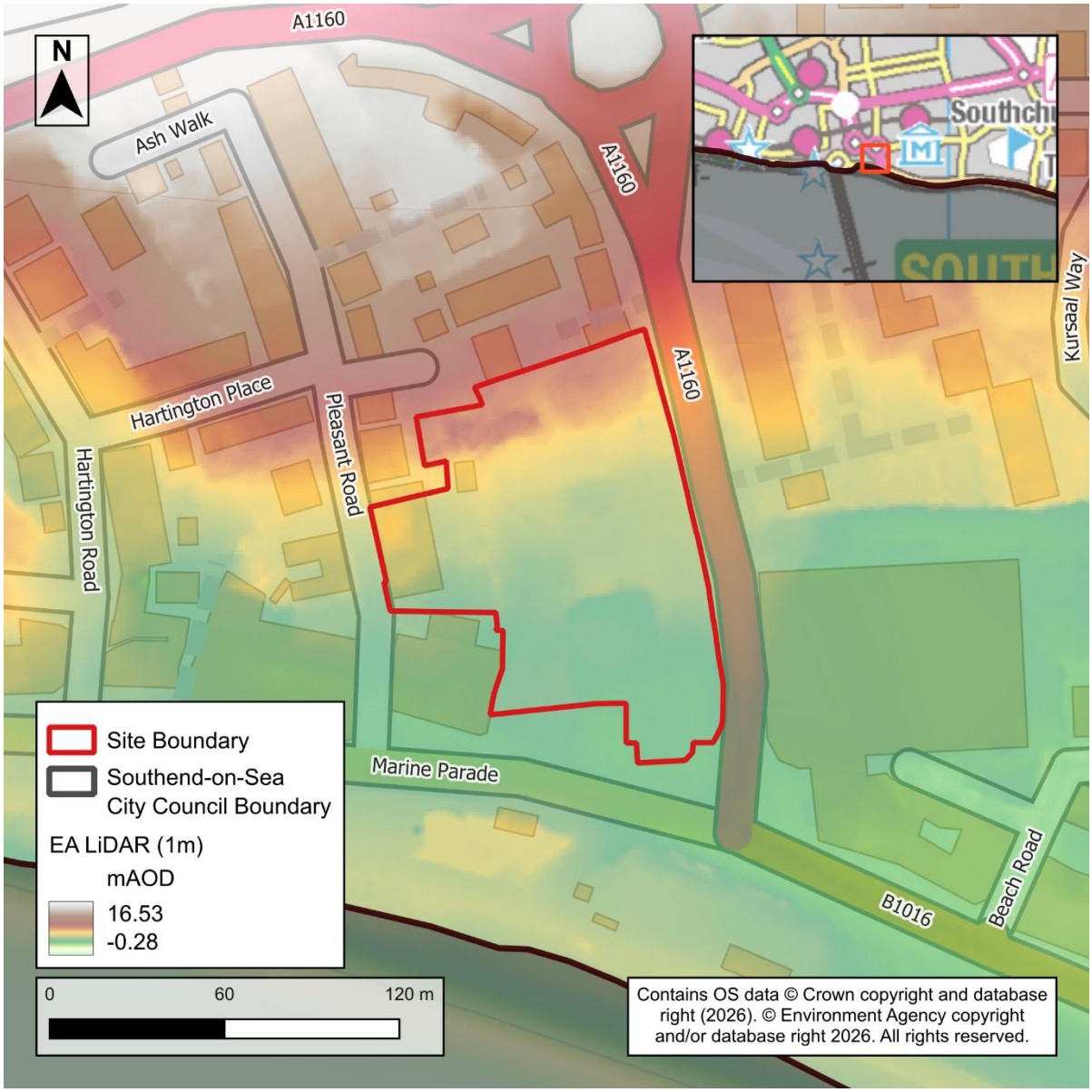


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation comprised of clay, silt and sand.
- Superficial - Head comprised of clay, silt, sand and gravel in the north of the site. Tidal flat deposits comprised of clay and silt in the south of the site.

Soils at the site consist of:

- Freely draining slightly acid loamy soils in the north of the site.
- Loamy and clayey soils of coastal flats with naturally high groundwater in the south of the site.

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 south of the study area. The site drains directly to the Thames Estuary to the south.

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 approximately 80m north of the Thames Estuary.

There is an unnamed watercourse which originates approximately 2km northeast of the site and flows in a south-westerly direction flowing as an open channel through the Thorpe Bay residential area and through Thorpe Hall Golf Course. The watercourse enters a culvert approximately 850m east of the site and discharges south into the Thames Estuary.

There is a lake located approximately 680m east of the site in Southchurch Park.

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 percentage areas of the site within each Flood Zone are stated in Table 2-1 and can be viewed in Figure 2-1. The FMfP does not consider the benefits from flood defence infrastructure.

Flood Zone 3b is not shown to be present at the site. The southeastern site extent is located within Flood Zone 3a. Flood Zone 2 extends further north covering the southern and central areas of the site. The northern extent of the site is located within Flood Zone 1.

The FMfP indicates that the source of flooding at the site is a combination of rivers and sea and sea.

Table 2-1: Present day fluvial flood risk based on the EA's FMfP *.

Flood Zones	Flood Zone 3b (%)	Flood Zone 3a (%)	Flood Zone 2 (%)	Flood Zone 1 (%)
Percentage of site at risk* (%)	0	11	64	36

**This shows the percentage of the site at flood risk from a particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3a and 3b percentage. Flood Zone 1 + Flood Zone 2 = 100%.*

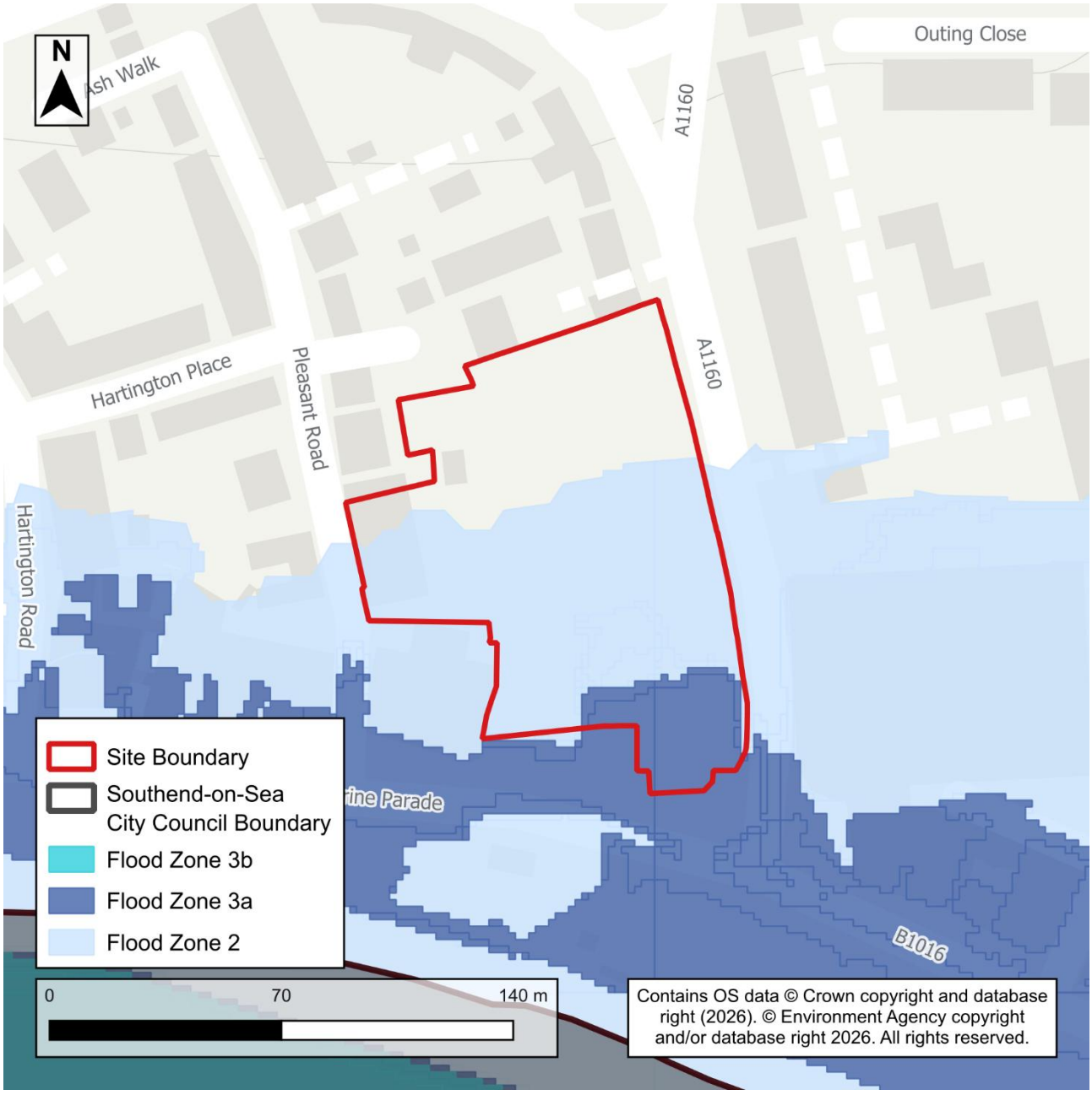


Figure 2-1: Flood Zones as shown within the EA Flood Mapping.

2.3.2 Fluvial

The EA's FMfP has been used within this assessment to assess fluvial risk as there is no detailed fluvial 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 fluvial risk to the site results from the unnamed watercourse described in Section 2.2. The watercourse is culverted when it exits the golf course in the west and there is a risk of the site being impacted by overland flows. However, the predominant risk to this site is tidal risk from the Thames Estuary.

2.3.3 Tidal - present day (2026 epoch)

As part of this SFRA, the existing EA detailed hydraulic models namely 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.

This site is shown to benefit from defences along the Thames Estuary which are described in Section 3.1. This section summarises both the defended and undefended risk.

Undefended

Figure 2-2 shows the undefended present day risk across the site. The 0.5% AEP event show a larger extent than the FMfP Flood Zone 3a with the southern half of the site shown to be at risk. Maximum depths of between 0.90m and 1.20m are found in the southeast corner of the site, and maximum depths decrease northwards into the site. Maximum velocities remain mostly below 0.25m/s. The maximum hazard classification is 'Danger for Most' across the southern end of the site.

In the 0.1% AEP event, the flood extent shows a similar extent to the EA FMfP Flood Zone 2. Maximum depths increase to exceed 1.20m in the southeast of the site, with larger areas exceeding 0.90m across the south of the site. Maximum velocities remain similar to the 0.5% AEP event. Maximum hazard remains as 'Danger for Most' but covers a larger area across the southern half of the site.

Defended

The site is not shown to be at tidal risk during the 3.3%, 0.5% and 0.1% defended scenarios.

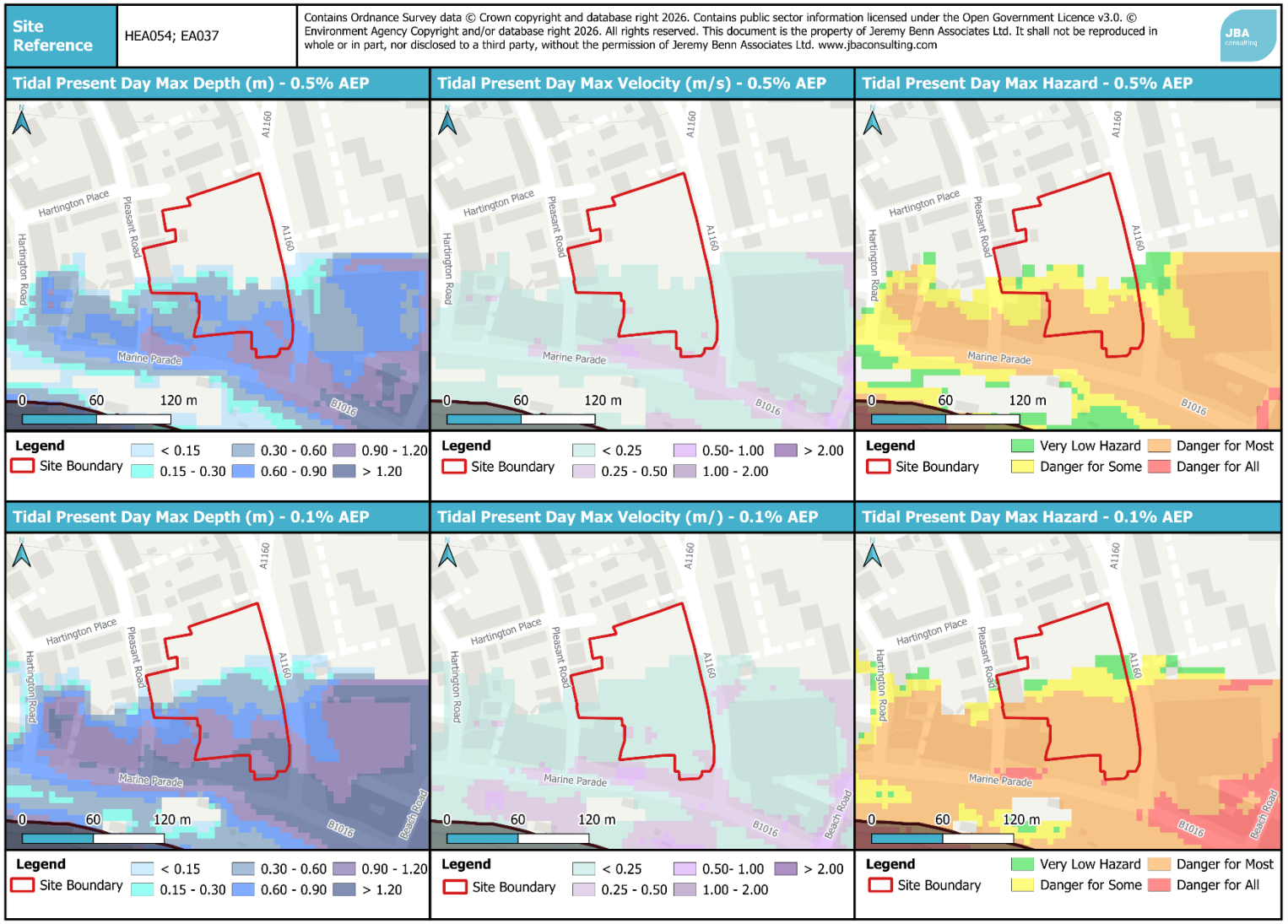


Figure 2-2: Present day tidal modelling for the 0.5% AEP and 0.1% AEP undefended events.

2.3.4 Tidal - future risk (2126 epoch)

The detailed tidal hydraulic model updated 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.

Undefended risk

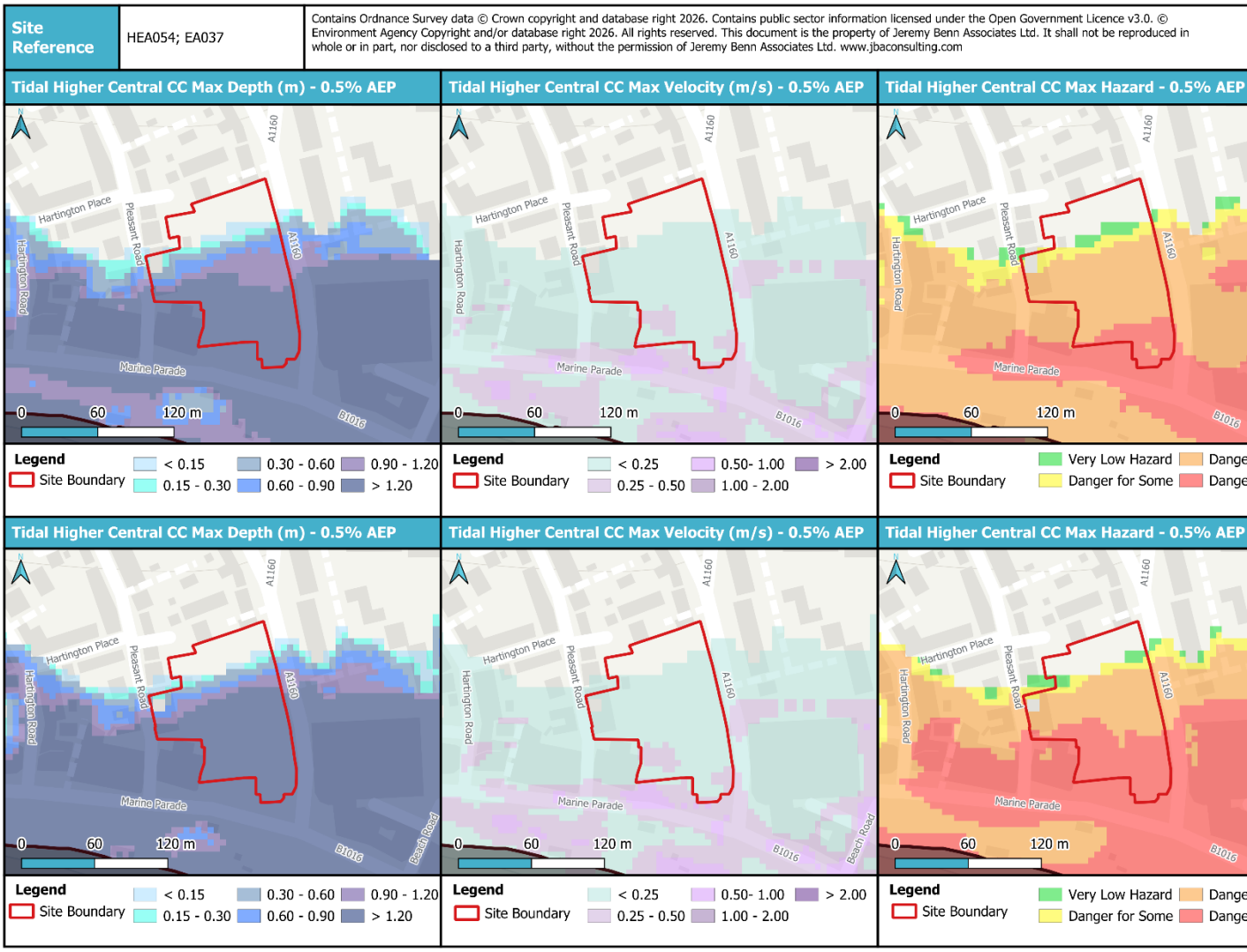


Figure 2-3: Tidal risk for the 0.5% AEP and 0.1% AEP higher central climate change undefended scenarios.

and Figure 2-4 show the undefended risk to the site in the higher central and upper end climate change events.

In all events, most of the site is shown to be at tidal risk, with only the northernmost area of the site remaining unaffected. Velocities across the site mostly remain below 0.25m/s across all events but depth and hazard are shown to increase. In the 0.1% AEP Upper End climate change scenario, depths exceed 1.20m across most of the site with a hazard classification of 'Danger for All'.

Defended risk

Figure 2-5 and Figure 2-6 show the defended risk to the site in the higher central and upper end climate change events.

The site is not shown to be at risk during the 3.3% AEP higher central defended scenario. In the 3.3% AEP upper end scenario, the southern end of the site is shown to be at tidal risk with maximum depths between 0.60m and 0.90m in the southeast of the site and hazard classification of 'Danger for Some' in the south of the site.

The 0.5% AEP higher central scenario shows similar risk as the 3% AEP upper end scenario.

In the larger climate change events, velocities are shown to increase across the central and southern areas of the site with maximum velocities of between 0.50m/s and 1.00m/s. Depths across most of the site exceed 1.20m with corresponding hazard classification of 'Danger for Most' across the southern half of the site and 'Danger for Most' in the northern area of the site. The northernmost end of the site is not shown to be at tidal risk in any modelled event.

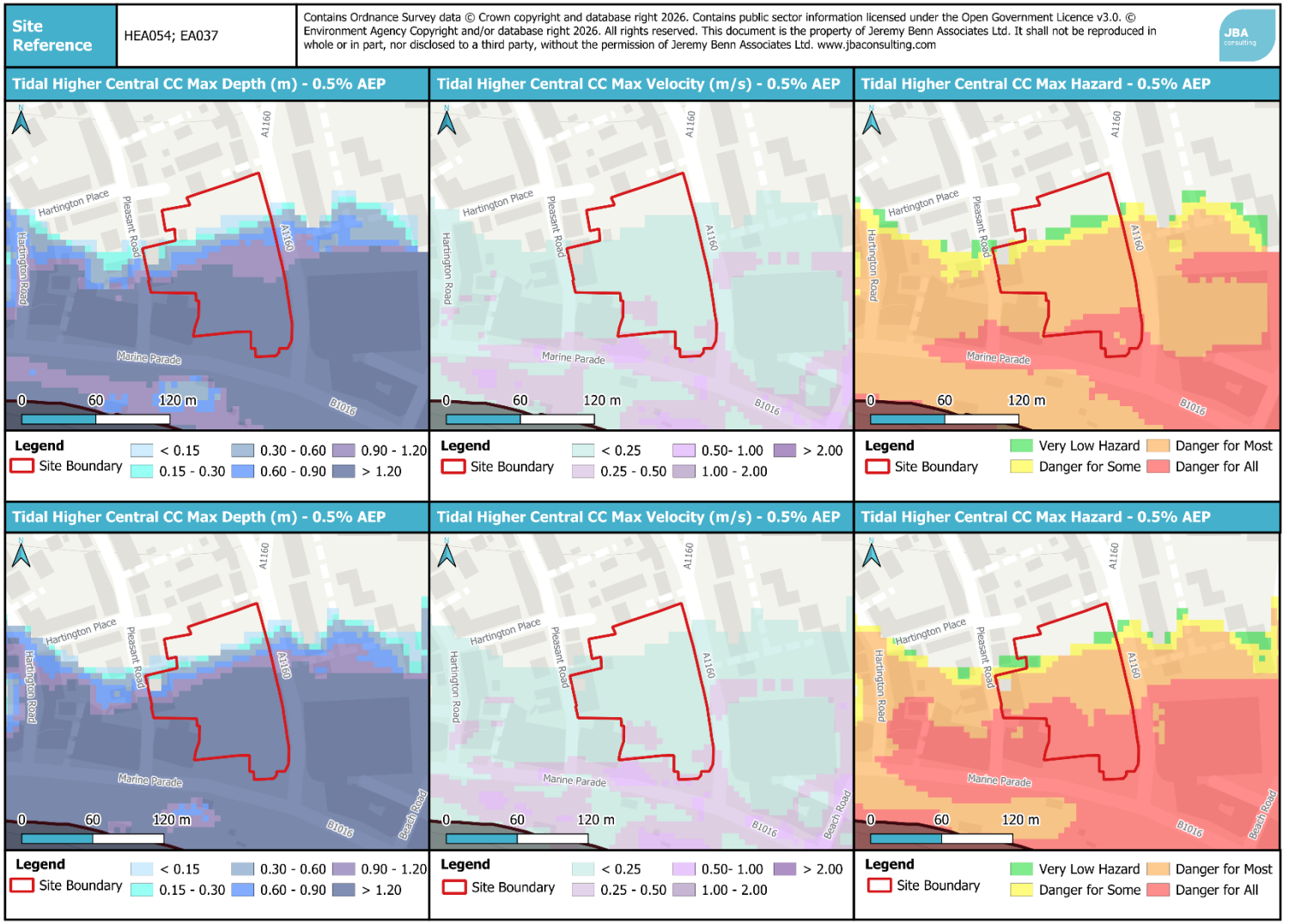


Figure 2-3: Tidal risk for the 0.5% AEP and 0.1% AEP higher central climate change undefended scenarios.

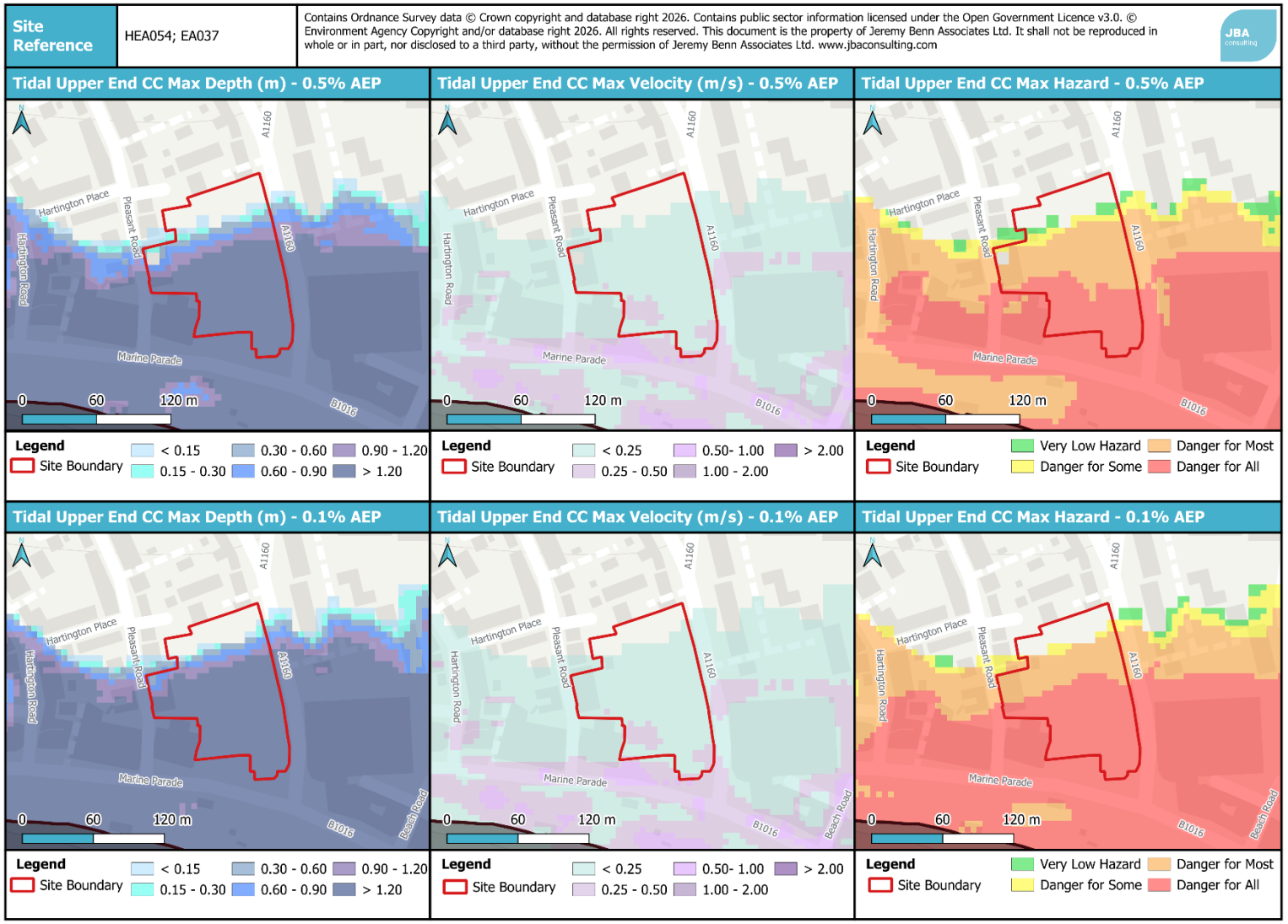


Figure 2-4: Tidal risk for the 0.5% AEP and 0.1% AEP upper end climate change undefended scenarios.

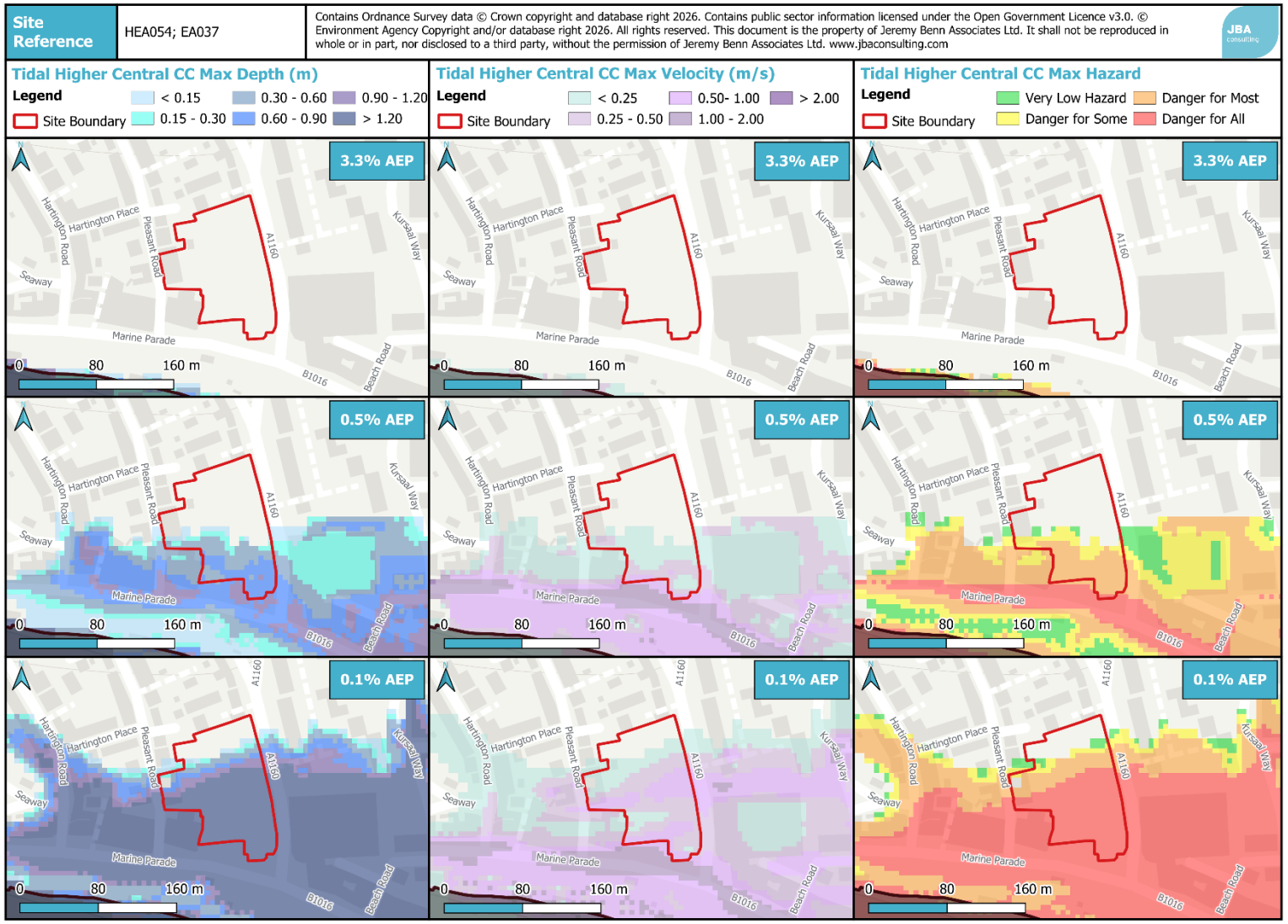


Figure 2-5: Tidal risk for the 3.3% AEP, 0.5% AEP and 0.1% AEP higher central climate change defended scenarios.

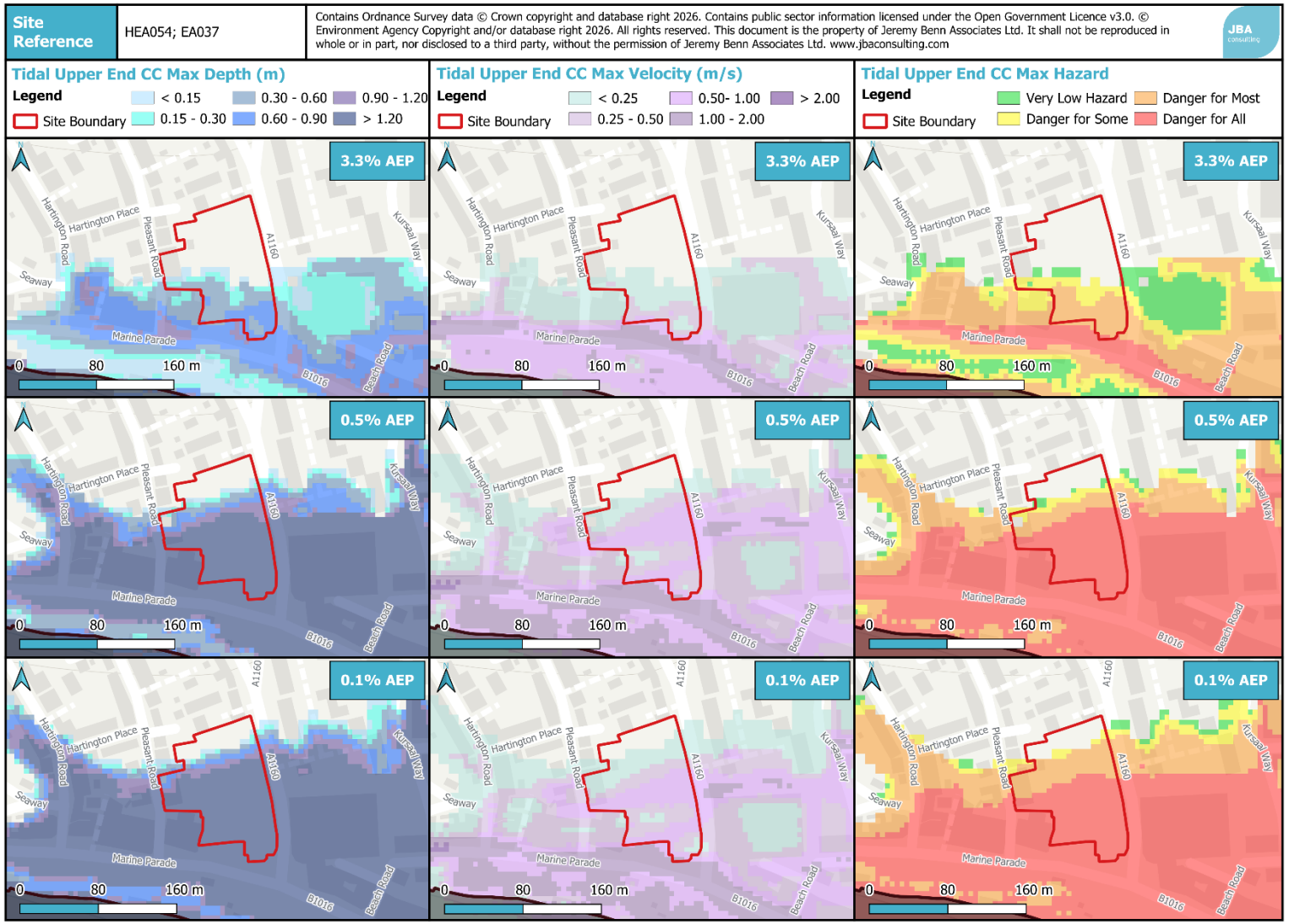


Figure 2-6: Tidal risk for the 3.3% AEP, 0.5% AEP and 0.1% AEP upper end climate change defended scenarios.

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

Surface water risk is mostly limited to the southeast corner of the site, where there is an area of pooling during the 3.3%, 1% and 0.1% AEP events. Figure 2-7 shows that there is also a small area of ponding in the southwest. Both of these noticeably increase in size during the 0.1% AEP event. A new area of ponding appears during the 0.1% AEP event in the centre of the site.

Figure 2-8 shows that the flooding in the southeast of the site during the 0.1% AEP event is shown to exceed 0.3m in depth, as well as a very minor part of the flooding here during the 1% AEP event. The rest of the surface water flooding at the site is shown to remain below 0.3m in depth. Only a very minor part of the flooding in the southeast is shown to exceed 0.5m/s in velocity during the 0.1% AEP event. There is also only a very minor area of the flooding in the southwest which exceeds 0.25m/s during the 1% AEP event. Most of the surface water flooding at the site is shown to remain below 0.25m/s in velocity. The far southeast of the site poses a 'Danger For Most' during the 0.1% AEP event. Small parts of this area pose a 'Danger for Some' in the 3.3% and 1% AEP events. The rest of the surface water flooding at the site poses a 'Very Low Hazard'.

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

Assessment category	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	9	11	22
Maximum depth (m)	Exceeds 0.15m but does not exceed 0.3m	Exceeds 0.3m but does not exceed 0.6m	Exceeds 0.3m but does not exceed 0.6m
Maximum velocity (m/s)	Does not exceed 0.25m/s	Exceeds 0.25m/s but does not	Exceeds 0.5m/s but does not

Assessment category	3.3% AEP	1% AEP	0.1% AEP
		exceed 0.5m/s	exceed 1.0m/s
Maximum hazard classification	Danger for Some	Danger for Some	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).*

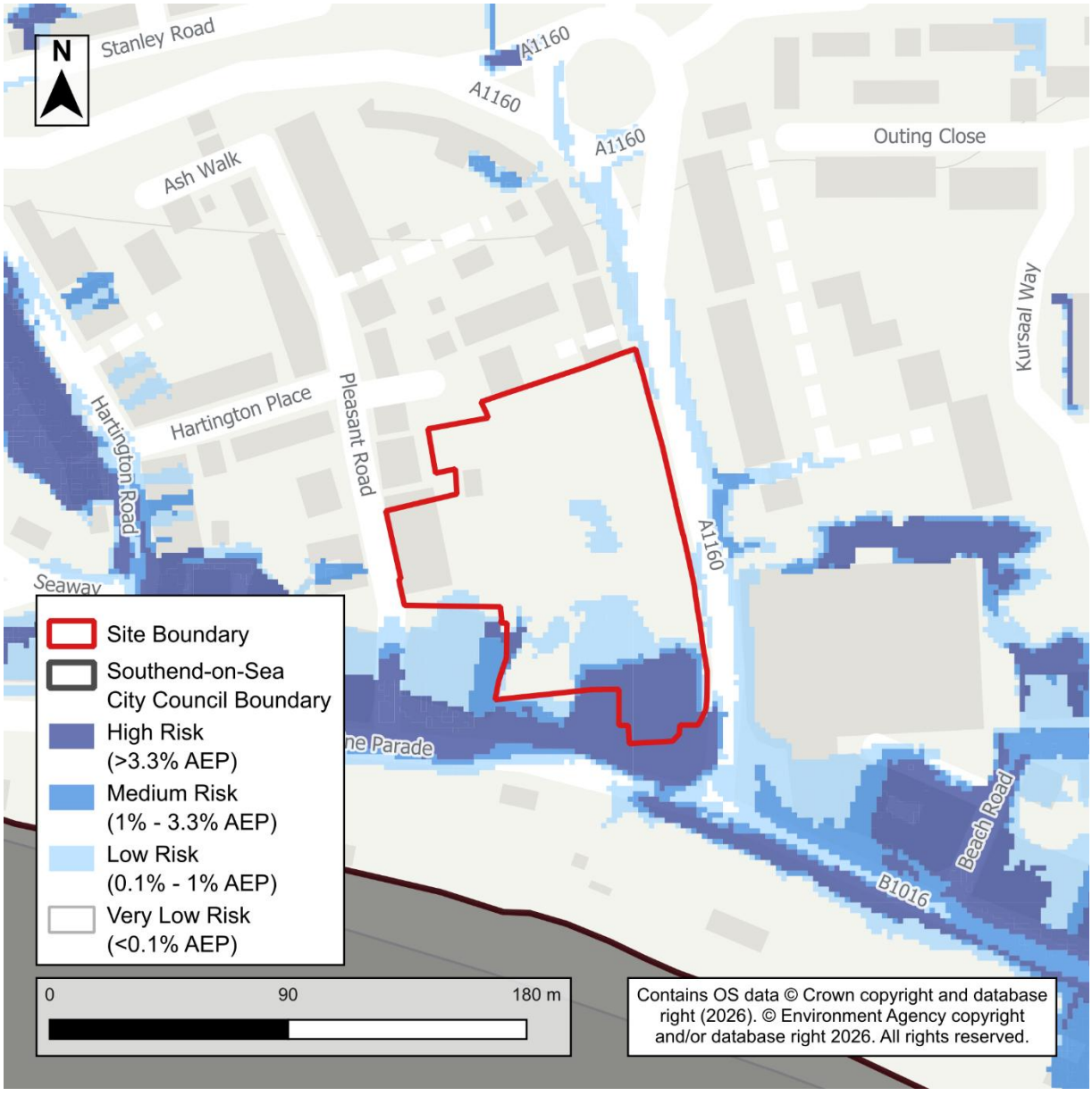


Figure 2-7: Present day surface water risk, based on the EA FMfP Surface Water Spatial Planning dataset.

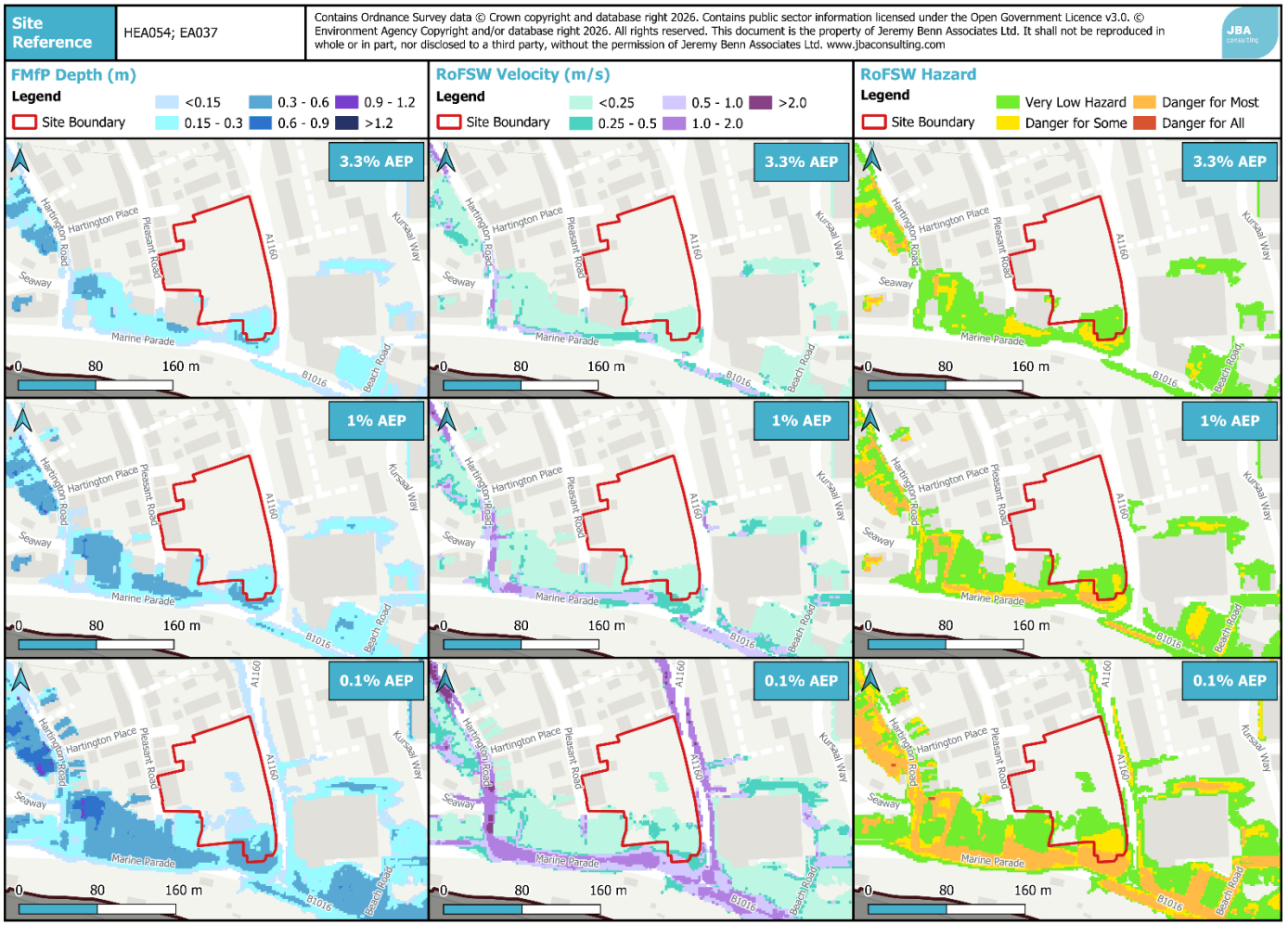


Figure 2-8: Present day surface water depth, velocity, and hazard for the 3.3%, 1%, and 0.1% AEP events.

2.4.3 Climate change - 2070s Upper End

Figure 2-9 shows the surface water risk in the Upper End climate change scenarios for the 3.3% AEP, 1% AEP, and 0.1% AEP events.

The 3.3% AEP climate change event shows the area at risk to increase slightly compared to the present-day event. The 1% AEP climate change event closely resembles the extent of the present day 0.1% AEP event. The 0.1% AEP climate change event shows the entire southern third of the site at risk.

The maximum flood depths in the 3.3% AEP climate change event increases to between 0.30m and 0.60m compared to the present day. However, this is a minimal amount of flooding in the southeast of the site. The area of the flooding exceeding 0.30m in depth increases in the 1% and 0.1% AEP climate change events when compared to the respective present day scenarios.

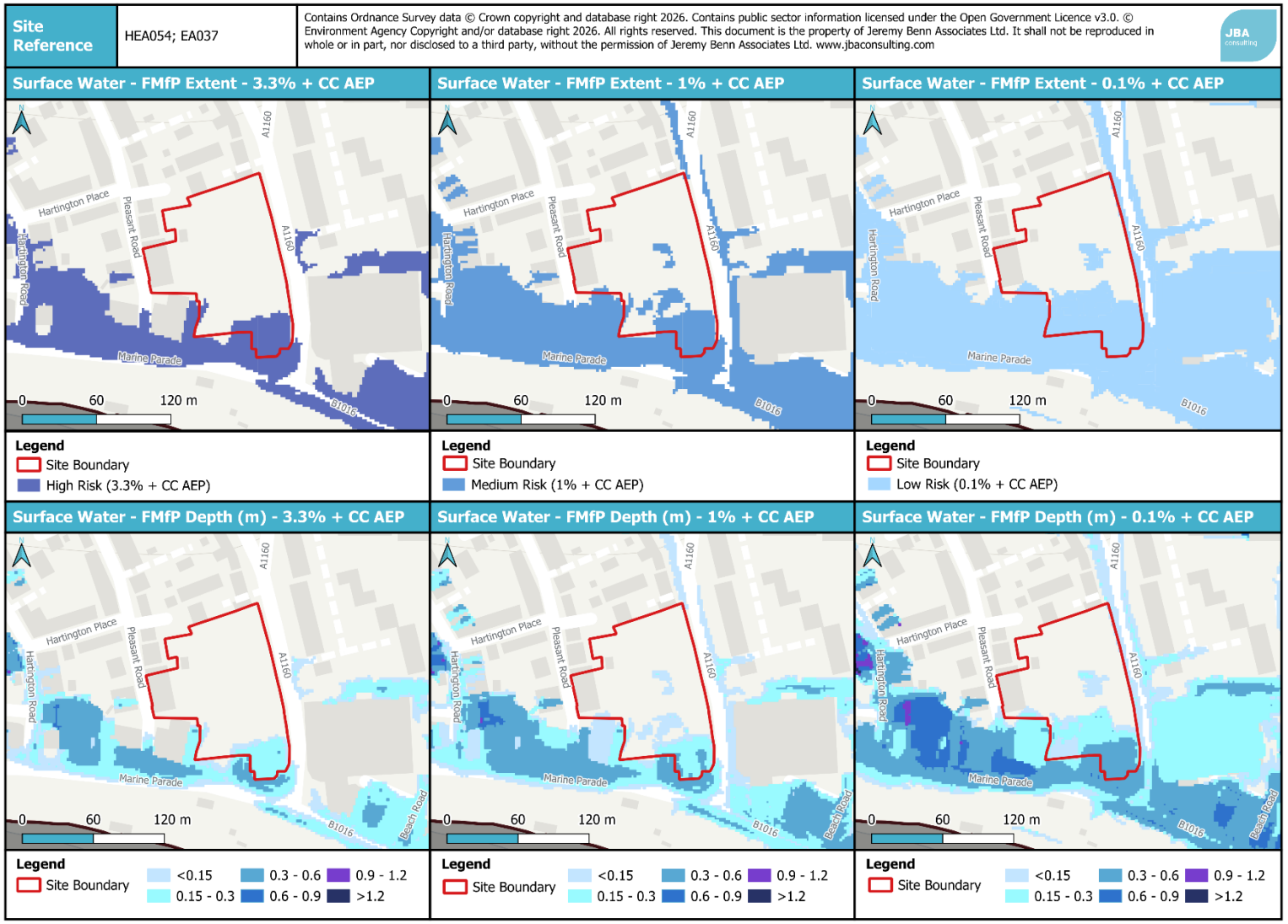


Figure 2-9: Surface water extents and depths for the 3.3%, 1%, and 0.1% AEP climate change events

2.5 Groundwater

The JBA Groundwater Emergence Map shows that the site has a negligible risk from groundwater flooding due to the nature of the local geological deposits.

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.

2.6 Sewers

Anglian Water provided a GDPR-compliant extract from their DG5 dataset, which identifies internal and external historic sewer flooding records between 2022 and 2026.

There are no recorded sewer flooding incidents within or in 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 one flood event impacting the southern site extent. The flood event occurred in 1953. The source of flooding is listed as the sea.

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

The EA AIMS dataset, mapped in Figure 3-1, shows that the site is protected by a coastal flood wall to the south. The flood wall is privately owned and is designed to provide protection against a 0.1% AEP tidal event.

As discussed in Sections 2.3.3 and 2.3.4, detailed hydraulic modelling shows that the defences offer protection for the site from tidal flood risk in all present day scenarios and in the 3.3% AEP higher central climate change scenario. The defences are shown to overtop in the 3.3% AEP upper end climate change scenario, and the 0.5% AEP and 0.1% AEP climate change scenarios, with significant depths experienced across the southern and central areas of the site in these events.

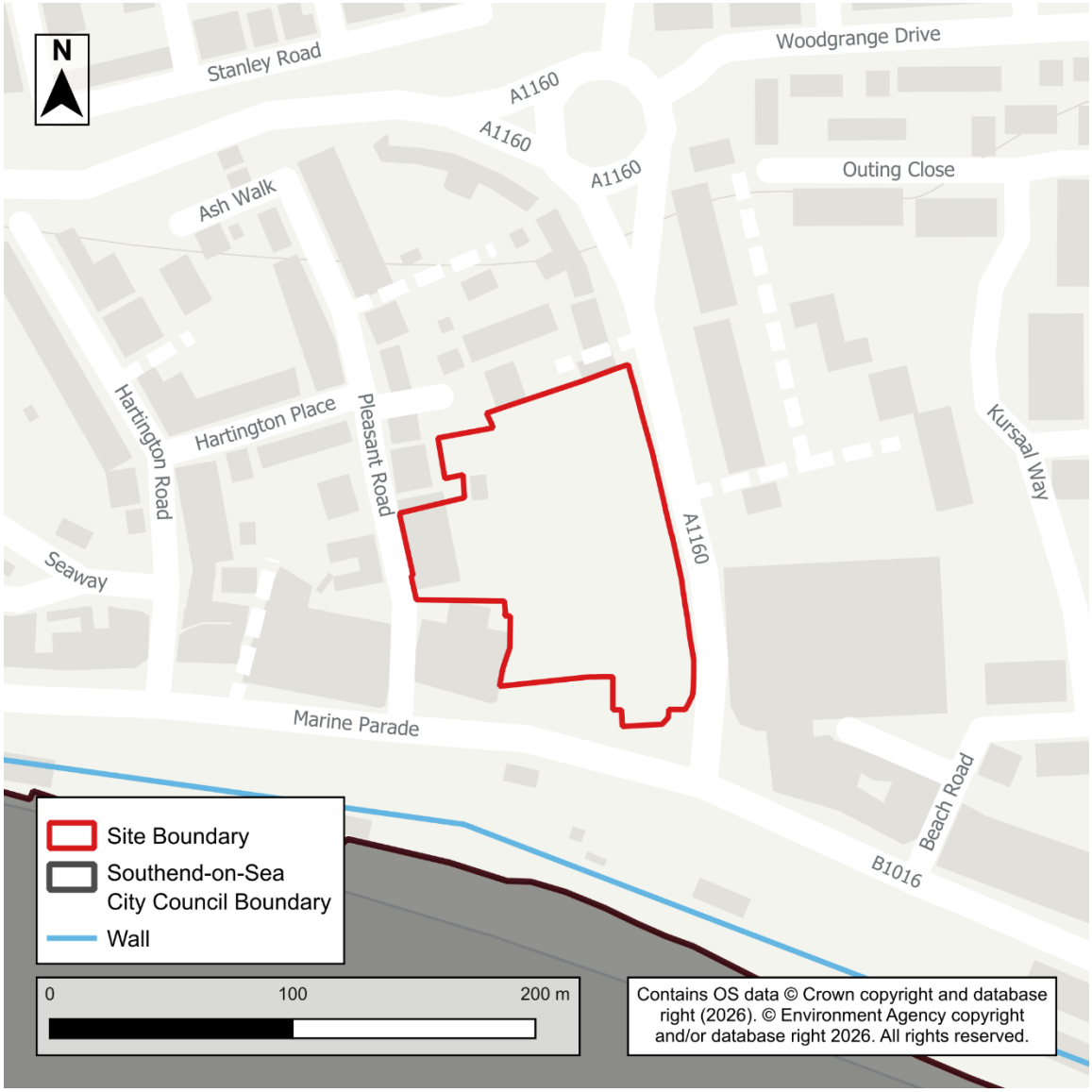


Figure 3-1: Flood defences as shown within the EA AIMS dataset.

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 locations were considered. Details of these breache scenarios and locations are provided in Appendix D.

This site is shown to be impacted by tidal flood risk from all three breach locations, during most modelled 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 or the 3.3% AEP higher central climate change scenario. In the 3.3% AEP upper end and 0.5% AEP higher central climate change scenarios there is a lead time of approximately 15 hours providing longer warning time, with a maximum flooding duration of around 30 hours. The 0.5% AEP higher central climate change has a similar lead time, but the larger events have a much shorter lead time of 2 to 3 hours and a maximum duration of up to 44 hours.

Breach two

The site is not predicted to be at risk in the present day scenarios or the 3.3% AEP higher central climate change scenario. Similarly to breach one, the 3.3% AEP upper end and 0.5% AEP higher central climate change scenarios provide warning time with a rate of onset of 12 to 13 hours. The larger events have a shorter lead time of less than 1 hour.

Breach three

Breach three presents the greatest risk to the site. The site is not at risk in the 3.3% AEP or 0.5% AEP present day scenarios. In the 3.3% AEP higher central climate change the rate of onset is 1.2 hours with a duration of around 35 hours. In all other scenarios this breach shows the fastest rate of onset mostly between 30 and 45 minutes. The maximum duration is up to 45 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	3.3% AEP Upper End CC	0.85	0.88	2.17	14.56	31.19
1	0.5% AEP Higher Central CC	0.90	0.89	2.25	13.9	31.2
1	0.5% AEP Upper End CC	2.35	1.12	4.01	2.6	42.3
1	0.1% AEP Higher Central CC	2.49	0.98	3.89	2.7	42.3
1	0.1% AEP Upper End CC	2.87	1.12	3.96	2.5	43.8
2	3.3% AEP Upper End CC	0.85	0.88	2.17	12.6	31.2
2	0.5% AEP Higher Central CC	0.90	0.89	2.26	11.9	31.2
2	0.5% AEP Upper End CC	2.35	1.12	4.01	0.8	42.3
2	0.1% AEP Higher Central CC	2.49	0.98	3.90	0.7	42.3
2	0.1% AEP Upper End CC	2.87	1.12	3.96	0.7	43.8
3	3.3% AEP Higher Central CC	0.45	0.25	1.21	1.2	34.9
3	3.3% AEP Upper End CC	1.13	0.60	2.25	0.6	41.5
3	0.5% AEP Higher Central CC	1.18	0.62	2.32	0.5	41.4
3	0.5% AEP Upper End CC	2.45	0.86	3.74	0.6	42.9
3	0.1% AEP	0.12	0.26	0.80	0.7	31.1
3	0.1% AEP Higher Central CC	2.50	0.80	3.60	0.5	42.9
3	0.1% AEP Upper End CC	2.87	0.87	3.76	0.6	44.2

4 Emergency planning

4.1 Flood warnings and alerts

The site is located in the Essex coast at Shoeburyness to Southend Pier EA Flood Warning Area and the Essex coast from Shoeburyness, to and including Southend seafront, including Southchurch Park Flood Alert Area.

4.2 Access and escape

Safe access and escape will need to be demonstrated in the 1% AEP plus climate change fluvial and 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 existing access to the site is from Marine Parade to the south. There is also potential access to the site via the A1160 to the east and Pleasant Road to the west, via Marine Road.

The existing access from the south is shown to be impeded in both tidal and surface water events as discussed in the following sections. Access and escape from the A1160 in the northeast of the site is shown to be the most feasible access point when considering all sources of flood risk.

4.2.2 Fluvial and tidal

Fluvial risk from the unnamed watercourse to the site is low and unlikely to impede access and escape.

However, most of the site and the surrounding roads to the south are shown to be at tidal risk from the Thames estuary and inundated during the 0.5% AEP climate change scenario in both the defended and undefended scenarios. Access and escape into the north of the site via the A1160 is likely to be possible in the 0.5% AEP climate change scenarios if the access point is within the northeast area of the site, outside the area of tidal risk.

Due to the tidal risk on and surrounding the site, a Flood Warning and Evacuation Plan is likely to 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

Access via Marine Parade and Pheasant Road is likely to be impacted by surface water in the 1% AEP climate change event. There is a significant flow path which forms to the south of the site along Marine Parade, with maximum depths along the road between 0.30m and 0.60m.

There are minor flow paths which form along the A1160 to the east however, depths along this road are predicted to remain below 0.15m so access and escape is unlikely to be impeded.

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 Southchurch Critical Drainage Area. The CDAs currently designated were identified in the Southend-on-Sea SWMP 2015 (southend.gov.uk). It is particularly important that any development within these CDAs will need to 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:

- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
- BGS data indicates that the underlying geology is clay, silt and sand which is likely to be with 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 of the receiving asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

SuDS assets should, where practicable, be located outside areas of flood risk in the 0.5% AEP plus climate change tidal event. As most of the site is shown to be at tidal risk within this event, this presents a significant constraint to the placement and design of sustainable drainage options at this site. SuDS features will need to consider above-ground storage and/or source control and be able to withstand the impacts of tide locking and saltwater ingress. The LLFA should be consulted at an early stage to discuss appropriate drainage options, and the acceptability of SuDS features for the site.

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.
- The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies and can also contribute towards requirements for Biodiversity Net Gain.

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 mixed use development as 'More Vulnerable'.

The Exception Test will be required for this site if 'More Vulnerable' development is proposed within areas of Flood Zone 3a.

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:

- in Flood Zones 2 and 3a
- 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 southern and central areas of the site are shown to be at significant tidal risk in undefended and climate change scenarios, and mitigation will be required to make built development safe in these areas of the site, particularly if more vulnerable development is proposed. The site layout should adopt a sequential approach by steering more vulnerable development outside the areas of highest risk in the south of the site. Further hydraulic modelling of the tidal risk to the site will be required at FRA stage to make sure the development and any associated mitigation measures do not cause off site detriment and to assist in the identification of safe access and escape routes and residual risk.

Finished Floor Levels should be raised above the expected height of flooding in line with the EA's guidance and any raising of ground levels should ensure that flood risk is not increased elsewhere. If this is not possible, additional resistance and resilience measures will need to be included as part of the building design to prioritise excluding floodwater where possible and reduce recovery time in the event of water ingress. Resistance

measures for flood levels beyond 0.6m can impact on the structural integrity of a building and are unlikely to be suitable.

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. The risk of tide locking will need to be considered within the drainage strategy.

Arrangements for safe access and escape will need to be provided for the 1% AEP fluvial and 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. Given the significant tidal risk on and surrounding the site, a Flood Warning and Evacuation Plan is likely to be required to ensure residents can be safely evacuated with sufficient warning and that sheltering in situ is possible in the event that evacuation is not possible.

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 southern and central areas of the site are at significant risk of tidal flooding in the undefended and climate change scenarios and are recorded to have previously experienced tidal flooding. Most of the site is shown to be impacted in the present day undefended events. The site is shown to be protected by tidal defences in the present day, but these are overtopped during the climate change events.
- **Residual**: The site is at residual risk of tidal flooding due to breach or overtopping of the tidal defences. Breach modelling has shown that breaches during the larger flood events provide little warning time at the site.
- **Surface water**: There is a significant surface water flow path predicted to impact the south of the site and potential access and escape from the south of the site.

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

- The Exception Test should be applied if 'More Vulnerable' development is proposed at the site.
- A site-specific FRA should be undertaken, which assess all sources of flood risk. This is likely to require further detailed tidal modelling to demonstrate that the development can be made safe throughout its lifetime and that proposed mitigation measures do not increase flood risk elsewhere.
- 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. Where safe access and escape is not possible, other means of safe refuge and evacuation must be considered. Due to the tidal risk surrounding the site, a Flood Warning and Evacuation Plan is likely to 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 the design events.
- The tidal defence owner should be consulted at an early stage to determine defence ownership and understand future plans for the defences, including plans for ongoing maintenance or defence improvements.
- Habitable areas of residential ('More Vulnerable') development must be set above the design flood level (0.5% AEP plus a suitable climate change allowance).
- 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. The tidal risk at the site

alongside the risk of tide locking of any outfalls may present a significant constraint to the implementation of SuDS at the site and will require early consultation with the LLFA to identify viable options.

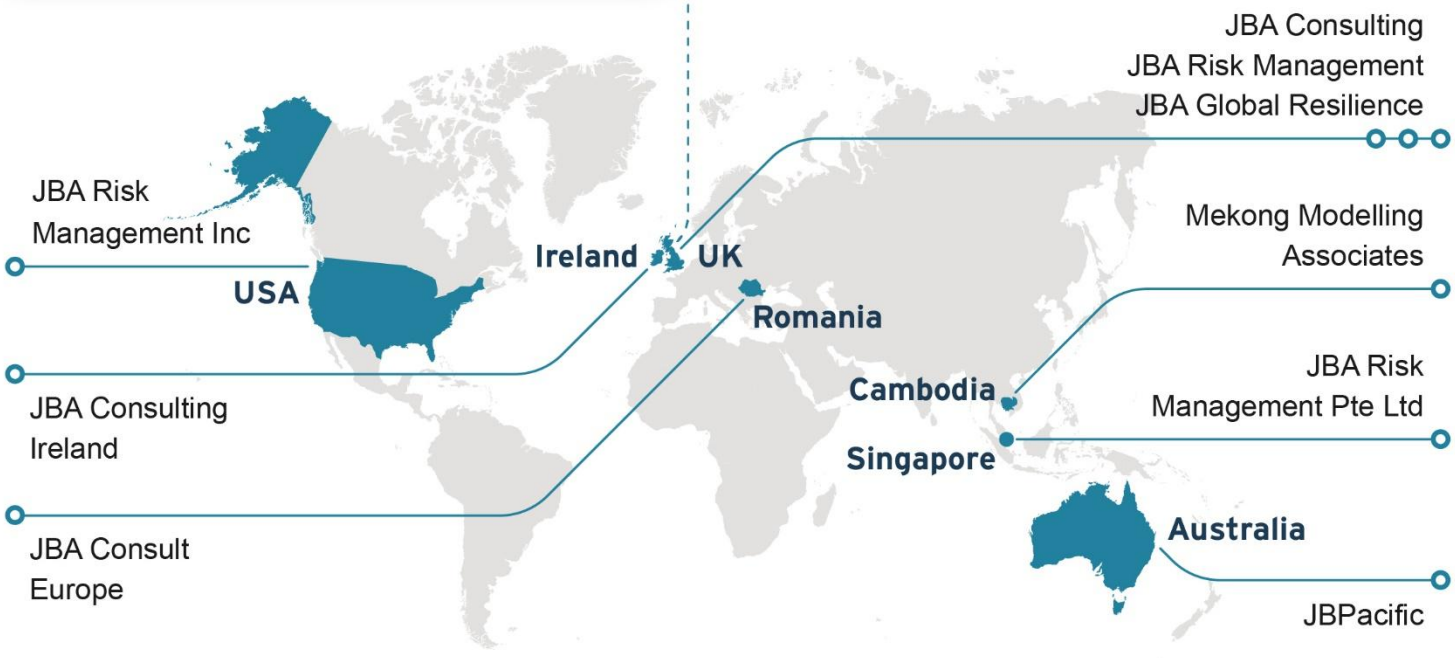
- Anglian Water should be consulted at an early stage on drainage proposals for the site to identify any potential constraints or existing sewer flooding issues that may not have been identified through this high level assessment.

www.jbaconsulting.com



Our Offices

Bristol
Coleshill
Cork
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Leeds
Limerick
Newcastle
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 on

Jeremy Benn
Associates Limited
Registered in
England
3246693

JBA Group Ltd is
certified to
ISO 9001:2015
ISO 14001:2015
ISO 27001:2022
ISO 45001:2018