

Bristol City Council

**River Avon Flood Risk
Management Strategy**

Non-Technical Summary for the
Strategic Environmental Assessment
Addendum

Issue | 22 January 2021

This report takes into account the particular instructions and requirements of our client.


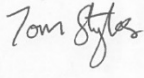


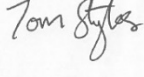


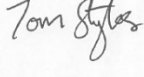

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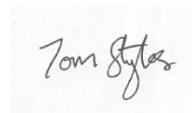

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1 Introduction

Bristol City Council (BCC) commissioned Ove Arup and Partners Ltd. (Arup) to update the River Avon Tidal Flood Risk Management Strategy previously undertaken by AECOM ('the Strategy'). Arup has undertaken a review of the Strategy and an update to the flood risk modelling to include fluvial flood risk alongside the tidal flood risk previously included by AECOM. This acknowledges the interaction between both tidal and fluvial flows in Bristol and the need for flood defences given the potential for flood events resulting from exceptional flows of both or either systems.

Following submission of the Strategic Environmental Assessment (SEA): Environmental Report¹ by AECOM in 2017, Bristol City Council has commissioned Arup to provide an update to the SEA Environmental Report to review the environmental impacts to align with the amended River Avon Flood Risk Management Strategy ("the amended Strategy"). This non-technical summary outlines the work undertaken as part of the SEA Addendum and the key findings.

2 Background

As with any city located close to rivers and the sea, Bristol has experienced many flood events in its past and has a long history of interaction with the River Avon, the Severn Estuary and other waterbodies in the region. The city centre is largely developed around these key waterbodies and over the years has experienced increasing flood events that have been caused by increased river/fluvial flows during storm events and also through surges of water via the Severn Estuary creating a tidal food up the river system. In recent years, communities across the UK have experienced increased levels of flooding causing disruption, damage to infrastructure and danger to life. Increasing sea levels and storm events caused by climate change mean the risk of flooding is increasing. The impact would be felt across the West of England due to Bristol's regional importance for employment, transport, recreation, tourism and economic growth.

Bristol City Council is working with the Environment Agency and key stakeholders to create a vital long-term strategy to protect the city from increased flood events, supported by Arup. The Strategy includes the provision of flood defence infrastructure to manage the risk from River Avon flooding to the centre of Bristol with placemaking to seek opportunities for inclusive growth, quality of life, environment and resilience.

The steering group made up of representatives of both organisations chose to subject the plans to Strategic Environmental Assessment (SEA)² on a voluntary

¹ AECOM (2017) Strategic Environmental Assessment: Environmental Report. River Avon Tidal Flood Risk Management Strategy, Bristol City Council.

² Environmental Assessment of Plans and Programmes Regulations 2004

basis. This ensures that the impacts on the environment can be fully understood and managed.

The findings of the SEA, including the likely environmental effects of the options considered and recommendations for how environmental effects can be reduced, minimised or avoided are presented in the AECOM Environmental Report ³ (SEA Environmental Report). A number of options were assessed to understand what effects they could have on the environment, and SEA was used as part of the appraisal process.

The assessment considered a number of environmental topics that were refined through the scoping process, namely:

- Biodiversity, flora and fauna;
- Population, human health and material assets;
- Soil and water;
- Climatic factors;
- Cultural heritage, including architectural and archaeological heritage; and
- Landscape.

3 Scope of works

Following submission of the AECOM Environmental Report in 2017⁴, BCC has commissioned Arup to provide an update on the Strategy given the need to consider fluvial inputs combined alongside tidal flows to understand broader implications on the core areas of Bristol and the need for flood defences and detriment mitigation measures.

The AECOM Environmental Report includes the following supporting documents that should be read in conjunction with the SEA Addendum (See Figure 1 - Scope of updates and reporting):

- SEA Scoping Report;
- Consultation Responses;
- Assessment tables for shortlisted options;
- Report to inform a Habitats Regulation Assessment (HRA); and
- Preliminary Water Framework Directive (WFD) Assessment.

The AECOM supporting documents remain relevant to the amended Strategy and a proportionate approach has been undertaken within the SEA Addendum to highlight the key differences to that previously reported within the AECOM Environmental Report.

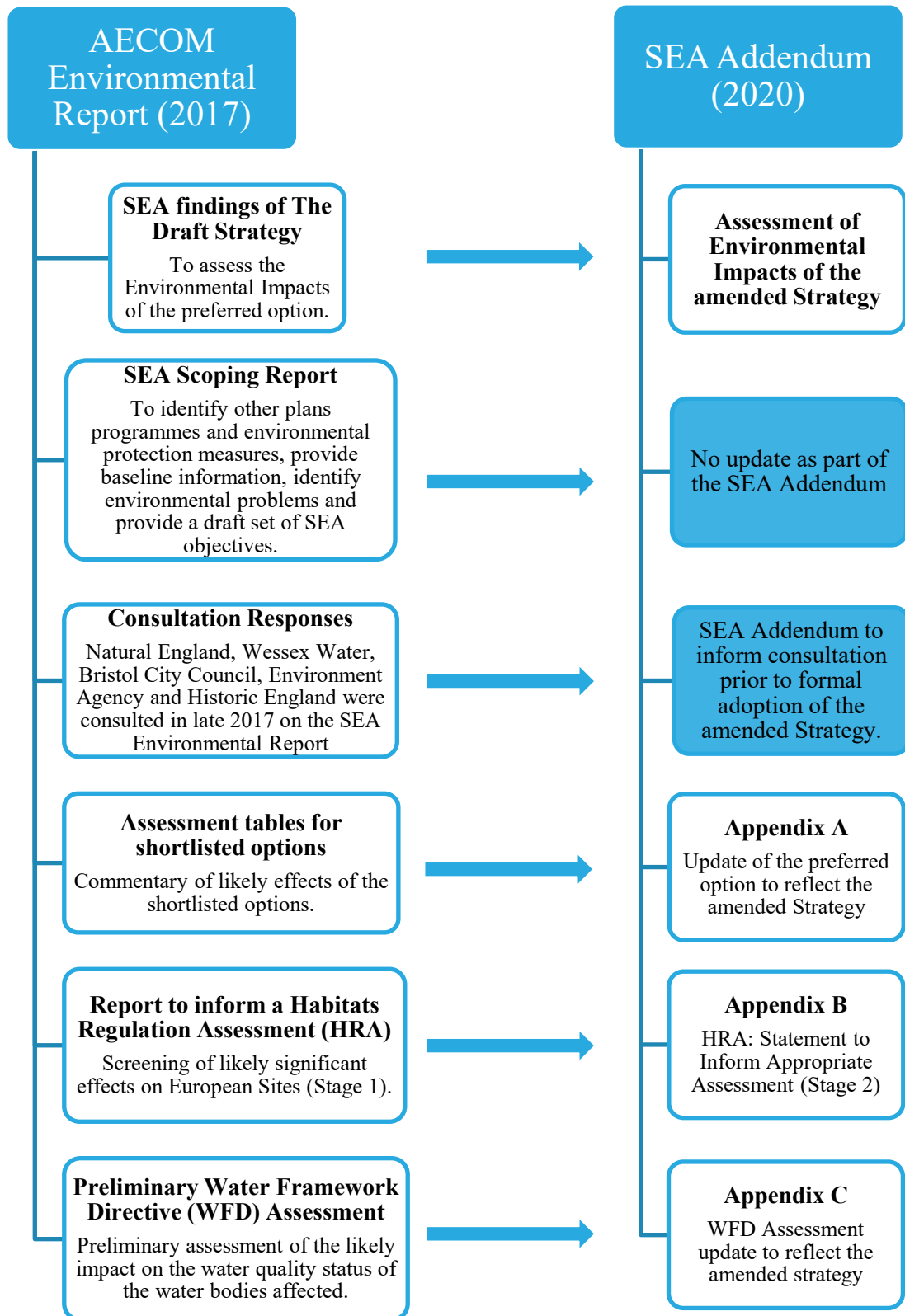
³ River Avon TFRMS Environmental Assessment: Environmental Report, AECOM (Sept 2017)

⁴ AECOM (2017) Strategic Environmental Assessment: AECOM Environmental Report. River Avon Tidal Flood Risk Management Strategy, Bristol City Council.

The following reports undertaken by AECOM are also included for reference and should be read in conjunction with this addendum:

- Baseline Mapping (Activity 9A);
- Options Identification and Environmental Appraisal (Activity 9B); and
- Pre-Scoping Report (Activity 9C).

Figure 1 - Scope of updates and reporting



The Options Identification and Environmental Appraisal⁵ report undertaken by AECOM sets out a review of a long list of 39 strategic options that each outlined a sequence of measures to be implemented. The spatial extent of the Options Appraisal undertaken by AECOM is outlined in Figure 2.

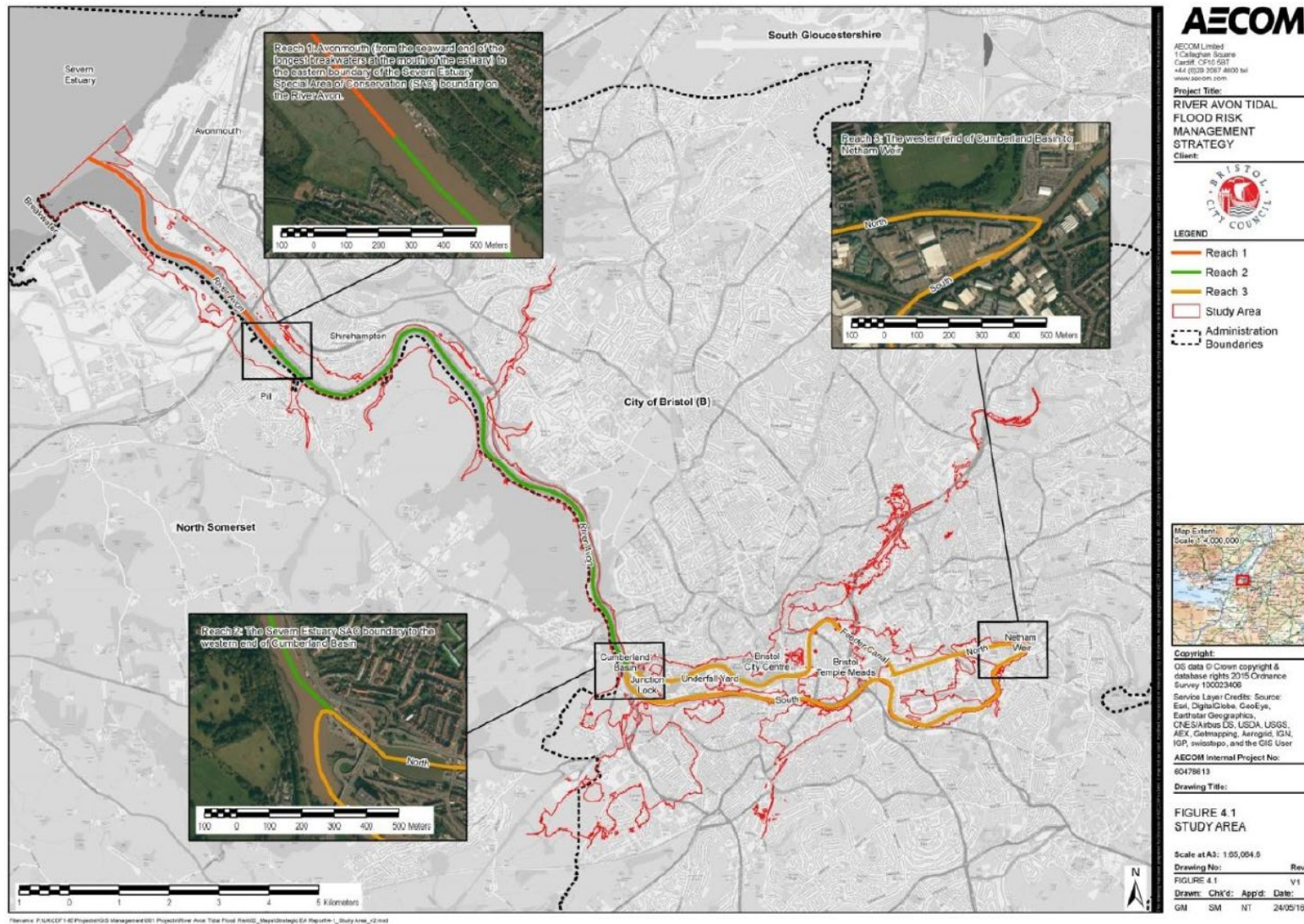
The amended Strategy has reviewed the preferred option through technical assessments and maintains the core approach of the preferred option (Option D1) comprising of the construction of Low and High defences, however the time periods in which they are implemented have been amended into the following two Epochs as outlined in Table 1. The Low defences will be constructed to a 1 in 200 year standard of protection for 2065. The upgraded High defences will provide a 1 in 200 year standard of protection for 2125.

Table 1 – Defences implemented by Epoch

AECOM Strategy 2017	Amended Arup Strategy 2020
Epoch 1 (Low defences) – 2015-2030	
Epoch 2 (Low defences) – 2030 to 2065	Epoch 1 (Low defences) – 2024 to 2065
Epoch 3 (High defences) – 2065 to 2115	Epoch 2 (High defences) – 2065 to 2125

⁵ AECOM (2017) Activity 9B: Options Identification and Environmental Appraisal, River Avon Flood Risk Management Strategy, Bristol City Council

Figure 2 - Spatial scope of Options Appraisal. *Source: SEA Environmental Report, AECOM, 2017*



4 Updates to the SEA Environmental Report

Whilst the study has assessed the impact of raised flood defences in the form of walls and embankments, the Council plans to pursue placemaking opportunities whereby the raised flood defences are integrated into the surroundings and form wider multi-functional public realm infrastructure.

In order to update the SEA Environmental Report 2017, a review of the following documents have been undertaken to assess the environmental implications of the amended Strategy.

4.1 Assessment of Environmental Impacts of the amended Strategy

An SEA Addendum has been produced by Arup to review the amendments of the River Avon Flood Risk Management Strategy ('the amended Strategy') given the need to consider fluvial inputs combined with tidal flows, to understand broader implications on the core areas of Bristol, and the need for flood defences and detriment mitigation measures⁶. This SEA Addendum outlines the key differences between the AECOM preferred option (Option D1) and the amended Strategy requiring additional and amended flood defences and detriment mitigation identified through flood risk modelling. The extent of flood defences and detriment mitigation measures as part of the amended Strategy are outlined in Figure 2 and Figure 3 below.

⁶ Detriment mitigation – flood defences required in areas of increased flood risk due to defences installed elsewhere.

Figure 3 - Extent of flood defences in the amended Strategy

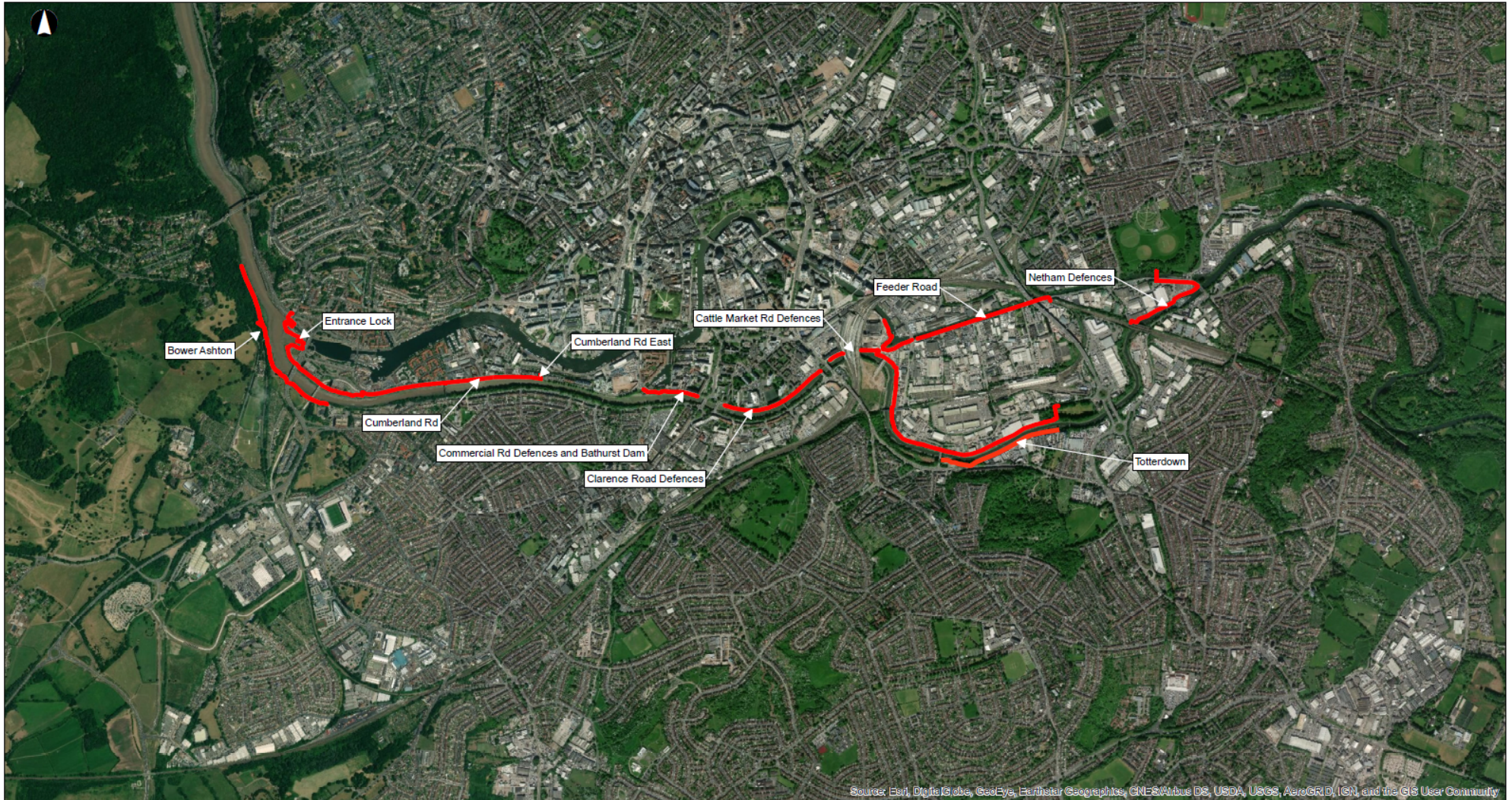
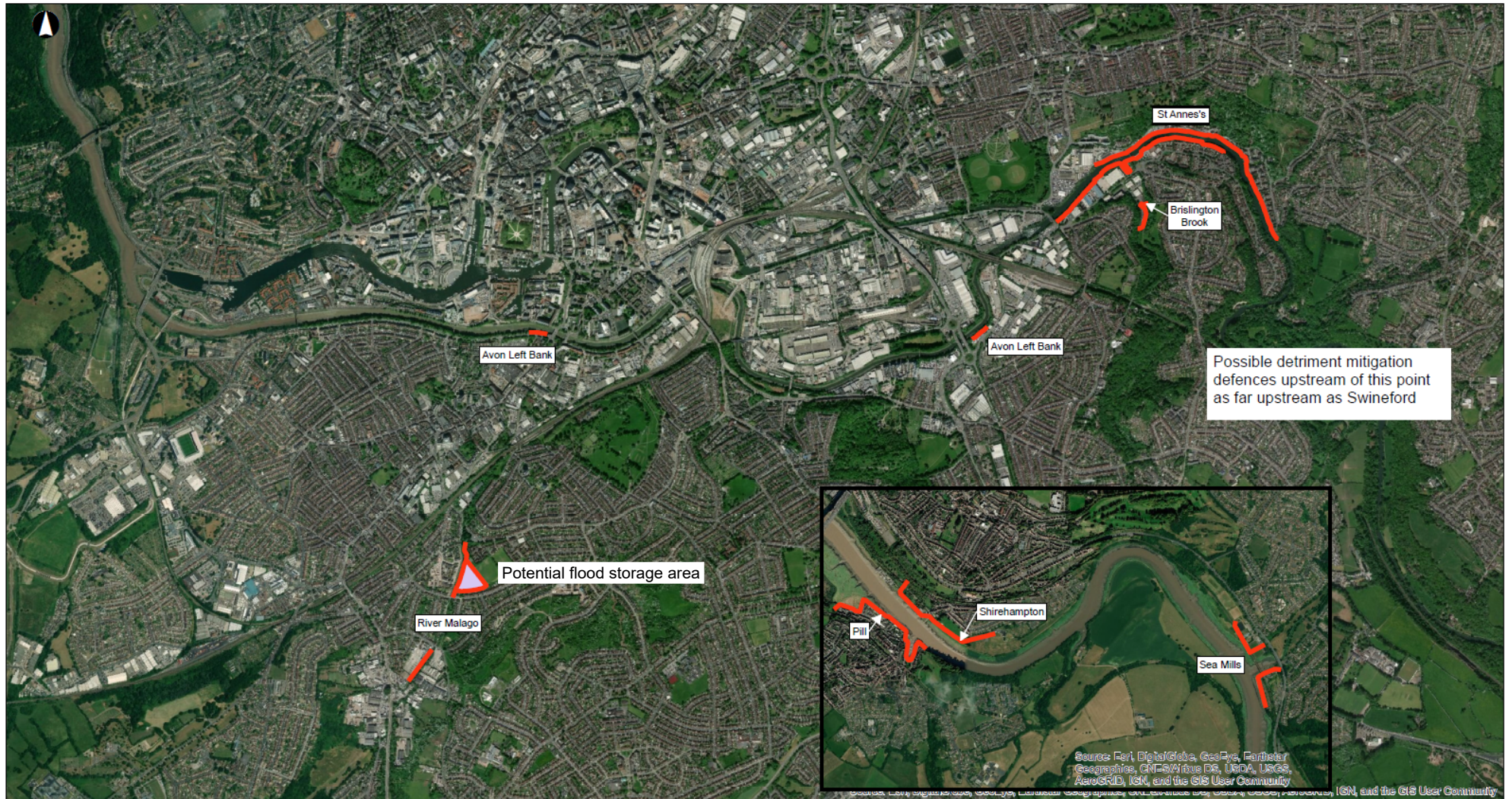


Figure 4 - Extent of detriment mitigation measures in the amended Strategy



The purpose of the SEA Addendum is to provide an update of the environmental findings within the AECOM Environmental Report through a consideration of the amendments to the proposed height and lengths of the flood defence design. This report also includes the assessment of new flood defences and detriment mitigation measures required to accommodate areas identified at risk of flooding within the updated model that considers the worst-case scenarios for both tidal and fluvial flows.

The focus of this report is to consider how these amendments to the flood defence design change the environmental findings within the Environmental Report, with reference to each environmental topic area presented within the assessment of the preferred option. This includes a review of the changes to environmental effects and the recommendations reported and follows on from the work already undertaken within the Environmental Report by AECOM.

This report does not supersede the Environmental Report but instead follows on to provide an update on the assessment resulting from the changes in design, with the exception of the Cultural Heritage chapter that replaces the chapter within the AECOM Environmental Report. This has been undertaken with information drawn from the River Avon Heritage Assessment⁷ commissioned by Bristol City Council that was undertaken following completion of the AECOM Environmental Report to better understand the vulnerability of the heritage assets in the area.

This SEA addendum also reviews the need for further assessment and provides recommendations regarding the implementation of the amended Strategy. The following conclusions were made through an assessment of the environmental impacts of the amended Strategy in the context of SEA.

Biodiversity, fauna and flora

During the construction of new and amended defences, a number of wildlife corridors, habitats and species could be affected, including intertidal / estuarine habitat. Other effects on estuarine ecology could result from disturbance of sediment as well as noise impacts. ‘Sensitive’ construction methods such as use of low noise piling techniques are recommended.

Effects are likely to be ‘temporary’ during construction of the amended Strategy in the context of biodiversity, fauna and flora for the majority of the amended Strategy however, new and amended defences at Bower Ashton and detriment mitigation measures proposed at Shirehampton and Pill are likely to impact on designated sites including European designated sites. Without avoidance and/or mitigation measures, it is reasonable to conclude there could be adverse effects on the integrity of the European designated sites. These impacts have been considered in detail through the Statement to Inform Appropriate Assessment as a supplementary activity to the Habitats Regulation Assessment (HRA) update, explained further in Section 3.2.

Some estuarine habitat would be lost as a result of the amended Strategy and the strategy would need to allow for replacement of these areas, where possible, with

⁷ River Avon Heritage Assessment (2018) City Design Group, Bristol City Council [draft].

the same habitat types elsewhere. As design evolves there will be a need to minimise any loss of intertidal mudflat and measures (including compensatory habitat) will be devised to ensure no net loss of biodiversity, taking account of any increased coastal defence footprint. Measures will be devised and presented as part of the detail to support a planning application that will commit to Biodiversity Net Gain.

Population, human health and material assets

Temporary negative effects are likely to occur during construction leading to a level of disruption, noise and dust impacts. These impacts are predicted to be generally localised and short term but could affect a number of major roads which run behind the defences (e.g. Cumberland Road, Commercial Road, Clarence Road and Feeder Road) through potential increases in traffic flows.

During operation, the amended Strategy is predicted to result in significant positive effects by reducing the risk of flooding to a substantial number of homes and businesses. The defences will also protect land allocated in the Local Plan for future development. Other wider benefits associated with the preferred option include benefits to the physical health of the local population through a reduction of injuries during flooding events and improved wellbeing.

Updated flood risk modelling has found that city centre defences may lead to an increased risk of flooding in other areas including Shirehampton, Pill, Sea Mills, River Avon near St Philip's Causeway, St Anne's, the Malago waterbody and the Brislington Brook. Detriment mitigation measures have therefore been included in the amended Strategy to resolve the issue.

The placemaking opportunities will offer wider opportunities to safeguard heritage and improve the built environment in the city. Where defences are to be deployed within the urban area this could offer opportunities to enhance the character of the surroundings and make use of community spaces.

Soil and water

The preferred option will require activities such as piling that could affect water and soil through disturbance to the river bed and the release of sediment into the River Avon, particularly at locations such as Cumberland Basin, Cumberland Road, Commercial Road, Clarence Road, Cattle Market Road, Bathurst Dam, Netham and St Anne's. An update to the Water Framework Directive (WFD) has been undertaken and outlines the temporary nature of these effects and could be reduced with good practice construction techniques.

In the longer term, the amended Strategy would provide increased flood and erosion protection and significantly reduce the chance of contaminated land exposure through erosion and contaminated run-off entering the River Avon.

Climatic factors

The amended strategy will provide substantial long-term benefits though the high level of protection from tidal flooding including from sea level rise due to climate

change. There will be limited emissions of greenhouse gases through embodied carbon and through the operation of plant and transportation during construction.

Cultural Heritage

Given the historic harbour side setting in central Bristol, there are a number of listed buildings, scheduled monuments, conservation areas and locally valued historic buildings that stand to be affected. Construction of the defences would likely result in some temporary impacts on the visual setting of these features, with a number of heritage assets integral to the existing riverside infrastructure experiencing lasting effects on the fabric and setting, some of which are likely to be significant.

In the long term, the raised defences will provide lasting protection to a ‘heritage rich’ area which will significantly benefit these historic buildings and features. Opportunities to repair and restore heritage assets that have been impacted through previous flood events have been explored through the amended Strategy as demonstrated by the works undertaken along the Chocolate Path to safeguard the continued use of this non-designated heritage asset.

Further design development, including the Placemaking Opportunities Report⁸, will seek to reduce these effects on heritage assets affected. There may also be further opportunities for the strategy to contribute to the enhancement of the existing character, setting and appearance of cultural heritage assets and Conservation Areas.

Due to the historic nature of the study area, there is the potential for archaeological remains to be discovered and affected, which will need to be considered during the construction process and an appropriate form of treatment identified including archaeological recording or monitoring.

Landscape

During construction of the measures set out within the amended Strategy there are likely to be temporary negative effects on the appearance of the local area due to the presence of construction sites, plant and machinery.

In the longer term, there is the potential for negative impacts on the local area through the introduction of a physical barrier to movement and to views across the river or city. High defences would have the greatest potential for an adverse effect as they would have the greatest visibility, although it may be possible to mitigate these effects through sensitive design such as the installation of reinforced glass on top of masonry clad defences instead of a solid structure. The amended Strategy also affords some opportunity to improve how the areas near the defences look and function.

⁸ Arup (2020) Placemaking Opportunities Report, River Avon Flood Risk Management Strategy, Bristol City Council.

4.2 Habitats Regulation Assessment (HRA) - Statement to Inform Appropriate Assessment

Regulation 63 of the Habitats Regulations requires a ‘competent authority’ to undertake an ‘appropriate assessment’ of any plan or project (alone or in combination with other plans and projects) which is likely to have a significant effect on the features or a European Site unless the project is directly connected with the management of the site.

An HRA was previously undertaken by AECOM as part of the original Environmental Report to assess the potential for significant effects on the features or European Sites in proximity to the works. As a result, a Stage 1 (Screening) HRA was undertaken, taking into account appropriate and agreeable mitigation and avoidance measures and concluded that no significant adverse effect on the integrity of the European sites.

As part of the update to the SEA Addendum, an update to the HRA through a Statement to Inform Appropriate Assessment (SIAA) (Stage 2) has been undertaken to reflect the changes to the amended Strategy and with regards to recent case law⁹ that considers the inclusion of plainly established and uncontroversial mitigation within Screening stage (Stage 1), previously undertaken by AECOM, is no longer appropriate.

The SIAA concluded that, without mitigation and/or avoidance measures, the amended Strategy could result in temporary and permanent negative effects on the integrity of the European Sites. Through implementation of appropriate and agreeable mitigation and avoidance measures it is likely to conclude that no significant adverse effect will arise. To allow the competent authority to conclude no adverse effect, further survey and mitigation measures are required to understand the impact of the proposed works on the Severn Estuary SPA, Ramsar and SAC, Avon Gorge Woodlands SAC, and the North Somerset and Mendip Bat SAC. Any habitat management or reinstatement, with respect to impacts on the European Sites, may require monitoring and further management. Refer to the SIAA for full details.

It is recognised that as the flood defences within the Strategy change, there is a need to reassess these supporting documents.

⁹ People Over Wind, Case C323/17 European Court of Justice, 12th April 2018.

4.3 Preliminary Water Framework Directive (WFD) Assessment

As part of the update to the SEA Addendum, an update to the Preliminary Water Framework Directive (WFD) Assessment has been undertaken to reflect the changes to the amended Strategy and supersedes the Preliminary WFD Assessment¹⁰ undertaken previously.

To ensure compliance with the WFD, decision makers must consider whether proposals for new developments have the potential to:

- cause a deterioration of a water body from its current status or potential; and/or
- prevent future attainment of good status or potential where not already achieved.

The amended Strategy requires additional defences and detriment mitigation along the River Avon and associated water bodies. These amendments have triggered the need to “screen in” two additional water bodies into the Preliminary WFD Assessment to that previously undertaken. This has required the assessment of the following:

- Bristol Avon (previously screened in by AECOM);
- Bristol Floating Harbour; and
- Bristol Avon (By Bk to Netham Weir).

The updated Preliminary WFD Assessment concluded that temporary negative effects on the water bodies assessed at locations where the amended Strategy requires work directly within the watercourse through the disturbance of the riverbed and the release of sediment. Construction activity has the potential to impact on the ecological status of the water bodies due to a likely reduction of aquatic habitat.

It is recognised that as the flood defences design within the Strategy evolve, there is a need to reassess these supporting documents and that a full WFD Assessment will be carried out and submitted as part of a future Environmental Impact Assessment (EIA).

¹⁰ AECOM (2017) Strategic Environmental Assessment: Preliminary Water Framework Directive Assessment. River Avon Tidal Flood Risk Management Strategy, Bristol City Council.

5 Next Steps

The SEA Addendum has assessed the amended Strategy and recognises the benefits from the implementation of the flood defences identified and the beneficial effects on people, health, material assets, heritage features and climatic factors. These works are crucial to the preservation of key areas of Bristol that are fundamental to the character and make-up of the city and will protect these areas from flood events arising from both tidal and fluvial flows.

It is recognised that the SEA Addendum and supporting documents identify a number of negative effects through the implementation of the amended Strategy, some of which are likely to be significant. Further work, alongside existing studies including the placemaking work, should be undertaken to further develop the design to minimise the impact on the environment and those effects reported.

The Environment Agency (EA), Natural England (NE) and Historic England (HE) were consulted in late 2017 on the Environmental Report produced by AECOM. As a key procedural requirement of the SEA Regulations, the SEA Addendum and supporting documents will be published alongside the amended Strategy for consultation with the public and the relevant key stakeholders including the EA, NE and HE in advance of adoption by Bristol City Council and endorsement by the Environment Agency.