ARUP

Bristol City Council

River Avon Flood Risk Management Strategy

Preliminary Water Environment Regulations Compliance Assessment

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Executive Summary

Bristol City Council (BCC) have commissioned a Preliminary Water Environment Regulations (WER) assessment (also known as Water Framework Directive (WFD) assessment) to inform the Outline Business Case stage. BCC is working in partnership with the Environment Agency (EA) to deliver the long-term Bristol Avon Flood Strategy ('the Strategy').

The Strategy is focused along the River Avon through Bristol and extends east (upstream) to Swineford and west (downstream) to Pill. It is split into two delivery phases. Phase 1 is the initial phase of construction expected to be delivered in the 2020s. Phase 2 includes the construction of additional defences and defence raising in the 2060s and is not considered in this assessment.

Surface Waters

Several WER surface water bodies intersect with Phase 1 of the Strategy, namely:

- Bristol Floating Harbour Water Body (GB70910601);
- Bristol Avon Water Body (GB530905415405);
- Malago – source to conf R Avon (Brist New Cut) Water Body (GB109053021970);
- Frome (Brist) – Bradley Bk to conf Floating Hbr Water Body (GB109053027840);
- Trym – source to conf R Avon (Brist) Water Body (GB109053027530); and
- Brislington Bk – source to conf R Avon (Brist) Water Body) (GB109053021980).

With the exception of the Bristol Floating Harbour Water Body, which is classified as artificial, all of the water bodies are designated as heavily modified due to physical modifications.

The Malago and the Frome were screened out of further assessment at Stage 1 based on there being no planned works in the water bodies. All other surface water bodies were taken forward to the Stage 2 scoping assessment on the basis that the proposed works have the potential to impact on the WER status due to in-channel works. This scoping assessment concluded that there is potential for minor localised adverse impacts on these surface water bodies.

Groundwater

The Strategy area is underlain by three WER groundwater bodies, including:

- the Bristol Triassic Water Body (GB40902G804800),
- the Carboniferous Limestone (Bristol) Water Body (GB40901G806800), and
- the Portishead Mercia Mudstone Water Body (GB40902G805300).

All three groundwater bodies were screened into further assessment due to there being potential for impact on the WER statuses of the water bodies. This potential for impact results from the anticipated piling required to construct new flood defences. Piling activities can mobilise contaminated ground, create new pathways for pollution to reach groundwater or modify groundwater flows. Ground investigation is required to quantify any impacts and determine mitigation requirements.

Conclusion

Further assessment, in the form of a detailed WER assessment, is required at the Full Business Case stage. Where impacts are confirmed, mitigation would be developed as part of the design. Enhancement of intertidal and riparian habitat is also achievable at many locations and should be considered as the design develops.

1. Introduction

1.1 Project background

Bristol City Council (BCC) ('the Applicant') commissioned Ove Arup and Partners Ltd. (Arup) to prepare a Preliminary Water Environment Regulations (WER) assessment (also known as Water Framework Directive (WFD) assessment) to inform the Outline Business Case (OBC) stage. BCC is working in partnership with the Environment Agency (EA) to deliver the long-term Bristol Avon Flood Strategy ('the Strategy').

Tidal and fluvial flooding from the River Avon represent an increasingly significant risk to Bristol and its neighbouring communities with the potential for severe consequences. The city is at risk from both tidal surges from downstream and high river flows from upstream. Climate change is increasing sea levels and peak river flows meaning that widespread flooding of central Bristol likely to become a relatively frequent occurrence. The impact would be felt across the West of England due to Bristol's regional importance for employment, transport, recreation, tourism and economic growth.

BCC is working with the EA 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.

A WER (WFD) assessment was originally produced by AECOM in September 2017 and was updated by Arup in September 2020 as part of the Strategic Outline Case (SOC). This iteration of the assessment provides an update to reflect changes to WER legislation, WER status and objectives, and developments in project design since 2020.

1.2 Purpose of this report

Arup has been commissioned to update the previous Preliminary WFD Assessment to support the Strategy, comprising a Stage 1: Baseline assessment – screening and Stage 2: Preliminary assessment – scoping.

The purpose of this report is to:

- Identify the relevant water bodies that may be affected by the Strategy and collate the available baseline information;
- Identify relevant scheme components with the potential to affect the water bodies at the site, together with any embedded mitigation measures integrated into the current design;
- Undertake a preliminary scoping assessment to identify the likely impacts of the Strategy on the current status and status objectives of the relevant waterbodies (including identification of any additional mitigation requirements);
- Identify any risks of non-compliance with water body objectives and associated requirements for further detailed impact assessment and/or mitigation design; and
- Identify potential enhancement opportunities to support the delivery of water body objectives.

This report summarises the Strategy, outlines the assessment methodology and presents the assessment results. The assessment has been undertaken in accordance with relevant guidance (see Appendix A) and has involved a desk-based study using readily available baseline information and existing design information.

The WER assessment comprises a 'living document' and should be updated as further design detail, including mitigation, becomes available. This will be considered in future iterations of the document.

1.3 Supporting environmental reports

Other relevant environmental baseline and impact assessment reports produced to date to support the optioneering for the Strategy include:

- Bristol Avon Flood Strategy Preliminary Draft Environmental Impact Assessment Scoping Report (September 2023)

1.4 Assumptions and limitations

The WER water body classification data in this assessment has been taken from the EA 2022 Cycle 3 River Basin Management Plan (RBMP) data[1]. These classifications are considered to provide the current best estimate of status and are the formal baseline against which the EA will assess compliance with the 'no deterioration' objective in 2027.

The assessment in this document is based on the design information currently available for the Strategy. As such, the mitigation identified in this assessment as being required to mitigate the likely significant effects reported are based on this worst-case scenario where no or limited design information exists. It may be the case that as design of the Strategy evolves, it becomes apparent that a lesser form of mitigation is required to achieve the same outcome. This will be detailed in future iterations of this assessment.

EA mitigation measures information was requested in September 2023. At the time of issue, the information had not been received. Information will be incorporated into future iterations of the document if it is made available.

This document is considered to be a 'live document' and should be updated as further design detail, including mitigation, becomes available. This will be considered in future iterations of the document.

[1] Environment Agency. 2022. *Catchment Data Explorer.* Available at: https://environment.data.gov.uk/catchment-planning/ [Accessed: 14/09//2023]

2. Legislative Context

The Water Environment (Water Framework Directive) (England and Wales) Regulations (amended 2017) is currently the largest and most influential piece of UK legislation for the water environment and transposes the Water Framework Directive into English and Welsh law. The Environment Agency is the competent authority responsible for delivering the requirements of the WER in England.

The legislation takes an integrated approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems.

Under the WER, 'water bodies' are the basic management units and are defined as all or part of a river system or aquifer. These water bodies form part of a larger River Basin District (RBD), for which RBMPs are developed and environmental objectives are set. These RBMPs are produced every six years, in accordance with the river basin management planning cycle.

The WER requires classification of the current condition or 'status or potential' of surface water and groundwater bodies and to set a series of objectives for maintaining or improving conditions so that water bodies reach and / or maintain 'good status or potential'. These overall Environmental Objectives are to:

- Prevent the deterioration of (and where possible enhance) the status of surface water bodies, ground water bodies and their ecosystems;
- Aim to achieve at least 'Good' status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve Good status by 2021 or 2027;
- Meet the requirements of Water Framework Directive Protected Areas;
- Promote sustainable use of water as a natural resource;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to surface water (particularly the aquatic environment);
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts.

All new (and current on-going) activities in the water environment need to be guided by the requirements of the WER. This includes ensuring that no changes occur that cause a deterioration of current status of a water body or prevents the achievement of the future status objectives of a water body. This principle is now integrated into the planning permission application process for proposed schemes.

Further background information regarding the determination of WER status and the WER compliance assessment requirements for new developments is provided in Appendix B.

3. Assessment methodology

3.1 Stage 1: Baseline assessment (screening)

Initial screening identified relevant WER water bodies located in the zone of influence. The zone of influence includes the physical footprint of the works and the surface water bodies that run through the site and the groundwater bodies that underlies the site. Water bodies are selected for inclusion at this early stage of the compliance assessment with reference to the relevant RBMP.

This stage has considered whether the scheme has the potential to impact on WER water bodies. Where impact pathways have been considered possible, the proposed zones of influence have been established based on the Strategy design.

Water body baseline

This has been established by identifying the WER surface water and groundwater bodies potentially affected by the Strategy and identifying their baseline condition, using a desktop assessment.

The desktop assessment has collated and reviewed the water body status and status objectives information for the relevant WER water bodies based on EA data (2022 Cycle 3 Water body Status Classification data). This data is considered to provide the current best estimate of status and the formal baseline against which the EA will assess compliance with the 'no deterioration' objective in 2027.

The following datasets have also been used to establish the nature and existing condition of those watercourses located within WER water bodies that are affected by the Strategy:

- Severn River Basin Management Plan[2];
- Cycle 3 RBMP water body status classification and status objectives data, reasons for not achieving good (RNAG) data, protected area data;
- Historic OS maps[3];
- Ordnance Survey (OS) Open Data[4];
- DEFRA 'MAGIC' map (providing authoritative geographic information about the natural environment from across government)[5]; and
- The British Geological Society (BGS) Interactive Map[6].

Project baseline

Scheme components and activities that have the potential to permanently affect surface water and/or groundwater bodies, and that therefore have the potential to impact on WER status, have been identified. This included the identification of all relevant embedded mitigation within the scheme design in Section 5.2.

3.2 Stage 2: Preliminary assessment (scoping)

Scoping comprises a more detailed assessment to identify risks from the scheme to receptors (within the zone of influence) on the relevant WER water bodies and their quality elements. The aim of this assessment

[2] Environment Agency, 2022. *Severn River Basin Management Plan (Cycle 3).* Available at: https://www.gov.uk/guidance/severn-river-basin-district-river-basin-management-plan-updated-2022 (Accessed: 14/09//2023)

[3] National Library of Scotland, 2023. *Historical OS maps.* Available at: http://maps.nls.uk/os/ (Accessed: 14/09//2023)

[4] Ordnance Survey, 2023. *Open Data maps.* Available at: https://www.bing.com/mapspreview (Accessed: 14/09//2023)

[5] DEFRA, 2023. *MAGIC map*. Available at: https://magic.defra.gov.uk/magicmap.aspx (Accessed: 14/09//2023)

[6] British Geological Society, 2023. *Geology Viewer.* Available at: https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/ (Accessed: 14/09//2023)

is to identify whether there is potential for deterioration in water body status or failure to comply with WER objectives for any of the water bodies identified in Stage 1 and establish if further detailed assessment is required (see Section 1.1).

4. Site and Surrounding Area

4.1 Site location

The Site[7] is predominantly located in the centre of Bristol on the River Avon with areas extending east upstream to National Grid Reference (NGR): ST 68265 69100 and west downstream to NGR: ST 51965 76909.

The Bristol Avon Flood Risk Management Strategy consists of main defences, additional main defences and upstream defences (see Section 5).

4.2 Site description

4.2.1 Watercourses

Bristol lies adjacent to the River Severn Estuary, a tidal water body that has the second highest tidal range in the world. The River Avon that flows through Bristol discharging to the Severn Estuary and is therefore also tidal, and the influence of the tide extends upstream as far as Saltford, near Bath.

Various watercourses are located within, or adjacent to the main and additional main defences of the Site, including Bristol Floating Harbour, Bristol Avon Water Body, the Malago, the Frome (Brist) – Bradley Bk, Bristol Avon (By Bk to Netham Weir), Brislington Bk, Siston Bk, the Chew, the Boyd and, the Trym – source to conf R Avon (Brist)[1].

4.2.2 Geology

Mapped bedrock geology varies over the Site from Keynsham to the mouth of the Bristol Avon[6]. The predominant bedrock geology types include: Charmouth Mudstone Formation – Mudstone; Wilmcote Limestone Member – Limestone and Mudstone, Interbedded; Blue Anchor Formation – Mudstone; Farrington Member and Barren Member (Undifferentiated) – Sandstone; Mercia Mudstone Group – Mudstone and Halite-stone; Redcliffe Sandstone Member – Sandstone; and Quartzitic Sandstone Formation – Sandstone. Superficial deposits predominantly comprise: Tidal Flat Deposits – Clay and Silt. Mapped superficial deposits comprise several areas of River Terrace Deposits, 1 – Sand and Gravel and River Terrace Deposits, 2 – Sand and Gravel.

4.2.3 Topography

Topography over the Site is predominantly low-lying with maximum elevations of approximately 150 to 200 metres Above Ordnance Datum (mAOD). Within the city of Bristol elevations vary between 10 and 20mAOD[8].

4.2.4 Land use

Land use within and surrounding the city of Bristol is largely urban. To the east of Bristol, upstream to Kenysham, and to the west of Bristol towards Shirehampton, land use is predominantly grassland, with some arable and horticulture, and scattered woodland[8].

4.2.5 Designated Sites

Several designated sites lie within or adjacent to the Site[5], these include:

- Cotswold Area of Outstanding Natural Beauty (AONB) – a varied landscape, including, enclosed landscape valleys, escarpments, a Low Limestone plateau and settled valleys amongst other defining features.

[7] The Proposed Site is indicative at this stage and may be subject to further changes as design progresses.

[8] [8] National River Flow Archive, 2023. *Data.* Available at: https://nrfa.ceh.ac.uk/data/ (Accessed: 14/09//2023)

- Willsbridge Valley Local Nature Reserve (LNR) – a former site of milling, quarrying and a coal dramway, which now contains many habitats, including ponds.
- Avon Valley Woodland LNR – designated as an LNR owing to the presence of maturing broadleaved woodlands, and varied habitats of oak woodland, willow scrub and pasture.
- Troopers Hill LNR – designated as an LNR in recognition of the wide range of wildlife present on the Hill and its importance as a unique habitat in the Bristol area due to the presence of acidic soils.
- Avon New Cut LNR – a former industrial site, with the Cut having been excavated between 1804 and 1809 to divert the course of the River Avon as part of the process to create Bristol's Floating Harbour. Silt deposited by the river has formed banks against the walls of the New Cut that now support saltmarsh vegetation. A band of scrub and woodland lies above the tide line and provides a valuable wildlife corridor through Bristol, hence its designation as an LNR.
- Lamplighters Marsh LNR – home to a variety of semi-natural habitats including scrub, grassland and saltmarsh.
- Leigh Woods National Nature Reserve (NNR) – designated as an NNR due to the presence of rare flora and fauna.
- Severn Estuary Ramsar/Site of Special Scientific Interest (SSSI)/Special Area of Conservation (SAC) – designated as a Ramsar/SSSI/SAC due to the extensive intertidal zone comprising intertidal mudflats, sand banks, saltmarsh, shingle, and rocky platforms. Flora and fauna communities typical of extreme physical conditions occur at the site.
- Horseshoe Bend, Shirehampton SSSI – designated as a SSSI due to the site consisting of a wooded cliff and a narrow salt marsh. The underlying rocks are Devonian sandstone and Carboniferous limestone, overlaid with Triassic dolomitic conglomerate.
- Avon Gorge SSSI/SAC – one of the principal nature conservation sites in the southwest. It is recognised for its exceptional number of nationally rare plants and for its exposures of Carboniferous Limestone, which are of great geological interest.

5. Strategy

5.1 Design description

The Strategy is split into two delivery phases:

- Phase 1: an initial phase of construction expected to be delivered in the 2020s; and
- Phase 2: a subsequent phase of construction of additional defences and defence raising in the 2060s.

Phase 2 will be subject to its own planning consent and assessment appropriate to the time when consent is required, therefore, is excluded from the Bristol Avon Flood Strategy Preliminary Draft Environmental Impact Assessment Scoping Report and supporting deliverables including this WER assessment.

The Bristol Avon Flood Risk Management Strategy Phase 1 consists of three broad geographical areas:

- Central Bristol;
- Shirehampton, Pill and Sea Mills;
- Detriment defences – isolated areas upstream.

Central Bristol

For the purposes of design and ease of reference, the central Bristol defences have been split into eight areas, as described below and shown in Figure 2.2 of the Bristol Avon Flood Strategy Preliminary Draft Environmental Impact Assessment Scoping Report (September 2023):

Entrance Lock

The length of this section is up to 300m. This section runs from Hotwell Road, around the Tongue Head and end of Spike Island to the Brunel Way flyover. It includes:

- Creation of a section of flood wall adjacent to Hotwell Road;
- Raising of Hotwell Road by approximately 0.8m;
- Installation of new outer lock gates to replace the existing outer gates; and
- Creation of new flood walls including terracing around the outside of the Knuckle / Tongue head to tie in to a crossing, with an average height of 1.9m.

Spike Island

This section runs for around 1.5km from the Brunel Way flyover along the north bank of the River Avon to the eastern end of the Chocolate Path. It includes:

- Using the existing off ramp from Brunel Way, with isolated sections (45m) infilled to a height of 1m with a gravity wall;
- A new piled flood wall along Bonded Warehouses, with mostly piled foundations, and road raising to provide line of defence across the guided busway. The average height is 1.5m.
- A new piled flood wall along the Chocolate Path, including active travel improvements and incorporating the existing heritage railway. Some sections will not require piling depending on the total defence height. The average height is 1.9m; and
- A new 1.8m high flood gate across the railway.

Redcliffe

The length of this section is around 1.1km, from God's Garden along the north Bank of the River Avon to Bristol Temple Meads. It includes:

- Raising of the existing Bathurst Dam to an average height of 1.8m;
- New piled flood wall with an average height of 0.8m along Commercial Road;
- New piled flood wall with an average height of 1.3m along Clarence Road;
- New piled flood wall with an average height of 0.6m along Cattle Market Road; and
- New gravity foundation flood wall along the South Bank west of Bedminister Bridge Roundabout.

Feeder Road

This section extends from Bristol Temple Meads along the south bank of the Feeder Canal for a distance of 950m. This will comprise two new piled flood walls, using gravity foundation where the defence height tapers down with average heights of 0.1m and 0.9m for the two walls, respectively. Feeder Road itself will also require raising by approximately 0.9m.

St Philip's Marsh

This section extends from Bristol Temple Meads to Sparke Evans park on the north bank of the River Avon for a distance of 1.8km. This will comprise a new piled floodwall with an average height of 1.3m. A new embankment 250m long embankment is to also be constructed with an average height of 0.9m.

Netham Lock

This section extends from the Avon railway bridge along the north bank of the River Avon to Netham Lock. The length of this section is up to 710m and is composed of a new floodgate, raising an existing road to an average height of 0.9m, and new flood walls. The flood walls will be a mix of sheet pile and gravity foundations, with piles used for the high defence areas, with average heights of 1.4m.

Ashton

This section extends from the western riverside of the Avon parallel to Ashton Court to east of Ashton Avenue Bridge. The length of this section is up to 1.1m. It includes:

- New piled flood wall with an average height of 1.5m;
- New embankment with an average height of 1.1m south of Rownham Bridge across the railway;
- New gravity foundation flood wall beneath Brunel Way with an average height of 1.1m;
- Road raising along the Metrobus route;
- New piled flood wall with an average height of 0.8m in front of the pumping station;
- New piled flood wall with an average height of 1.4m to tie into the existing Bristol Metal Spraying Building; and
- Property flood resilience protection along Hotwell Road.

St Anne's

This section extends from the bank of the River Avon upstream of Netham Lock, including section along Eldonwall trading estate, St Anne's wood and Pump House Lane. Defences at this location include new floodwalls with mostly piled foundations, and gravity foundations where the defence height tapers down.

Downstream of central Bristol

Downstream of central Bristol, defences are required in:

- Pill and Shirehampton - riverside on both sides of the River Avon at Pill and Shirehampton; and
- Sea Mills – riverside on the eastern side of the Avon, to the north and south of the River Trym.

Pill

The first part of this section involves raising the height of an existing embankment running from Avon Road to Marine Parade in Pill to an average height 0.8m, over a distance of 530m. This ties in to a flood wall along Marine Parade and Underbanks which will also require raising by 0.9m for 440m length – the associated footpath will require raising to maintain views. This will need to be matched with a new flood wall from the upstream viaduct with piled foundations and average height of 1.3m. The length of this wall is 320m.

Shirehampton

The length of this section is around 900m, starting at the end of Wellington Mews and extending roughly parallel to the Bristol Avon along Lamplighters Open Space to the Port of Bristol Sports Club car park. The majority will be two new embankments with average height of 1.6m and 0.6m. In front of Shirehampton Sailing Club for approximately 80m, an existing flood wall will be raised with an average height of 1.6m.

Sea Mills

The length of this section is up to 900m. It includes:

- New gravity foundation flood wall adjacent to the railway with an average height of 0.3m;
- A new 120m long embankment with an average height of 2m;
- Bridge parapet retrofit;
- Raising of the existing flood walls around properties by 0.5m;
- New 60m long gravity foundation flood wall with an average height of 0.5m;
- New 120m long embankment with an average height of 2m north of Sea Mills Lane.

Upstream of central Bristol

Further upstream interventions (detriment defences) may also be needed, but this is likely to mostly comprise property flood resilience measures, which will be considered further as the Strategy is developed.

5.2 Construction phase mitigation

An Environmental Action Plan (EAP) will be prepared in advance of construction, outlining environmental risks and constraints within the site and will define best practice and mitigation measures required for inclusion within the construction phase work method statements, to ensure compliance with relevant environmental legislation, consents, and approvals.

The EAP will include measures to avoid and minimise impacts to the water environment during construction of the Proposed Scheme, in alignment with the Environment Agency's best practice guidance including adherence with the Safety, Health, Environment and Wellbeing Code of Practice (CoP) guidance which relates to risks associated with pollution and biosecurity requirements. For the basis of this assessment, it is assumed that relevant environmental good practice advice set out in the Pollution Prevention Guidelines (PPG) and its replacement Guidance for Pollution Prevention (GPP[9]) document series will be implemented on site during the construction phase. Whilst PPGs and GPPs do not provide regulatory guidance in England, they form environmental good practice guidance. Key aspects of the PPGs and GPPs that should be considered are summarised in the following sections.

[9] GPPs withdrawn in 2018 but in the absence of replacement guidance, this is still referred to as industry best practice.

5.2.1 Pollution control

It is assumed that best practice will be adopted in line with Guidance for Pollution Prevention (GPP) 5: Works and maintenance in or near water to minimise the risk of silt pollution to nearby watercourses during construction activities. This will involve the application of appropriate measures, where necessary, to avoid or control silt runoff. For example, this may include:

- seeding or covering exposed ground and sediment stockpiles;
- only removing vegetation from areas that need to be exposed in the near future;
- minimising the amount of time soil stockpiles are exposed for;
- all plant and wheel washing to be carried out in a designated area at least 10m from any water body or surface drain; and
- any runoff water containing sediments or other pollutants to be treated appropriately before discharge back to the water environment.

5.2.2 Spillages

A pollution risk assessment should be carried out for the proposed scheme ahead of construction, considering both the storage and transportation of materials used. This would identify potentially hazardous materials or activities and assess the probability and magnitude of potentially harmful effects. From this, a pollution incident response plan (see GPP 21: Pollution incident response planning) should be compiled, identifying the specific measures needed to reduce the likelihood of a spillage happening, and implemented, to minimise the impact of any spills that may occur.

5.2.3 Minimising disturbance

Appropriate measures should be included within the work method statements and adhered to, to reduce potential environmental impacts of an in-channel construction activities. This includes measures to:

- minimise the footprint of any in channel works as far as reasonable possible to reduce the degree of physical disturbance of the existing riverbed and banks;
- reinstate any impacted benthic or marginal habitats where necessary;
- reduce associated noise, vibration, and any artificial lighting impacts where possible; and
- control the timing of works so that any in-channel works are programmed to take place outside of sensitive times of year for juvenile fish and migratory fish.

5.2.4 Biosecurity

Good biosecurity practices are vital for preventing the spread of invasive non-native species (INNS) and pathogens such as waterborne fish diseases. Measures should be adopted to minimise the risk of construction activities leading to the spread of invasive non-native species or pathogens.

To avoid the spread of invasive species the following measures should be detailed within the EAP and be adhered to during construction:

- contractor's Ecologist to undertake toolbox talks for any INNS prior to works starting to all workers on site. Toolbox talks are to be signed by site workers who have received the briefing;
- ensure all site teams are briefed in EA 'Check, Clean, Dry' procedure and will be made aware of areas on site where INNS are known to be present; and
- avoid working in areas where INNS are present. Where this is not possible, appropriate biosecurity measures are to be developed, adopted, and implemented.

Any potential additional measures will be specified during the detailed design phase, prior to construction.

6. Baseline assessment (screening)

6.1 Overview

A baseline assessment has been undertaken to identify the relevant WER water bodies that could be affected by the Proposed Scheme. This screening assessment collates the latest available WER baseline data in order to inform the scoping assessment (Section 1.1) of the likely effects of the Proposed Scheme on WER status and objectives.

6.2 Relevant water bodies

The Strategy is located within the Severn River Basin District (RBD). The WER status, status objectives and programme of measures derived by the EA for water bodies located within this RBD are outlined within the current Cycle 3 Severn RBMP[3].

The Strategy lies within or adjacent several WER waterbodies, which are listed in Table 6-1.

Table 6-1: WER classified catchments associated with the main and additional main defences

Water body name (ID)	Location of defences to water body
Surface water bodies	
Bristol Floating Harbour Water Body (GB70910601)	Adjacent to Entrance Lock, Feeder Road, and Netham Lock. Approximately 270m north of Spike Island. Approximately 400m north of Redcliffe. Approximately 970m north of St Phillip's Marsh. Approximately 550m north of Temple Meads.
Bristol Avon Water Body (GB530905415405)	Adjacent to Entrance Lock, Spike Island, Redcliffe, St Phillip's Marsh, Netham Lock, Ashton, Temple Meads, Pill and Shirehampton, and Sea Mills. Approximately 130m south of Feeder Road.
The Malago – source to conf R Avon Water Body (GB109053021970)	Approximately 270m west of Temple Meads.
Frome (Brist) – Bradley Bk to conf Floating Harbour Water Body (GB109053027840)	Approximately 420m west of Temple Meads.
Trym – source to conf R Avon (Brist) Water Body (GB109053027530)	Adjacent to Sea Mills
Brislington Bk - source to conf R Avon (Brist) Water Body (GB109053021980)	Adjacent to St Anne's
Groundwater bodies	
Bristol Triassic Water Body (GB40902G804800)	Located beneath Temple Meads, Ashton, Pill and Shirehampton, Entrance Lock, Spike Island, Redcliffe, Feeder Road, Netham, and St Phillip's Marsh.
Carboniferous Limestone (Bristol) Water Body (GB40901G806800)	Located beneath Ashton, Sea Mills, and Pill and Shirehampton.
Portishead Mercia Mudstone Water Body (GB40902G805300)	Located beneath Pill and Shirehampton.

6.3 Bristol Floating Harbour Water Body (GB70910601)

The 'Bristol Floating Harbour Water Body' (GB70910601) is an artificial water body. The water body has a total length of 6km.

In 2022 the water body had an Overall Status of 'Moderate' with an Ecological Status of 'Moderate' and a Chemical Status of 'Does not require assessment'. A breakdown of the current status and status objectives of the water body is provided in Table 6-2.

Table 6-2: Cycle 3 RBMP WER status and objectives for the 'Bristol Floating Harbour Water Body' (GB70910601)

Water body name/Classification Item	Description, notes or more information
Water body name	Bristol Floating Harbour Water Body
Water body ID	GB70910601
Water body length	6km
Ecology ***Physico-chemical quality elements*** Ammonia (Phys-Chem) Dissolved oxygen Phosphate Temperature pH ***Supporting elements (Surface Water)*** Mitigation Measures Assessment	**Moderate** ***Moderate*** High Good Moderate High High ***Moderate*** Moderate or less
Chemical ***Priority substances*** ***Priority hazardous substances***	**Does not require assessment**[10] Does not require assessment Does not require assessment
WER protected areas	None
Reasons for not achieving good (RNAG)	Phosphate – sewage discharges (continuous). Perfluorooctane sulphonate (PFOS) – unknown. Mitigation Measures Assessment – Other (not in list, must add details in comments). Polybrominated diphenyl ethers (PBDEs) – Measures delivered to address reason, awaiting recovery. Mercury and Its Compounds – Measures delivered to address reason, awaiting recovery.

[10] For the 2022 RBMP Cycle 3 assessment of chemical status, the methods were changed to increase the evidence base. Due to these changes, all water bodies now fail chemical assessment and this assessment is not comparable to previous years assessments. Environment Agency. "How to use Catchment Data Explorer." *Department for Environment Food & Rural Affairs.* 2021, https://environment.data.gov.uk/catchment-planning/help/usage#chemical-status.

6.4 Bristol Avon Water Body (GB530905415405)

The 'Bristol Avon Water Body' (GB530905415405) is designated as heavily modified, owing to physical modifications. The water body has a total surface are of 2km^2.

In 2022 the water body had an Overall Status of 'Moderate' with an Ecological Status of 'Moderate' and a Chemical Status of 'Does not require assessment'. A breakdown of the current status and status objectives of the water body is provided in Table 6-3.

Table 6-3: Cycle 3 RBMP WER status and objectives for the 'Bristol Avon Transitional Water Body' (GB530905415405)

Water body name/Classification Item	Description, notes or more information
Water body name	Bristol Avon Transitional Water Body
Water body ID	GB530905415405
Water body surface area	2km^2
Ecology ***Biological quality elements*** Macroalgae Opportunistic Macroalgae Phytoplankton ***Hydromorphological Supporting Elements*** Hydrological Regime ***Supporting elements (Surface Water)*** Mitigation Measures Assessment ***Specific pollutants*** Iron	**Moderate** ***High*** High High High ***Supports good*** Supports good ***Moderate*** Moderate or less ***High*** High
Chemical ***Priority substances*** ***Priority hazardous substances***	**Does not require assessment** Does not require assessment Does not require assessment
WER protected areas	The 'Bristol Avon Water Body' has the following protected areas, namely the Severn Estuary – Special Protection Area (UK9015022), Ramsar site (UK11081), and SAC (UK0013030); and the River Avon (Bristol) – Urban Waste Water Treatment Directive (UKENRI77).
RNAG	Mitigation measures assessment – Physical modifications. PBDE – measures delivered to address reason, awaiting recovery. Mercury and Its Compounds – measures delivered to address reason, awaiting recovery.

6.5 The Malago – source to conf R Avon (Brist New Cut) Water Body

'The Malago – source to conf R Avon (Brist New Cut) Water Body' (GB109053021970) is designated as heavily modified, owing to physical modifications. The water body has a catchment area of 15.6km^2.

In 2022, the 'The Malago – source to conf R Avon (Brist New Cut) Water Body' had an Overall Status of 'Moderate' with an Ecological Status of 'Moderate' and a Chemical Status of 'Does not require assessment'. A breakdown of the current status and status objectives of the water body is provided in Table 6-4.

Table 6-4: Cycle 3 RBMP WER status and objectives for the 'The Malago – source to conf R Avon (Brist New Cut) Water Body' (GB109053021970)

Water body name/Classification Item	Description, notes or more information
Water body name	The Malago – source to conf R Avon (Brist New Cut) Water Body
Water body ID	GB109053021970
Water body catchment area	15.6km^2
Ecological ***Biological quality elements*** Invertebrates Macrophytes Sub Element ***Physico-chemical quality elements*** Ammonia (Phys-Chem) Dissolved oxygen Phosphate Temperate pH ***Hydromorphological supporting elements*** ***Supporting elements (Surface Water)*** Mitigation Measures Assessment ***Specific pollutants***	**Moderate** ***Good*** Good Good ***Moderate*** High Moderate Poor High High ***Supports good*** ***Moderate*** Moderate or less ***High***
Chemical ***Priority substances*** ***Priority hazardous substances***	**Does not require assessment** Does not require assessment Does not require assessment
WER protected areas	None
RNAG	Phosphate – transport drainage, misconnections, urbanisation. Dissolved oxygen – misconnections. Benzo(g-h-i)perylene – unknown (pending investigation). Benzo(b)fluoranthene – unknown (pending investigation). Mitigation Measures Assessment – Other (not in list, must add details in comments). PBDE – measures delivered to address reason, awaiting recovery. Mercury and Its Compounds – measures delivered to address, awaiting recovery.

6.6 Frome (Brist) – Bradley Bk to conf Floating Hbr Water Body (GB109053027840)

The 'Frome (Brist) – Bradley Bk to conf Floating Hbr Water Body' (GB109053027840) is designated as heavily modified, owing to physical modifications. The water body has a catchment area of 33km^2.

In 2022, the 'Frome (Brist) – Bradley Bk to conf Floating Hbr Water Body' had an Overall Status of 'Moderate' with an Ecological Status of 'Moderate' and a Chemical Status of 'Does not require assessment'. A breakdown of the current status and status objectives of the water body is provided in Table 6-5.

Table 6-5: Cycle 3 RBMP WER status and objectives for the 'Frome (Brist) – Bradley Bk to conf Floating Hbr Water Body' (GB109053027840)

Water body name/Classification Item	Description, notes or more information
Water body name	Frome (Brist) – Bradley Bk to conf Floating Hbr Water Body
Water body ID	GB109053027840
Water body catchment area	33km^2
Ecological	**Moderate**
Biological quality elements	***High***
Invertebrates	High
Macrophytes Sub Element	High
Physico-chemical quality elements	**Moderate**
Ammonia (Phys-Chem)	High
Dissolved oxygen	High
Phosphate	Moderate
Temperate	High
pH	High
Hydromorphological supporting elements	**Supports good**
Supporting elements (Surface Water)	**Moderate**
Mitigation Measures Assessment	Moderate or less
Specific pollutants	***High***
Chemical	**Does not require assessment**
Priority substances	Does not require assessment
Priority hazardous substances	Does not require assessment
WER protected areas	None
RNAG	Phosphate – poor nutrient management. PFOS – Unknown (pending investigation). Mitigation Measures Assessment – Other (not in list, must add details in comments). Mercury and Its Compounds – Measures delivered to address reason, awaiting recovery. PBDE – Measures delivered to address reason, awaiting recovery.

6.7 Trym – source to conf R Avon (Brist) Water Body (GB109053027530)

The 'Trym – source to conf R Avon (Brist) Water Body' (GB109053027530) is designated as heavily modified, owing to physical modifications. The water body has a catchment area of 21.3km^2. In 2022, the 'Trym – source to conf R Avon (Brist) Water Body' had an Overall Status of 'Moderate' with an Ecological Status of 'Moderate' and a Chemical Status of 'Does not require assessment'. A breakdown of the current status and objectives of the water body is provided in Table 6-6.

Table 6-6: Cycle 3 RBMP WER status and objectives for the 'Trym – source to conf R Avon (Brist) Water Body' (GB109053027530)

Water body name/Classification Item	Description, notes or more information
Water body name	Trym – source to conf R Avon (Brist) Water Body
Water body ID	GB109053027530
Water body catchment area	21.3km^2
Ecological ***Biological quality elements*** Fish Invertebrates Macrophytes Sub Element ***Physico-chemical quality elements*** Ammonia (Phys-Chem) Dissolved oxygen Phosphate Temperate pH ***Hydromorphological supporting elements*** ***Supporting elements (Surface Water)*** Mitigation Measures Assessment ***Specific pollutants***	**Moderate** ***Bad*** Bad Moderate Good **Moderate** High High Moderate High High **Supports good** **Moderate** Moderate or less ***High***
Chemical ***Priority substances*** ***Priority hazardous substances***	**Does not require assessment** Does not require assessment Does not require assessment
WER protected areas within 5km	None
RNAG	Phosphate – Poor livestock management, other (not in list, must add details in comments), urbanisation – urban transport. Fish – Sewage discharge (intermittent), misconnections, incidents, flood protection – structures, barriers – ecological discontinuity. Invertebrates – Sewage discharge (intermittent). Benzo(b)fluoranthene – Unknown (pending investigation). Benzo(g-h-i)perylene – Unknown (pending investigation). Mitigation Measures Assessment – Other (not in list, must add details in comments). Mercury and Its Compounds – Measures delivered to address, awaiting recovery. PBDE – Measures delivered to address reason, awaiting recovery.

6.8 Brislington Bk - source to conf R Avon (Brist) Water Body (GB109053021980)

The 'Brislington Bk - source to conf R Avon (Brist) Water Body' (GB109053021980) is designated as heavily modified, owing to physical modifications. The water body has a catchment area of 13.7km^2.

In 2022, the 'Brislington Bk - source to conf R Avon (Brist) Water Body' had an Overall Status of 'Moderate' with an Ecological Status of 'Moderate' and a Chemical Status of 'Does not require assessment'. A breakdown of the current status and status objectives of the water body is provided in Table 6-7.

Table 6-7: Cycle 3 RBMP WER status and objectives for the 'Brislington Bk - source to conf R Avon (Brist) Water Body' (GB109053021980)

Water body name/Classification Item	Description, notes or more information
Water body name	Brislington Bk - source to conf R Avon (Brist) Water Body
Water body ID	GB109053021980
Water body catchment area	13.7km^2
Ecological ***Biological quality elements*** Invertebrates Macrophytes and Phytobenthos Combined Phytobenthos Sub Element ***Physico-chemical quality elements*** Ammonia (Phys-Chem) Dissolved oxygen Phosphate Temperate pH ***Hydromorphological supporting elements*** ***Supporting elements (Surface Water)*** Mitigation Measures Assessment ***Specific pollutants*** Triclosan	**Moderate** ***Moderate*** Moderate Moderate Moderate ***Moderate*** Good High Poor High High ***Supports good*** ***Moderate*** Moderate or less ***High*** High
Chemical ***Priority substances*** ***Priority hazardous substances***	**Does not require assessment** Does not require assessment Does not require assessment
WER protected areas within 5km	None
RNAG	Invertebrates – Ttransport drainage, misconnections, flood protection – structures. Macrophytes and Phytobenthos Combined – Unknown (pending investigation). Phosphate – Unknown (pending investigation). Benzo(b)fluoranthene – Unknown (pending investigation). Benzo(g-h-i)perylene - Unknown (pending investigation). Mitigation Measures Assessment – Other (not in list, must add details in comments). Mecury and Its Compounds – Measures delivered to address reason, awaiting recovery. PBDE - Measures delivered to address reason, awaiting recovery.

6.9 Bristol Triassic Water Body

In 2019 the water body had a 'Good' overall water body classification. A breakdown of the current status and status objectives of the water body is provided in Table 6-8.

Table 6-8: Summary of 2019 WER status for the 'Bristol Triassic Water Body'

Water body name/Classification Item	Description, notes or more information
Water body name	Bristol Triassic Water Body
Water body ID	GB40902G804800
Water body surface area	694.3km^2
Overall water body ***Quantitative*** ***Chemical (GW)***	**Good** ***Good*** ***Good***
WER protected areas	Severn Estuary Special Protection Area (UK9015022)/Ramsar (UK11081)/SAC (UK0013030). Chew Valley lake Eutrophic lake Nitrate Vulnerable Zone (NVZ) Nitrates Directive (EL109). Chew Valley Lake Special Protection Area (UK9010041) R Chew – source to conf Winford Bk NVZ Nitrates Directive (S557). Wellow Bk – conf Lyde Bk to conf Cam Bk NVZ Nitrates Directive (S565). Bristol Triassic Drinking Water Protected Area (UKGB40902G804800). Blagdon Lake Eutrophic lake NVZ Nitrates Directive (EL112). Newton Bk – source to conf R Avon (Brist) NVZ Nitrates Directive (S558). Feltham Brook Nitrates Directive (S570).

6.10 Carboniferous Limestone (Bristol) Water Body

In 2019 the water body had a 'Good' overall water body classification. A breakdown of the current status and status objectives of the water body is provided in Table 6-9.

Table 6-9: Summary of 2019 WER status for the 'Carboniferous Limestone (Bristol) Water Body'

Water body name/Classification Item	Description, notes or more information
Water body name	Carboniferous Limestone (Bristol) Water Body
Water body ID	GB40901G806800
Water body surface area	74.8km^2
Overall water body ***Quantitative*** ***Chemical (GW)***	**Good** ***Good*** ***Good***
WER protected areas	Severn Estuary Special Protection Area (UK9015022), Ramsar site (UK11081) and SAC (UK0013030). Carboniferous Limestone (Bristol) Drinking Water Protected Area (UKGB40901G806800).
RNAG	None

6.11 Portishead Mercia Mudstone Water Body (GB40902G805300)

In 2019 the water body had a 'Poor' overall water body classification. A breakdown of the current status and status objectives of the water body is provided in Table 6-10.

Table 6-10: Summary of 2019 WER status for the 'Portishead Mercia Mudstone Water Body'

Water body name/Classification Item	Description, notes or more information
Water body name	Portishead Mercia Mudstone Water Body
Water body ID	GB40902G805300
Water body surface area	27.6km^2
Overall water body ***Quantitative*** ***Chemical (GW)***	**Poor** ***Good*** ***Poor***
WER protected areas	Severn Estuary Special Protection Area (UK9015022), Ramsar site (UK11081) and SAC (UK0013030). Portishead Mercia Mudstone Drinking Water Protected Area (UKGB40902G805300).
RNAG	None

6.12 Screening conclusions

All of the surface water bodies are designated as artificial or heavily modified for uses that include flood protection, navigation and urbanisation, which align with the objectives of the Strategy. The Malago and the Frome surface water bodies have been screened out of further assessment because of there being no intended development in the water bodies.

All other surface water bodies have been screened into the next stage of the assessment on the basis that the proposed works have the potential to impact on the WER status due to in-channel works. This includes the following surface water bodies:

- Bristol Floating Harbour Water Body (GB70910601)
- Bristol Avon Water Body (GB530905415405)
- Trym – source to conf R Avon (Brist) Water Body (GB109053027530)
- Brislington Bk - source to conf R Avon (Brist) Water Body (GB109053021980)

All three groundwater bodies have been screened into further assessment due to there being potential for impact on the WER statuses of the water bodies. These are:

- Bristol Triassic Water Body (GB40902G804800)
- Carboniferous Limestone (Bristol) Water Body (GB40901G806800)
- Portishead Mercia Mudstone Water Body (GB40902G805300)

A summary of the screening conclusions for water bodies is provided in Table 6-11.

Table 6-11: Summary of screening conclusions

Water body name	Screening decision	Preliminary assessment of deterioration	Assessment of cumulative affects	Sensitive/critical habitats check	Will the Strategy prevent Good Ecological Potential (GEP)/Status (GES) being achieved? Could they help towards GEP/S?	Will the Strategy impact on the ability to deliver proposed water body measures?	Mitigation measures to limit impact of the Strategy	Conclusions
Bristol Floating Harbour	Screened in: work in water body proposed.	A non-temporary impact from new piled walls and piling on ecology is unlikely but cannot be ruled out.	Sheet piling is likely to cause temporary impacts as a result of noise and vibration and scour during construction that could disturb sensitive ecological species and may need mitigation. Piling may mobilise sediment into the water column through piling activities in potentially contaminated areas, further investigation will be required to quantify any mitigation requirements.	A non-temporary impact from new piled walls and piling on ecology is unlikely but cannot be ruled out.	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified. Overall, the nature and scale of the scheme is unlikely to have a significant impact or influence on progress towards WER GEP, due to the nature and timescales of the project.	The scheme will not restrict the ability to deliver water body improvements. The scheme is an investment opportunity that could be used to improve aquatic habitats.	Mitigation may be required for loss of habitat. Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the Construction Environmental Management Plan (CEMP) to minimise the risks posed by activities to the water environment.	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment is needed to identify any mitigation measures required to ensure no n-temporary impacts on the status of the water body. Suitable mitigation and/or compensation may be required within the water body, and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.
Bristol Avon	Screened in: work in water body proposed.	A non-temporary impact from new piled walls and piling on the hydrological regime and ecology is unlikely but cannot be ruled out.	Sheet piling is likely to cause temporary impacts as a result of noise and vibration and scour during construction that could disturb sensitive ecological species and may need mitigation. Piling may mobilise sediment into the water column through piling activities in potentially contaminated areas. Further investigation will be required to quantify any mitigation requirements.	The new piled walls are likely to result in a loss of priority habitat of intertidal zone and mudflats. Further WER assessment will be required, and mitigation to ensure no net loss. Protected Areas: Eutrophic sensitive areas, NVZs, Horseshoe Bend SSSI, Severn Estuary Ramsar, Severn Estuary SAC, Avon Gorge SSSI, Avon Gorge Woodlands SAC. Potential impacts on protected European Sites to be assessed using Appropriate Assessment under the Habitats Regulations.	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified. Overall, the nature and scale of the scheme is unlikely to have a significant impact or influence on progress towards WER GEP, due to the nature and timescales of the project.	The scheme will not restrict the ability to deliver water body improvements. The scheme is an investment opportunity that could be used to improve aquatic habitats.	Mitigation will be required for loss of habitat. Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the CEMP to minimise the risks posed by activities to the water environment.	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment and mitigation will be required to address loss of priority habitats and to identify other mitigation measures required to ensure no non-temporary impacts on the status of the water body. Suitable mitigation and/or compensation may be required within the water body and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.
The Malago	Screened out: no intended development in water body.							
Frome	Screened out: no intended development in water body.							
Trym	Screened in: work in water body proposed.	A non-temporary impact from new piled walls and piling on the hydrological regime and ecology is unlikely but cannot be ruled out.	Sheet piling is likely to cause temporary impacts as a result of noise and vibration and scour during construction that could disturb sensitive ecological	A non-temporary impact from new piled walls and piling on ecology is unlikely but cannot be ruled out.	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified. Overall, the nature and scale of the scheme is unlikely to have a significant impact or influence on progress towards WER GEP,	The scheme will not restrict the ability to deliver water body improvements. The scheme is an investment opportunity that could be used to improve aquatic habitats.	Mitigation will be required for loss of habitat. Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the CEMP to	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment and mitigation will be required to address loss of priority habitats and to identify other mitigation measures required to ensure no non-temporary impacts on the status of the water body.

Water body name	Screening decision	Preliminary assessment of deterioration	Assessment of cumulative affects	Sensitive/critical habitats check	Will the Strategy prevent Good Ecological Potential (GEP)/Status (GES) being achieved? Could they help towards GEP/S?	Will the Strategy impact on the ability to deliver proposed water body measures?	Mitigation measures to limit impact of the Strategy	Conclusions
			species and may need mitigation. Piling may mobilise sediment into the water column through piling activities in potentially contaminated areas. Further investigation will be required to quantify any mitigation requirements.		due to the nature and timescales of the project.		minimise the risks posed by activities to the water environment.	Suitable mitigation and/or compensation may be required within the water body and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.
Brislington Bk	Screened in: work in water body proposed.	A non-temporary impact from new piled walls and piling on the hydrological regime and ecology is unlikely but cannot be ruled out.	Sheet piling is likely to cause temporary impacts as a result of noise and vibration and scour during construction that could disturb sensitive ecological species and may need mitigation. Piling may mobilise sediment into the water column through piling activities in potentially contaminated areas. Further investigation will be required to quantify any mitigation requirements.	A non-temporary impact from new piled walls and piling on ecology is unlikely but cannot be ruled out.	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified. Overall, the nature and scale of the scheme is unlikely to have a significant impact or influence on progress towards WER GEP, due to the nature and timescales of the project.	The scheme will not restrict the ability to deliver water body improvements. The scheme is an investment opportunity that could be used to improve aquatic habitats.	Mitigation will be required for loss of habitat. Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the CEMP to minimise the risks posed by activities to the water environment.	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment and mitigation will be required to address loss of priority habitats and to identify other mitigation measures required to ensure no non-temporary impacts on the status of the water body. Suitable mitigation and/or compensation may be required within the water body and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.
Bristol Triassic	Screened in: work in water body proposed	A non-temporary impact from new piled walls and piling on the hydrogeological regime is unlikely but cannot be ruled out.	Piling may create new pathways for pollution to reach groundwaters. Further investigation will be required to quantify any mitigation requirements.	Not applicable	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified.	The scheme will not restrict the ability to deliver water body improvements.	Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the CEMP to minimise the risks posed by activities to the water environment.	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment to identify other mitigation measures required to ensure no non-temporary impacts on the status of the water body. Suitable mitigation and/or compensation may be required within the water body and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.
Carboniferous Limestone	Screened in: work in water body proposed	A non-temporary impact from new piled walls and piling on the hydrogeological regime is unlikely but cannot be ruled out.	Piling may create new pathways for pollution to reach groundwaters. Further investigation will be required to quantify any	Not applicable	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified.	The scheme will not restrict the ability to deliver water body improvements.	Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the CEMP to	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment to identify other mitigation measures required to ensure no non-temporary impacts on the status of the water body.

Water body name	Screening decision	Preliminary assessment of deterioration	Assessment of cumulative affects	Sensitive/critical habitats check	Will the Strategy prevent Good Ecological Potential (GEP)/Status (GES) being achieved? Could they help towards GEP/S?	Will the Strategy impact on the ability to deliver proposed water body measures?	Mitigation measures to limit impact of the Strategy	Conclusions
			mitigation requirements.				minimise the risks posed by activities to the water environment.	Suitable mitigation and/or compensation may be required within the water body and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.
Portishead Mercia Mudstone	Screened in: work in water body proposed	A non-temporary impact from new piled walls and piling on the hydrogeological regime is unlikely but cannot be ruled out.	Piling may create new pathways for pollution to reach groundwaters. Further investigation will be required to quantify any mitigation requirements.	Not applicable	Works are unlikely to prevent good status being achieved for the water body, however further WER assessment and proposal of mitigation measures will be required for potential localised impacts identified.	The scheme will not restrict the ability to deliver water body improvements.	Construction method statements should be used to plan and minimise non-temporary impacts during sheet piling construction. Best working practices (e.g., GPP5 will be implemented during the construction phase and included in the CEMP to minimise the risks posed by activities to the water environment.	The scheme is low in impacts in WER terms and is designed to improve flood defence for wider social benefits. Further WER assessment to identify other mitigation measures required to ensure no non-temporary impacts on the status of the water body. Suitable mitigation and/or compensation may be required within the water body and this should be planned in close consultation with Natural England, the Environment Agency and other key stakeholders.

7. Preliminary assessment (scoping)

7.1 Overview

A scoping assessment has been undertaken to establish the likely impacts of the Strategy on the WER status elements of the screened-in water bodies and WER compliance risks. This assessment has considered relevant design elements embedded within the latest Proposed Scheme design.

Impacts have been considered with regard to the risk of the Strategy:

- causing a deterioration in current status of the water body; and/or
- preventing the future achievement of water body status objectives.

The assessment process for determining the potential risk of status deterioration uses the following traffic light rating system to assign the magnitude of the likely effect anticipated on each of the quality elements of the affected water bodies:

- **Dark Blue**: Beneficial effect of a scale sufficient to increase status class for the quality element at water body scale.
- **Light Blue**: Minor/localised beneficial effect resulting in a localised improvement but insufficient to increase status class for the quality element at water body scale.
- **Green**: No measurable change to (or effect on) status class for the quality element at water body scale.
- **Yellow**: Minor localised adverse effect when balanced against mitigation included in the design – insufficient to affect status class for the quality element at water body scale.
- **Amber**: Adverse effect is possible when balanced against mitigation included in the design – the extent of effect is uncertain, and there remains a potential to affect status class for the quality element at water body scale. Additional mitigation and residual effects need to be considered.
- **Red**: Adverse effect of sufficient scale to impact on status class for the quality element at a water body scale (certain). Additional mitigation or re-design required to avoid non-compliance.

Any adverse effect rating (yellow, amber, or red) would qualify the relevant WER status element/receptor to be taken forward to the detailed assessment stage.

7.2 Impact assessment on the surface water bodies

For this preliminary assessment, the potential impacts upon the screened-in water bodies have been assessed using one framework combining quality elements for both transitional/coastal and river/canal water bodies. At the full WER assessment stage the transitional Bristol Avon water body will be assessed separately following the EA's Clearing the Waters for All guidance on assessing the impact of activities in estuarine and coastal waters.

The results of the preliminary (scoping) assessment are presented in Table 7-1.

Table 7-1: Preliminary (scoping) assessment of the potential impacts on surface water bodies

WER Quality Element at risk of impact		Activities						
		Construction: Noise and vibration from piling	Construction: Temporary land take	Construction: Pollution due to discharges	Construction: Scour	Operation: Permanent land take for new sheet piled walls	Overall impact	Further WER Assessment and Mitigation (to retain or promote good status)
Hydromorphological	Hydrological Regime: Quantity and dynamics of water flow	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No significant impact anticipated.	None required.
	Hydrological Regime: Connection to groundwater bodies	No measurable change anticipated.	No measurable change anticipated.	Possible minor impact from piling into groundwater at the foreshore locations in the water bodies, where there is the possibility of mobilising contaminated sediments or creating new pathways for pollution to reach groundwaters.	No measurable change anticipated.	New piled walls will have possible minor impacts in the connection of groundwater to surface water in the water bodies, but it is unlikely that there would be any significant impact at the water body scale. Overall, impacts are considered unlikely but cannot be ruled out at this stage as groundwater levels in the areas are not known.	Potential localised impacts anticipated in all water bodies but not considered significant at the water body scale.	To be considered further at full WER assessment stage. Further site investigation is proposed at the detailed design stage to make sure that the introduction of a sheet piled wall will not prevent groundwater flow towards the water bodies or increase risk of groundwater flooding from mounding of groundwater behind the wall. If risk is found to exist suitable mitigation must be incorporated into the design to prevent the build-up of groundwater behind the new piled structures.
	River Continuity: Migration of aquatic organisms	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
	River Continuity: Sediment transport	No measurable change anticipated.	There is potential for minor impacts due to changes in local hydraulics and substrate transport at the perimeter of the land take required for construction of river frontage pile walls in the water bodies, but unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	There is potential for scour local to works in the foreshore in the water bodies, but this is unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	No significant impact anticipated.	None required.
	Morphological conditions: River depth and width variation	No measurable change anticipated.	There is potential for minor impacts due to changes in local hydraulics and substrate transport at the perimeter of the land take required for construction of river frontage pile walls in the water bodies, but unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	No measurable change anticipated.	There is potential for minor impacts on channel width (and hydraulics) due to construction of river frontage pile walls in the water bodies, but unlikely to be significant at water body scale. It is expected that the scheme design will take into account site-specific bank characteristics and ensure that changes to those characteristics are minimal.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage.
	Morphological conditions: Estuarine depth and width variation	No measurable change anticipated.	There is potential for minor impacts due to changes in local hydraulics and substrate transport at the perimeter of the	No measurable change anticipated.	No measurable change anticipated.	There is potential for minor impacts on channel width (and hydraulics) due to construction of river frontage pile walls in the water bodies, but unlikely to be significant at water body scale.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body	To be considered further at full WER assessment stage.

WER Quality Element at risk of impact		Activities						
		Construction: Noise and vibration from piling	Construction: Temporary land take	Construction: Pollution due to discharges	Construction: Scour	Operation: Permanent land take for new sheet piled walls	Overall impact	Further WER Assessment and Mitigation (to retain or promote good status)
			land take required for construction of river frontage pile walls in the Bristol Avon water bodies, but unlikely to be significant at water body scale, and likely to recover naturally.			It is expected that the scheme design will take into account site-specific bank characteristics and ensure that changes to those characteristics are minimal.	scale but cannot be ruled out at this stage.	
	Morphological conditions: Structure and substrate of the river bed	No measurable change anticipated.	There is potential for minor impacts due to changes in local hydraulics and substrate transport at the perimeter of the land take required for construction of river frontage pile walls in the three water bodies, but unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	There is potential for scour local to works in the foreshore in the water bodies, but this is unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	No significant impact anticipated.	None required.
	Morphological conditions: Quantity, structure and substrate of the Estuary bed	No measurable change anticipated.	There is potential for minor impacts due to changes in local hydraulics and substrate transport at the perimeter of the land take required for construction of river frontage pile walls in the three water bodies, but unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	There is potential for scour local to works in the foreshore in the Bristol Avon water bodies, but this is unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	No significant impact anticipated.	None required.
	Morphological conditions: Structure of the riparian zone/intertidal zone	No measurable change anticipated.	There is potential for minor impacts due to changes in local hydraulics and substrate transport at the perimeter of the land take required for construction of river frontage pile walls in the three water bodies, but unlikely to be significant at water body scale, and likely to recover naturally.	No measurable change anticipated.	There is potential for scour local to works in the foreshore in the water bodies, but this is unlikely to be significant at water body scale, and likely to recover naturally.	New walls could have the potential for some minor detrimental impacts on the structure of the riparian zone/intertidal zone compared to existing conditions in the three water bodies. Where new walls are constructed, this could result in a loss of riparian/intertidal environment. This is unlikely to be significant at the water body scale but mitigation may be required to ensure no net loss in habitat.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage. The potential loss of riparian/intertidal environments will need to be quantified and, if required, mitigation included to ensure no net loss in priority ecological environments.
	Tidal Regime: Freshwater flow	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No significant impact anticipated.	None required.
	Tidal Regime: Wave exposure	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No significant impact anticipated.	None required.
Biological	Macroalgae and angiosperms	No measurable change anticipated.	There is the potential for minor temporary impacts in the three water bodies due to	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the	New walls in the water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be	To be considered further at full WER assessment stage.

WER Quality Element at risk of impact		Activities						
		Construction: Noise and vibration from piling	Construction: Temporary land take	Construction: Pollution due to discharges	Construction: Scour	Operation: Permanent land take for new sheet piled walls	Overall impact	Further WER Assessment and Mitigation (to retain or promote good status)
			loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.		ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	significant at the water body scale but cannot be ruled out at this stage.	
	Benthic invertebrate fauna: Composition	No measurable change anticipated.	There is the potential for minor temporary impacts in the three water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage.
	Benthic invertebrate fauna: Abundance	No measurable change anticipated.	There is the potential for minor temporary impacts in the three water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage.
	Fish fauna: Species composition and abundance	Possible temporary effects from piling in foreshore area. Mitigation will be needed depending on methodology and timing.	There is the potential for minor temporary impacts in the three water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage.
	Fish fauna: Presence of type-specific disturbance sensitive species	Possible temporary effects from piling in foreshore area. Mitigation will be needed depending on methodology and timing.	There is the potential for minor temporary impacts in the three water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage.
	Fish fauna: Age structure of fish communities	Possible temporary effects from piling in foreshore area. Mitigation will be needed depending on methodology and timing.	There is the potential for minor temporary impacts in the three water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage.

WER Quality Element at risk of impact		Activities					Overall impact	Further WER Assessment and Mitigation (to retain or promote good status)
		Construction: Noise and vibration from piling	Construction: Temporary land take	Construction: Pollution due to discharges	Construction: Scour	Operation: Permanent land take for new sheet piled walls		
Critical sensitive habitats and species	Priority habitats and species: Various species using mudflats	Possible temporary effects from piling in foreshore area. Mitigation will be needed depending on methodology and timing.	There is the potential for minor temporary impacts in the Bristol Avon water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the Bristol Avon water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts in the Bristol Avon water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage. The potential loss of intertidal environments will need to be quantified and, if required, mitigation included to ensure no net loss in priority ecological environments. Full WER assessment should reference the Habitats Risk Assessment (HRA) Appropriate Assessment that will specifically consider potential impacts on protected European Sites in the water bodies.
	Priority habitats and species: Intertidal mudflat	Possible temporary effects from piling in foreshore area. Mitigation will be needed depending on methodology and timing.	There is the potential for minor temporary impacts in the Bristol Avon water bodies due to loss of habitat during works on the foreshore and channel. This is unlikely to be significant at the water body scale.	No measurable change anticipated (impact mitigated through CEMP).	There is potential for scour local to works in the foreshore, affecting the ecological habitats in the water bodies, but this is unlikely to be significant at water body scale.	New walls in the Bristol Avon water bodies will result in some loss of habitat on the foreshore and channel. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts in the Bristol Avon water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage. The potential loss of intertidal environments will need to be quantified and, if required, mitigation included to ensure no net loss in priority ecological environments. Full WER assessment should reference the HRA Appropriate Assessment that will specifically consider potential impacts on protected European Sites in the water bodies.
Physico-chemical	Ammonia, Biochemical Oxygen Demand (BOD), Dissolved Oxygen, pH, Phosphate, Temperature	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated (impacts mitigated through CEMP and best practice for design, construction and operations). There is potential for the works to mobilise contaminated sediments and/or create new pathways for pollution to reach groundwaters. Impacts cannot be ruled out at this stage.	No measurable change anticipated (no structures in river channel).	Possible impact on surface water run-off (and therefore water quality) into the three water bodies. Impacts considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	Potential localised impacts anticipated in all water bodies. Overall impacts are considered unlikely to be significant at the water body scale but cannot be ruled out at this stage.	To be considered further at full WER assessment stage. Further site investigation is proposed at the detailed design stage to clarify the potential for contaminated land in the areas of proposed new piling.
Chemical	Pollution by all priority hazardous substances identified as being discharged into the water body							
	Pollution by other priority substances identified as being discharged in significant quantities into the water body							

7.3 Impact assessment on the groundwater bodies

7.3.1 Potential impacts on current status

The assessment has considered the key components of the Strategy that have the potential to impact upon the current status of the 'Bristol Triassic Water Body', 'Carboniferous Limestone (Bristol) Water Body', and 'Portishead Mercia Mudstone Water Body'.

Potential construction activities and risks include piling that may mobilise contaminated ground and/or create new pathways for pollution to reach groundwater. There is also a minor risk that piled foundations will modify shallow groundwater levels or flows. Further investigation will be required to quantify any impacts and determine mitigation requirements.

8. Opportunities for enhancement

There is an opportunity for the Strategy to contribute to the improvement in the WER status of the water bodies, to help achieve Good Ecological Potential (GEP). The types of measures that would deliver GEP have the potential to be enhanced such that they also deliver Biodiversity Net Gain (BNG). Given the nature of flood defences, there is greatest opportunity to enhance intertidal and riparian habitat adjacent to any new structures.

At present, the design is not sufficiently developed to investigate site specific opportunities. During the development of the Proposed Scheme's detailed design, consideration should be given to improving the riparian habitat by planting buffer strips to contribute to water quality improvements. There is also an opportunity to improve bankside habitat which can also contribute to erosion protection and reduce the input of sediment, improving water quality.

9. Conclusion

The screening stage identified six water bodies, four of which were scoped in given the potential to be affected by the Strategy, namely, the 'Bristol Floating Harbour', the 'Bristol Avon', the 'Trym', and the 'Brislington Bk' surface water bodies, all of which have an Overall 'Moderate' status, 'Moderate' Ecological status, and 'Does not require assessment' for Chemical status. All three groundwater bodies, namely, the 'Bristol Triassic', 'Carboniferous Limestone', and 'Portishead Mercia Mudstone' groundwater bodies were also screened into further assessment, the former two being of 'Good' Overall status, and the latter of 'Poor' Overall status.

Following the preliminary scoping stage, it is concluded that there is potential for minor localised adverse impacts on all surface water bodies that were screened into the assessment. The construction of defences via piling has the potential to negatively impact the ecological status of the water bodies as the work will involve a reduction of aquatic habitat as well as potentially having a negative effect on hydromorphology. Whilst individual defence scheme elements are assessed as having only minor, localised adverse effects on WER quality elements within a reach, the cumulative effect of multiple defence elements within a water body may cause deterioration.

For the three groundwater bodies, there is a risk that piling activities may impact upon groundwater quality, levels or flows. Further assessment is needed once more detailed design and ground investigation information is available.

The Preliminary WER Assessment therefore recommends that a full WER Assessment be undertaken to evaluate the total combined length and percentage of the water bodies affected to assess the overall significance of the impacts. It is intended that the full WER will be carried out as part of the optioneering to provide an evaluation which help will inform design.

The full WER Assessment should include detailed consideration of mitigation measures that will best address adverse impacts on the water body quality elements. It should also seek to suggest enhancement opportunities to improve the overall status of the water bodies where possible. To do this it should reference the programme of measures identified by the Environment Agency in the Severn RBMP and any specific actions identified for the improvement of each water body. It should ensure that there is no conflict between the amended Strategy and the Environment Agency's goals for the water bodies and that the amended Strategy is used as an opportunity to design in enhancements where possible.

This WER Assessment comprises 'living document'. Should further design information and mitigation become available as the project develops then this document can be updated. This may result in a detailed assessment not being required should further detail change the outcomes.

Appendix A: Background information – WER status determination and compliance assessment process

A.1 Determination of WER Status

A.1.1 Introduction

Surface water bodies and groundwater bodies are defined within WER legislation. There are three types of surface water body, as follows:

- Natural water bodies;
- Heavily modified water bodies (HMWBs); and,
- Artificial water bodies (AWBs).

The Overall Status of natural surface water bodies is determined on the basis of their Ecological Status and Chemical Status. The overall status of heavily modified and artificial water bodies is classified based on their ecological potential and chemical status. The overall status of groundwater bodies is determined on the basis of their Quantitative Status and Chemical Status.

Groundwater bodies are defined within WER legislation as Groundwater Management Units (GWMU) and Water Resource Management Units (WRMU) and their status is determined on the basis of quantitative and chemical sub-elements.

The means by which these determinations are made for both surface water and ground water bodies is described in this section.

A.1.2 Surface water bodies

A.1.2.1 Ecological status

Ecological Status is defined by the overall quality of the structure and functioning of aquatic ecosystems associated with surface waters, i.e. the condition of the watercourse. This is assigned on a scale of high, good, moderate, poor or bad, and on the basis of four classification elements or ‘tests’, as follows:

- Biological - this test is designed to assess the status indicated by a biological quality element such as fish, invertebrates, macrophytes or phytobenthos (diatoms). The biological quality elements can influence an overall water body status from bad through to high. It is also important to note that the presence of invasive species prevents a water body from achieving high status when all other elements attain high;
- Physicochemical - this test is designed to assess the status indicated by physicochemical quality elements such as dissolved oxygen, phosphorus and ammonia, against environmental standards. The physicochemical quality elements can only influence an overall water body status from moderate through to high;
- Specific pollutants - this test is designed to assess compliance with environmental standards for concentrations of specific pollutants, such as zinc, cypermethrin or arsenic. As with the physicochemical test, the specific pollutant assessment can only influence an overall water body status from moderate through to high; and,
- Hydromorphology - for natural surface water bodies this test is undertaken by the EA during classification when the biological and physicochemical tests indicate that a water body may be of high Overall Status. It specifically assesses hydromorphological quality elements such as water flow, sediment composition and movement, continuity, and structure of the habitat against reference or ‘largely undisturbed’ conditions. If the hydromorphological quality elements do not support high Ecological Status, then the status of the water body is limited to good Overall Status. Hydromorphological assessments are used to determine ‘high’ Overall Status only and are not be used to drive a water body status class below good. The ‘does not support good’ classification should be reported for the purposes of identifying water bodies which fail the flow test.

The worst-case classification is assigned as the overall surface water body status, in a 'one-out all-out' system. This system is summarised in Figure 9-1.

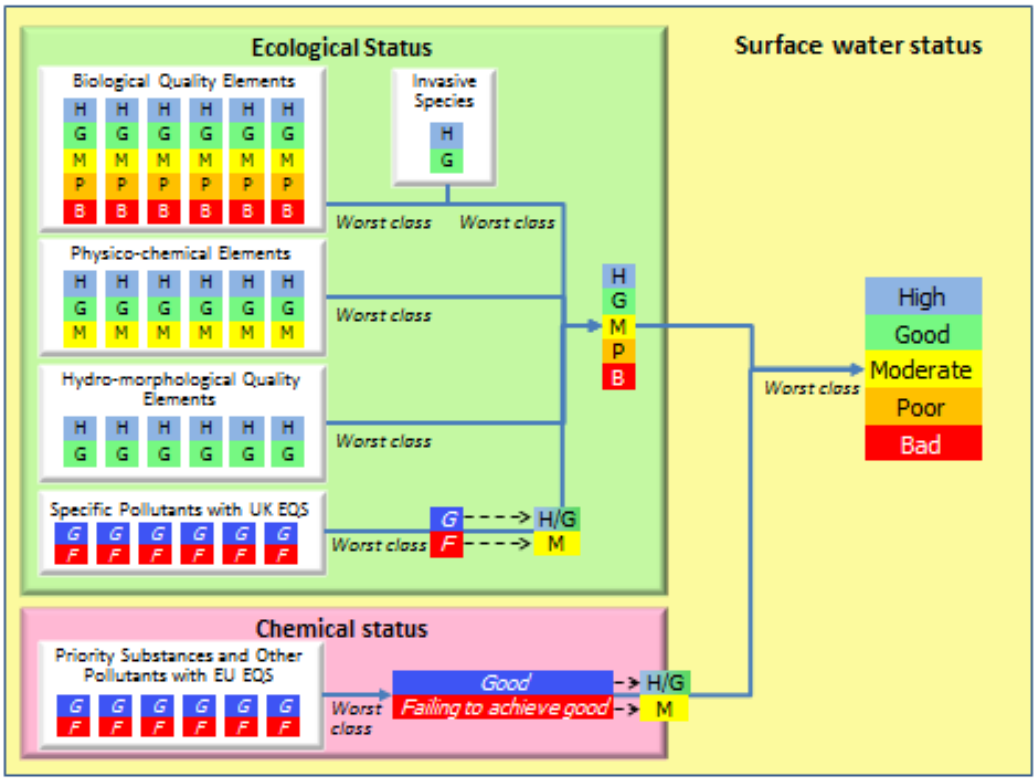

Figure 9-1: Ecological status classification process (Source: Environment Agency (2015).

A.1.2.2 Chemical status

Chemical Status is defined by compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances, in accordance with the Environmental Quality Standards Directive (2008/105/EC)[11]. This is assigned on a scale of good or fail.

Surface water bodies are only monitored for priority substances where there are known discharges of these pollutants; otherwise surface water bodies are reported as being of good Chemical Status.

A.1.2.3 Ecological potential for heavily modified (and artificial) water bodies

Ecological Potential is assigned to AWB (such as reservoirs and canals), or natural water bodies which, as a result of physical alterations by human activity, are substantially changed in character. The latter are termed HMWB. The term 'ecological potential' is used to classify AWBs and HMWBs as it may be impossible for these water bodies to achieve good Ecological Status (GES) because of their creation or modification for a specific use, such as navigation, water supply or flood protection. The Ecological Potential of an AWB or HMWB represents the degree to which the quality of the water body approaches the optimum condition it could achieve given its artificial or heavily modified state.

AWB and HMWB are subject to an additional set of rules that need to be implemented prior to running the one-out-all-out process. These rules determine which biological quality elements should be used in the water body Ecological Potential classification. Under normal circumstances, AWB and HMWB are classified

[11] Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008; *on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council*. Strasbourg, European Parliament and European Council

according to an assessment of mitigation measures, which defines good Ecological Potential (GEP) in water bodies where all applicable mitigation is in place, and moderate ecological potential in water bodies where some or all relevant mitigation is missing. However, to prevent AWB and HMWB being incorrectly classified as good potential in situations where all mitigation is in place, but other pressures are causing an impact (e.g. nutrient enrichment or pollution from toxic substances), the methodology adopted in the UK additionally considers biological indicators providing they are not sensitive to the heavily modified nature of the water body.

AWB and HMWB hydromorphological elements are assessed using a three-stage process, firstly looking at flow, then mitigation measures and biological quality elements.

Flow conditions are assessed initially on a fail or pass basis to determine which of the biological and physicochemical quality elements should be used in the classification of Ecological Potential.

Where the flow conditions are unaffected by the physical modification (flow conditions pass), the water body Ecological Potential is determined by the worst of either the mitigation measures assessment, or any element that is not sensitive to the modified nature of the water body.

Where the flow conditions are significantly impacted by the physical modification (flow conditions fail), the water body Ecological Potential is determined by the worst of any of the mitigation measures assessments or the assessment of biological quality elements, physicochemical quality elements or specific pollutants.

Where a water body is designated as artificial or heavily modified for water resources usage, either solely or jointly with other uses, the flow condition is assumed to be good (pass).

A.1.2.4 Groundwater bodies

Under the WER, groundwater body Overall Status is classified on the basis of Quantitative Status and Chemical Status. The groundwater bodies are separated into GWMU and WRMU. GWMU are sub-divisions of the groundwater to aid the resource assessment process. WRMU are sub-divisions according to the water resource availability and the management of water.

The worst-case classification dictates the Overall Status, via a ‘one-out all-out’ system. This system is summarised below in Figure 9-2.

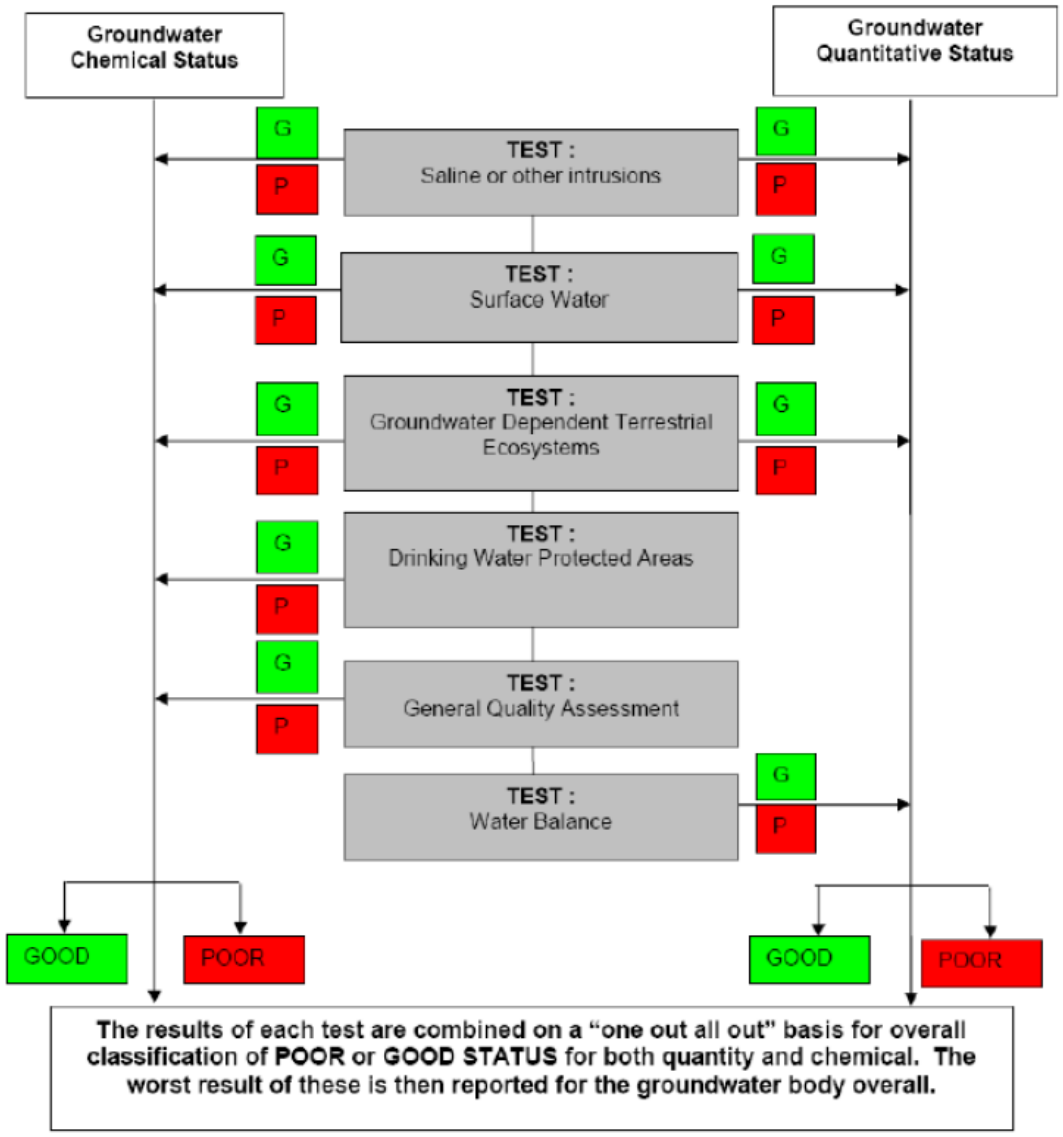

Figure 9-2: Groundwater body status classification (Source: UKTAG, 2012).

A.1.2.5 Quantitative status

Quantitative Status is defined by the quantity of groundwater available as base flow to watercourses and water-dependent ecosystems and as 'resource' available for use as drinking water and other consumptive purposes. It is assigned on a scale of good or poor, and on the basis of four classification elements or 'tests' as follows:

- Saline or other intrusions - this test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions;
- Surface water - this test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the Ecological Status of associated surface water bodies;
- Groundwater Dependent Terrestrial Ecosystems (GWDTE) - this test is designed to identify groundwater bodies where groundwater abstraction is leading to significant damage to associated GWDTE; and,
- Water balance - this test is designed to identify groundwater bodies where groundwater abstraction exceeds the 'available groundwater resource', defined as the rate of overall recharge to the groundwater

body itself less the rate of flow required to meet the ecological needs of associated surface water bodies and GWDTE.

A.1.2.5.1 Chemical status

Chemical Status is defined by the concentrations of a range of key pollutants, by the quality of groundwater feeding into watercourses and water-dependent ecosystems and by the quality of groundwater available for drinking water purposes. This is assigned on a scale of good or poor, and on the basis of five classifications elements or 'tests', as follows:

- Saline or other intrusions - this test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions;
- Surface water - this test is designed to identify groundwater bodies where groundwater is leading to a significant diminution of the Chemical Status of associated surface water bodies;
- GWDTE - this test is designed to identify groundwater bodies where groundwater is leading to significant damage to associated GWDTE;
- Drinking Water Protected Areas (DrWPA) - this test is designed to identify groundwater bodies failing to meet the DrWPA objectives defined in Article 7 of the WER or at risk of failing in the future. The aim is no deterioration in quality of waters for human consumption; and,
- General quality assessment - this test is designed to identify groundwater bodies where widespread deterioration in quality has, or will, compromise the strategic use of groundwater. The aim is no significant impairment of human use of groundwater and no significant environmental risk from pollutants across a groundwater body. Status is assessed primarily using data collected from the EA monitoring network; therefore, the scale of assessment means that groundwater status is mainly influenced by larger scale effects such as significant abstraction or widespread diffuse pollution.

A.1.2.6 Environmental standards

Under the WER, a range of environmental standards and condition limits are applied in order to help the classification of water body status and the setting of status objectives via the RBMP process. These environmental standards define the range of environmental conditions that support "healthy" aquatic life. For instance, standards are set for the composition of biological communities, the physicochemical water quality parameters, the concentration of pollutants, and the level of flows in rivers (as described above).

These standards[12] inform the EA on the implementation of the RBMP process, including the identification of measures required to support the achievement of the GES / GEP objectives, as well as underpinning efforts to protect the water environment by helping to regulate activities that could cause adverse impacts.

A.1.3 WER Assessment requirements for new developments

To ensure compliance with the WER, 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;
- Prevent future attainment of good status or potential where not already achieved;
- Impact on protected or priority species and habitats; and/or,
- Provide opportunities to improve the water environment.

[12] The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

A ruling by the European Union Court of Justice on 1 July 2015[13] has significant implications for projects that may impact water bodies, namely:

- Consent for development must not be granted by an authorising authority – unless a derogation is granted - where the project may cause a deterioration in the status of a body of surface water or where it jeopardises the attainment of good Ecological Status or of good Ecological Potential and good Chemical Status by the date laid down in the Directive;
- That deterioration of the status of the relevant body of surface water includes a fall by one class of any element of the quality elements within the meaning of Annex V of the WER even if the fall does not result in a fall of the classification of the body of surface water as a whole; and,
- If the quality element is already in the lowest class, any deterioration of that element represents deterioration of status within the meaning of Article 4(1)(a)(i).

A.1.4 Guidance

Whilst there is no established methodology for assessing compliance with WER legislation, the WER Compliance Assessment will be based upon expert judgement, established best practice and consultation with the EA and will be undertaken in accordance with relevant EA guidance[14] and the recent advisory guidance provided by The Planning Inspectorate[15].

[13] Case 461/13 Bund für – Umwelt Und Naturschutz Deutschland v Bundesrepublik Deutschland ('the Bund case') concerning the interpretation of Article 4(1)(a)(i) to (iii) of the Water Framework Directive 2000/60/EC (WFD)

[14] Environment Agency, (2010), *Assessing new modifications for compliance with WFD: detailed supplementary guidance.*

[15] The Planning Inspectorate (2017), *Advice note eighteen: The Water Framework Directive*.

Appendix B: WER Assessment Process

B.1 WER Assessment Process

B.1.1 Overview

WER Compliance Assessment is undertaken as an iterative, stepped process, which typically includes the following:

- Step 1: Baseline assessment (screening);
- Step 2: Preliminary assessment (scoping);
- Step 3: Detailed impact assessment (where required); and,
- Step 4: Application of Article 4.7 (where applicable).

These key process steps are described in further detail in the following sections. Consultation with regulatory authority should be undertaken to share the findings of each step, where necessary/applicable.

B.1.2 Baseline assessment (screening)

The key objective of the baseline (screening) assessment is to identify the relevant WER surface water and groundwater bodies (including any undesignated tributary watercourses) potentially affected by the Strategy and to establish their baseline condition.

The water body baseline condition of relevant water bodies has been identified via desk-top assessment, utilising readily available information and environmental, asset and operations data obtained from relevant stakeholders, including the EA, Natural England, and Yorkshire Water.

WER baseline datasets have been obtained from the EA's Catchment Data Explorer website[16]. This includes:

- RBMP Cycle 2 current status and status objectives data;
- WER Protected Areas data;
- Reasons for to achieving good status (RNAG) data; and,
- Measures data.

The 2015 and 2016 EA WER water body status data has been used to inform the assessment. These data are considered to provide the current best estimate of status and the formal baseline against which the EA will assess compliance with the 'no deterioration' objective. Where baseline data is limited, professional judgement has been used in the assessment and a precautionary approach taken with regard to screening.

The relevant WER water bodies present within the potential zone of influence of the Strategy are taken through to the subsequent preliminary assessment (scoping) stage.

B.1.3 Preliminary assessment (scoping)

The objective of the preliminary (scoping) assessment is to establish the relevant likely effects of the Strategy on the WER status elements of the relevant WER surface water and groundwater bodies. This includes identification of potential impact types and any relevant mitigation measures embedded within the design of Strategy at this stage.

The preliminary assessment considers both the beneficial and adverse effects of the relevant elements of the Strategy and applies a risk-based method in line with existing EA guidance.

[16] See: http://environment.data.gov.uk/catchment-planning/

Effects are considered with regard to the risk of the Strategy causing a deterioration in current status and/or a failure to achieve status objectives. The assessment identifies those scheme components / impacts that pose a risk current status or status objectives and thus may require more detailed impact assessment.

The preliminary assessment therefore comprises two parts, as follows:

- Likely effects on current status or potential, involving:

  identification of relevant scheme components with potential to impact upon water body status;
  identification of likely potential impact and magnitude of effects of the relevant scheme components on the current status of the water body (taking account of any 'embedded' mitigation; and,
  identification of potential risks of deterioration in current status and associated requirements for additional mitigation and/or further detailed assessment.

- Likely effects on status objectives, involving:

  scoping of the relevant scheme components to identify where the Strategy may pose a risk of worsening existing pressures responsible for current status failures (RNAGs) and/or prevent the implementation of measures identified by the EA to address existing status failures; and,
  scoping of relevant scheme components against any available EA HMWB/ AWB 'mitigation measure assessment' outputs, in order to identify where the Strategy may pose a potential risk of inhibiting the implementation of measures derived to mitigate the impacts of existing physical modifications and operational regimes to support the achievement of good Ecological Potential objectives.

B.1.4 Detailed impact assessment

Where deemed required, the objective of the detailed impact assessment is to establish the nature and anticipated magnitude of the effects of relevant elements of the Strategy on the WER quality elements of the surface water and groundwater bodies affected. These effects are considered in terms of the potential for deterioration of current status and/or the prevention of status objectives. This detailed assessment may be based on targeted baseline surveys, monitoring or modelling assessments completed at the impact sites.

As with the preliminary assessment stage, the detailed impact assessment is therefore comprised of two key parts, as follows:

- Assessment of effects on current status of quality element; and,
- Assessment of effects on status objectives, with regards to any water body RNAG or measures/actions identified as potentially being at risk from the Strategy under the preceding preliminary (scoping) assessment. This is done via expert judgement and consultation with the EA, based on the currently available information.

Where significant effects are identified with regard to the risk of status deterioration and/or the prevention of status objectives, the assessment should identify 'further mitigation' required in order to avoid and/or minimise risks and the residual effects on quality elements at the water body scale.

The detailed impact assessment will also identify if Article 4.7 tests need to be prepared for affected water bodies, where a residual risk to status deterioration and/or prevention of future status objectives has been identified.

A detailed impact assessment has not been deemed required for the Strategy, based on the information available at this stage.

B.1.5 Article 4.7 tests

Article 4.7 of the WER states that Member States will not be in breach of the Directive when failure to meet its environmental objectives is the result of either new modifications to the physical characteristics of a water body or as a result of new human sustainable development, on the proviso that the modifications or new development proposed are compliant with the four key conditions listed below. In doing so, Article 4.7 provides a means whereby a derogation for a proposed modification or sustainable development may be granted where it meets these four conditions.

1. All practicable steps have been taken to mitigate the adverse impact on the status of the water body;
2. The reasons for the modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development; and
3. The beneficial objectives served by the modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.
4. The reasons for the modifications or alterations are clearly identified to the EA, so that they can be specifically set out and explained in the relevant RBMP (as required under Article 13).

Article 4.7 tests are not deemed required for the Strategy, based on the information available at this stage.