Forth Road Bridge Five-Year Marine Licence

Habitats Regulations Appraisal

V2

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Forth Road Bridge Five-Year Marine Licence

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1 Introduction

1.1 Background

1.1.1 In August 2020, BEAR Scotland were awarded the Term Contract ('NMC') to maintain the South East Trunk Road Unit on behalf of Transport Scotland. This contract sees BEAR Scotland responsible for the management and maintenance of trunk road assets in the south east of Scotland, until at least 2028. Previously part of a separate contract, the A9000 Forth Road Bridge (FRB) and the Queensferry Crossing are now included within the South East Trunk Road Unit.

1.1.2 The FRB (Photograph 1) is a long span suspension bridge which carries the A9000 over the Firth of Forth approximately 15km west of Edinburgh. The structure supports a dual two-lane carriageway without hard shoulders or strips and has a separate footway/cycle track on either side. The FRB was opened in September 1964 and is a Category A listed structure. The bridge has a main span of 1006m and the side spans are each 408m long.

1.1.3 Under the Fourth Generation Maintenance Contract for the Forth Bridges Unit, Amey, on behalf of Transport Scotland, obtained a Marine Licence to cover all maintenance and improvement works on the FRB. This licence (Licence Number 05568/15/0) was obtained on the 22 October 2015 and was valid for a period of five years, expiring on 21 October 2020. As part of this licence application, Amey produced the following documentation: Marine Licence Application for Construction Projects, an Appropriate Assessment (AA) and a Construction Noise Management Plan (CNMP).

1.1.4 In order to provide and deliver the management and maintenance of the FRB, BEAR Scotland require a Marine Licence to remain in place over the NMC. This is vital to allow both the continuation of existing works contracts and to allow future maintenance and improvement projects to be progressed.

1.1.5 A short-term extension was granted to cover all works to be undertaken by BEAR Scotland between 22 October 2020 to 31 March 2021. A subsequent additional short-term extension between 31 March 2021 and 30 September 2021 was granted by Marine Scotland on 31 March 2021.

1.1.6 Jacobs UK Limited (hereafter 'Jacobs') have been commissioned by BEAR Scotland, on behalf of Transport Scotland, to identify ecological constraints and undertake a Habitats Regulations Appraisal (HRA). The HRA for the planned ongoing maintenance works is required in order to comply with legislation detailed in Section 1.2, and will be submitted in support of a five-year Marine Licence application. This Licence would be required to commence from 1 October 2021.

Photograph 1: View of the Forth Road Bridge from the north east looking towards South Queensferry, with the Queensferry Crossing visible in the background.

1.2 The Bern Convention, Habitats Directive, Habitats Regulations and European/Ramsar Sites

1.2.1 The Habitats Regulations (Conservation (Natural Habitats, &c.) Regulations 1994) translated the European Union Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive[1]) into UK legislation to protect sites that are internationally important for threatened habitats and species (European Sites), and to create a legal framework for species requiring strict protection.

1.2.2 The Habitats Regulations have been amended in Scotland, most recently in 2019 as a result of the UK leaving the EU (Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019). This latest amendment ensures that the requirements of the Habitats Directive and the Birds Directive (European Union Council Directive 2009/147/EC) continue to be relevant to the management of European sites, so that the sites are both protected and that they continue to operate as originally intended.

1.2.3 European Sites are Special Protection Areas (SPAs) (classified under the Birds Directive) and Special Areas of Conservation (SACs) (classified under the Habitats Directive) and form part of an international network of protected sites. Prior to leaving the EU Scotland's sites contributed to the Natura network and now form part of the Emerald Network[2], spanning Europe and into Africa.

1.2.4 This HRA is presented under the aegis of Regulation 48 of the Habitats Regulations, which transposes the requirements of Article 6(3) of the Habitats Directive.

1.2.5 The Habitats Regulations continue to require that an Appropriate Assessment (AA) be undertaken by a Competent Authority where any plan or project not directly connected with or necessary to the management of the European/Ramsar site (i.e. a SAC or SPA, or candidate or potential SAC/SPA, or a Ramsar site), is likely to have a significant effect either individually or in combination with other plans or projects. HRA refers to the process that provides the Competent Authority with the information to enable them to make an AA determination. The HRA provides data concerning site integrity, and the AA must be undertaken '*in view of the site's conservation objectives*'. With respect to this HRA, the Competent Authority will be Transport Scotland on

[1] The Habitats Directive was adopted in 1992 by the European Community (as was) as the Community's response to the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention).

[2] The Emerald Network was launched by the Council of Europe as part of its work under the Bern Convention.

behalf of Scottish Ministers, with their Statutory Nature Conservation Body (SNCB) for consultation being NatureScot[3].

1.2.6 Whilst not a European site designation, wetland sites designated under the Convention on Wetlands of International Importance, known as Ramsar sites, are also relevant as they are afforded the same level of protection as European sites under domestic policy and treated in the same way as the UK site network. Most Ramsar sites in Scotland are either designated SPAs or SACs although not always sharing the same qualifying interests (NatureScot, 2020a).

1.2.7 A programme of works has been provided by BEAR Scotland to inform this HRA, setting out the routine and non-routine works expected to be undertaken during the five year period (Appendix A). It details the expected activities, timing, duration/frequency, and equipment required. The AA undertaken within this HRA is based on this programme of works. As such, if the Operating Company or Contractor changes the programme of works (excluding changes to routine maintenance where the activities are generally covered within the routine maintenance section) the changes will have to undergo an HRA process to demonstrate there are no additional likely significant effects which could lead to adverse effect on site integrity of European/Ramsar sites from the changes, and that the conclusion of this HRA is still valid.

1.3 The HRA Process

1.3.1 The HRA process establishes whether the proposal:

- is directly connected with or necessary for site management for nature conservation;
- is likely to have a significant effect on the site; and
- will adversely affect the site's integrity.

1.3.2 If the assessment cannot ascertain that the proposal would not adversely affect site integrity and yet the Competent Authority still wish to consent the proposal, a consideration of alternative solutions is required. If no alternative solutions are available, a proposal may be carried out for Imperative Reasons of Overriding Public Interest as indicated by Article 49 of the Habitats Regulations. As stated in Article 53 of the Habitats Regulations, where this is the case '*the Secretary of State shall secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected*' (The Conservation (Natural Habitats, &c.) Regulations 1994).

1.3.3 The four stages of the HRA process are as follows:

- Stage One – Screening (should be undertaken in all cases).
- Stage Two – Appropriate Assessment.
- Stage Three – Alternative Solutions.
- Stage Four – Imperative Reasons of Overriding Public Importance (IROPI) and including, in certain circumstances, compensatory measures.

1.3.4 Diagram 1 (European Commission, 2001) provides a schematic representation of the HRA process. However, following the UK's exit from the EU, Articles 6(3) and 6(4) of the Habitats Directive are replaced by Articles 48 and 49 of the Habitats Regulations, and references to the Commission should be understood as the Scottish Ministers.

[3] Note that Scotland's nature agency, NatureScot, was known as Scottish Natural Heritage (SNH) prior to August 2020. Within this document, all references to the organisation in the text and documents cited are provided with the name appropriate to the time at which the document was published or communication received, however the organisations are one and the same.

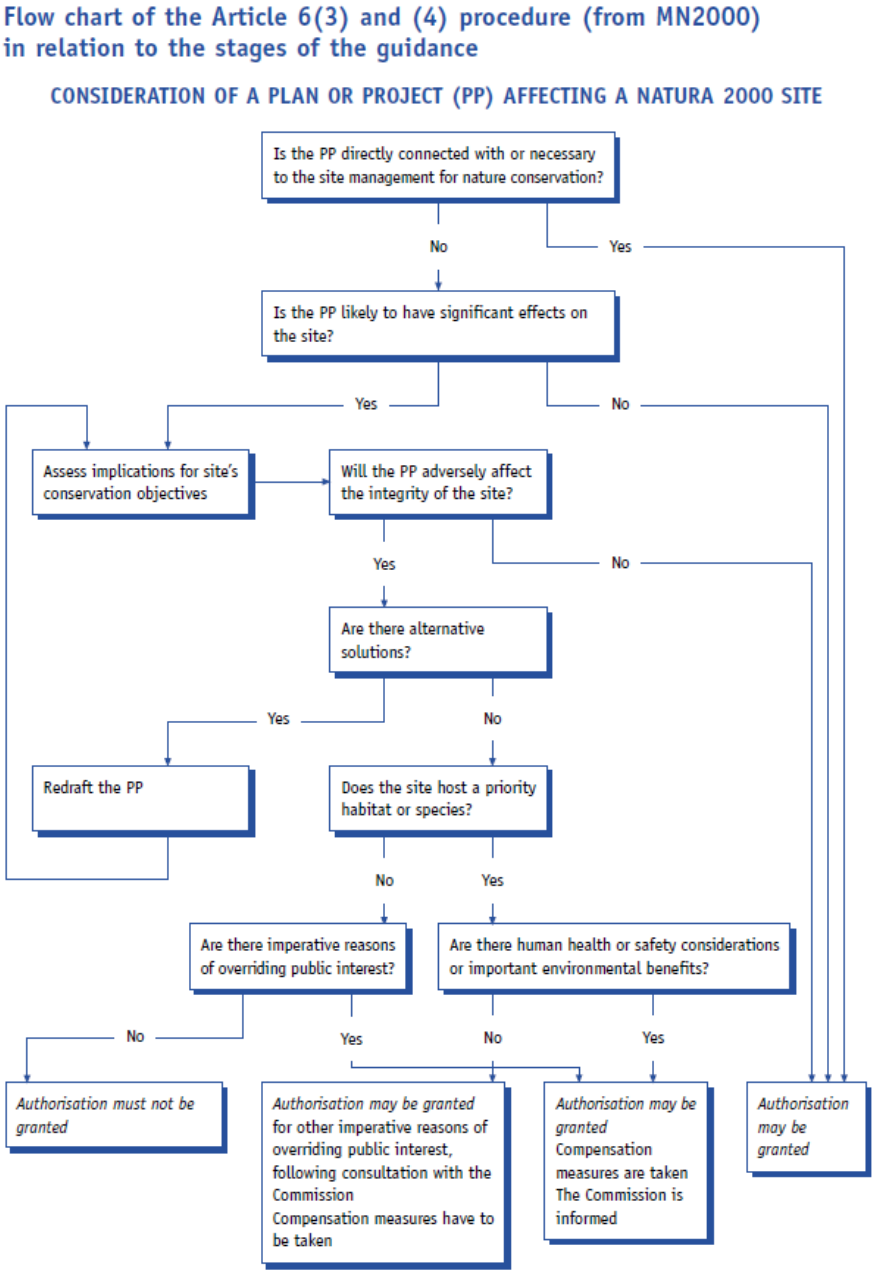

Diagram 1: The HRA process (European Commission, 2001).

1.3.5 It should be noted that not all stages may be necessary in the HRA process. If the screening stage determines that a plan or project is unlikely to have significant effects on a European/Ramsar site, subsequent stages are not required.

Stage One: Screening

1.3.6 Screening identifies the potential effects on a European/Ramsar site from a project or plan, either alone or in combination with other projects or plans, and considers whether these effects are likely to be significant.

1.3.7 The screening assessment is a test of the 'likelihood' of effects occurring rather than a 'certainty' of effects occurring. Following the UK's departure from the European Union, rulings from the European Court of Justice remain in force as though made by the Supreme Court (NatureScot, 2021k). On that basis, in accordance with the Waddenzee Judgement (European Court of Justice

case C-127/02), a likely significant effect is one that cannot be ruled out on the basis of objective information. This is underpinned by the precautionary principle which is enshrined in law in the Habitats Directive, and the test of something as being *"beyond reasonable scientific doubt"*, as presented in the Waddenzee Judgement. Paragraph 49 of the same judgement adds "*…where a plan or project… is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light inter alia of the characteristics and specific environmental conditions of the site concerned by such a plan or project"*. The Sweetman case (European Court of Justice C-258/11) reinforced and further refined the Waddenzee Judgement ruling that *'the question is simply whether the plan or project concerned is capable of having an effect. It is in that sense that the English 'likely to' should be understood.*'

1.3.8 The People Over Wind Judgement (European Court of Justice C-323/17) clarifies the stage in the HRA process when mitigation measures can be taken into account when assessing impacts on a European site. The ruling is that: "*…in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*."

Stage Two: Appropriate Assessment (AA)

1.3.9 If the Stage One Screening process determines that the project or plan (either solely or in combination) is associated with impacts which are likely to have a significant effect upon a European/Ramsar site, the HRA proceeds to Stage Two.

1.3.10 An AA considers the effect of the project or plan, either alone or in combination with other projects or plans, on the integrity of the European/Ramsar site, with respect to the site's structure and function, and its conservation objectives. Under the provisions of Article 48 of the Habitats Regulations the objective is to ascertain that the integrity of the site will not be adversely affected.

1.3.11 Site integrity is defined as "*the coherence of the site's ecological structure and function across its whole area, or the habitats, complex of habitats or populations of species for which the site is or will be classified"* (European Commission, 2000a). The decision as to whether a site is not adversely affected focuses on and is limited to the conservation objectives for the site (European Commission 2000a, 2018).

1.3.12 In carrying out an AA, mitigation measures, aimed at minimising or avoiding the negative effect of a plan or project during its operation or after its completion, may be considered as an integral part of the plan or project (European Commission 2000a, 2018). The Competent Authority has to be certain that the mitigation proposed would remove/avoid the negative effects of the plan or project. It must be clear, therefore, what the mitigation measures are, how they would reduce or avoid the effects, and the details of how and by whom they would be implemented/managed, and the timescale involved. In addition, the mitigation measures would require monitoring and enforcement, and procedures to rectify effects where measures have not been successful.

Stage Three: Alternative Solutions

1.3.13 Stage Three is when an adverse effect on site integrity (AESI) cannot be ruled out. It examines alternative ways of achieving the objectives of the project or plan, that may avoid an AESI on the European/Ramsar site. Guidance (European Commission, 2007) indicates that all alternatives have to be analysed. This could involve alternative locations or routes, different scales or designs of development, or alternative processes.

Stage Four: Imperative Reasons of Overriding Public Importance (IROPI)

1.3.14 Where no alternative solutions exist and where adverse effects remain, an assessment is undertaken of the IROPI to determine whether a project or plan should proceed. Where it is determined that there are IROPI it would be necessary to design, implement, manage and monitor compensation measures "*to offset the negative impact of a project and to provide compensation corresponding precisely to the negative effects*".

1.4 Guidance

1.4.1 In undertaking this HRA the following guidance was referred to:

- Assessing Connectivity with Special Protection Areas (SPAs) (SNH, 2016a);
- Habitats Regulations Appraisal (HRA) on the Firth of Forth: A Guide for developers and regulators (SNH, 2016b);
- Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (European Commission, 2000a);
- Communication from the Commission on the Precautionary Principle (European Commission, 2000b);
- Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission, 2001);
- Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones with particular attention port development and dredging (European Commission, 2011);
- Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (European Commission, 2018);
- Habitats Regulations Appraisal of Plans: Guidance for Plan-making Bodies in Scotland, Version 3.0 January 2015 (David Tyldesley and Associates, 2015);
- NatureScot Website: Habitats Regulations Appraisal (HRA) (NatureScot, 2020b); and
- Policy Note on The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 (Scottish Government, 2019).

1.5 Structure of this Report

1.5.1 This HRA fulfils the requirements of Article 48 of the Habitats Regulations and covers the first two stages of the HRA process: Stage One (Screening) and Stage Two (Appropriate Assessment). The other stages of the HRA process (Alternative Solutions or IROPI) are briefly described in Section 1.3 (The HRA Process). These stages are required under Article 49 of the Habitats Regulations where preliminary investigations reach negative conclusions and consent from the competent authority is still sought.

1.5.2 An assessment of the Scheme in combination with other plans and projects is provided in Section 5 (In-Combination Assessment).

1.5.3 Data which has been used to inform the assessment is presented in Appendix B (Baseline Data).

1.5.4 The following figures have been prepared to support this HRA, as follows:

- Figure 1 - Overview of European/Ramsar sites;
- Figure 2 - Location of Proposed Works and Adjacent European/Ramsar sites; and

- Figure 3 - British Trust for Ornithology Wetland Bird Survey Data Areas.

1.6 Consultation and Desk Study

1.6.1 Consultation was undertaken with NatureScot (formerly Scottish Natural Heritage (SNH)) and Marine Scotland in October 2020 regarding the application for a new Marine Licence. It was confirmed that an HRA is required for the new application.

1.6.2 This HRA is informed by data from the following sources:

- Wetland Bird Survey (WeBS) data provided by the British Trust for Ornithology (BTO). The data relates to two WeBS survey areas: Hound Point to South Queensferry and Forth Cult Ness for the survey years 2014/2015 to 2018/2019 (Figure 3);
- The Forth Islands Tern Warden's Season Reports (Knowles, 2017, 2018, 2019); and
- Long Craig Island tern count data from the RSPB's LIFE-funded Roseate Tern Recovery Project which ran from 2015 to 2020 (Appendix B).

1.6.3 In addition, existing relevant literature and data was reviewed to inform this assessment, including:

- Jacobs Arup (on behalf of Transport Scotland) (2009a). Forth Replacement Crossing Report to Inform and Appropriate Assessment for the Firth of Forth SPA;
- Jacobs Arup (on behalf of Transport Scotland) (2009b). Forth Replacement Crossing Report to Inform and Appropriate Assessment for the Forth Islands and Imperial Dock Lock, Leith SPAs; and
- Jacobs Arup (on behalf of Transport Scotland) (2018). Forth Replacement Crossing End of Project Report on Estuarine Bird Ecology: 2008 to 2017.

2 The Proposed Works

2.1 Existing Conditions

2.1.1 The Forth is the most substantial estuary on the east coast of Scotland (SNH, 2016b). It stretches approximately 55 miles from the floodplain around Stirling and Kincardine to the open sea. The adjacent land is characterised by a wide range of contrasting uses including areas of dense population, heavy industry, as well as rural and arable habitats. The Forth comprises a complex mosaic of habitats on a range of rocky, shingle, sand and mud substrates. The diversity of habitats present supports a correspondingly wide diversity of plant and animal species, notably including seabirds, marine mammals and fish species. The abundance of prey in the form of fish and invertebrates, and the diversity of opportunities for loafing, roosting and foraging habitats at low and high tide contribute to supporting internationally important populations of birds.

2.1.2 In December 2007 the Scottish Government confirmed a new bridge was to be built to the West of the existing FRB. This new bridge would replace the FRB as the main crossing point over the Firth of Forth. The new bridge was opened in August 2017 and named the Queensferry Crossing and is now the main crossing point for the majority of traffic.

2.1.3 Following completion of the Queensferry Crossing, the FRB now functions as a dedicated public transport corridor for buses, taxis, pedestrians and cyclists. As such it still requires ongoing maintenance works to keep it functional and safe.

2.1.4 The FRB passes directly over three European/Ramsar sites. The Firth of Forth SPA and the Firth of Forth Ramsar site cover very similar areas and are designated for internationally important overwintering populations, assemblages and passage migrant birds of wildfowl, wader and seabirds. The Forth Islands SPA covers a series of islands, one of which is Long Craig Island, and is designated for breeding bird populations. The FRB passes directly over Long Craig Island, which supports a breeding tern colony. Details of the sites considered within this HRA are provided in Section 3.2, Appendix C, and shown on Figures 1 and 2.

2.1.5 SNH's publication Habitats Regulations Appraisal (HRA) on the Firth of Forth: A Guide for developers and regulators (SNH, 2016b) reports Arctic and common tern species as typically arriving in the UK from mid-April onwards, with most birds back by early to mid-May. Roseate terns are reported as arriving between late April and early June, whilst Sandwich terns build in large numbers in July and August. Data from the Forth Islands Tern Warden's Season Reports (Knowles, 2017, 2018, 2019) indicates that terns on Long Craig Island start laying from late May. Most birds have left the area by the first week in September (SNH, 2016b); in 2020 it was confirmed by the ecological contractor that all common terns, juveniles and chicks had left Long Craig Island on 3 September, although it is expected that breeding would have concluded by the end of July. This HRA distinguishes between the tern breeding season because of the heightened sensitivity to disturbance during this period, and because of the importance of breeding in maintaining the population of the species. NatureScot have recently advised that the tern breeding season should be considered 1 May to 15 August, and that whilst some terns may be present in the Firth of Forth and at Long Craig Island before and after these dates, works should not affect the tern colony (NatureScot, 2021l).

2.2 Examples of Recent Disturbance Events

2.2.1 In July 2018 incidents resulting in disturbance to the breeding tern colony on Long Craig Island were recorded and reported to SNH (Amey, 2018). The colony was recorded as failing that year, with just five chicks fledging (Knowles, 2018). Following the reports of disturbance, works were temporarily ceased and SNH advised that further consultation would be required if any works likely to cause disturbance were to be carried out during the tern breeding season. In December

2019, Amey issued a further Appropriate Assessment, which then included details of additional mitigation implemented during the 2019 breeding season (Amey, 2019).

2.2.2 During August 2020, further incidents perceived as causing disturbance to terns on Long Craig Island occurred. One such incident saw part of the colony circling above the island in an unusual manner, apparently in response to two contractors working below the bridge above the island, who were using a loud power-tool intermittently (Knowles, 2021).

2.2.3 Also in August 2020, a metal cage was observed being lowered down from the bridge onto a submerged area of the island, where it was collected by boat. The adult terns dreaded and did not return to their chicks until 5-10 minutes after the boat left again (Knowles, 2021).

2.2.4 In both July 2018 and August 2020, an electric spanner/wrench tool used to tighten bolts on the bridge is reported as having caused disturbance to the terns from its loud banging noise (Knowles, 2021).

2.3 Programme of Works

2.3.1 A five year programme of works, including descriptions of the works is included in Appendix A. An overview of the Proposed Works is outlined in Table 1 below.

Table 1: Overview of 5 Year Programme of Works

Name of Works	Estimated Construction Period
Main Bridge Expansion Joint Replacement[4]	2021
Suspended Span Painting Contract	2021-2026
Suspended Span Strengthening Contract	2021-2026
Viaduct Span Painting Contract	2021-2026
Viaduct and North Approach Resurfacing	2021-2022
Suspended Span Resurfacing	2021-2022
Footpath Resurfacing	2021-2023
Suspended Span Under Deck Access (SSUDA)	2021-2026
Footpath Elastomeric Pads Replacement	2021-2026
Side Tower Lateral Thrust Bearing Strengthening	2022-2023
Main Tower Lateral Thrust Bearing Replacement	2022-2023
Side Tower Elastomeric Bearings Replacement	2022-2023
Main Cable Intrusive Investigation	2025/2026
Pedestrian Balustrade Strengthening	2022-2024
New Suspended Span Underdeck Access Gantry	2021-2022

2.3.1 In addition to the main planned works there will be ongoing routine maintenance activities throughout the full works period including:

- use of bridge access systems;

[4] Main Bridge Expansion Joint Replacement is expected to be completed by the start of the five-year licence, however due to weather or other delays, the possibility that the works may run on into October cannot be precluded. See also Section 4.4.19.

- hanger painting;
- weld repairs;
- bolt replacement;
- kingpost replacement (bottom lateral supports);
- pier defences painting;
- billet repair (half joint repairs);
- edge trimmer replacement/strengthening (viaduct and suspended spans);
- upper front staging installation (underdeck access staging);
- removal of lead based paint;
- maintenance painting;
- grit blasting;
- chemical removal of paint system;
- repair of cathodic protection systems; and
- replacement of structural health monitoring sensors.

2.3.2 Standard construction hours for the works will be Monday to Friday 08:00-17:00, however emergency works may be required to be undertaken outwith these hours.

2.3.3 There is limited requirement for night working however, overnight closures of the carriageway will be required for the surfacing works (see Table 1 and Appendix A) and may also be required for any emergency works. Weekend working may also be required for works packages that require carriageway closure, or as part of emergency works.

2.3.4 The AA undertaken is based on the above information and as such, if the Operating Company deviates from any of these, the changes have to be subject to an HRA process, including the AA to establish whether any change has any adverse effect on the site integrity of European/Ramsar sites and to demonstrate the conclusions of this HRA are still valid.

3 Stage One (Screening)

3.1 Introduction

3.1.1 This section details the Stage One Screening of the HRA process.

3.1.2 The Proposed Works are not directly connected with or essential for the management of any European or Ramsar site.

3.2 European Sites with Potential Effects from the Scheme

3.2.1 Guidance dictates that all European/Ramsar sites which have the potential to be affected by a plan or project should be considered as part of the HRA process. For the assessment of the Proposed Works, relevant European and Ramsar sites were identified by looking for ecological connectivity and potential source-receptor pathways. Seven sites were identified to be considered within the HRA screening assessment namely:

- Firth of Forth SPA (NatureScot Site Code 8499, EU Site Code UK9004411);
- Firth of Forth Ramsar (NatureScot Site Code 8424, EU Site Code UK13017);
- Forth Islands SPA (NatureScot Site Code 8500, EU Site Code UK9004171);
- Outer Firth of Forth and St Andrews Bay Complex SPA (NatureScot Site Code 10478, EU Site Code UK9020316);
- Imperial Dock Lock, Leith SPA (NatureScot Site Code 8668, EU Site Code UK9004451);
- Loch Leven SPA (NatureScot Site Code 8530; EU Site Code UK9004111);
- River Teith SPA (NatureScot Site Code 8367, EU Site Code UK0030263); and
- Isle of May SAC (NatureScot Site Code 8278, EU Site Code UK0030172).

3.2.2 The location of these sites relative to the FRB is shown in Figure 1. Other designated sites not relevant to this assessment are shown greyed out on Figure 1, for completeness. Site qualifying interests, conservation objectives and identified feature pressures, as identified by NatureScot's Sitelink tool are presented in Appendix C, along with the species scientific names. Common names are used within this HRA main text.

3.3 Screening

3.3.1 The Proposed Works could result in a variety of LSEs which could directly or indirectly affect European/Ramsar sites.

3.3.2 No activities that form part of the works programme, including routine maintenance activities, could result in loss of habitat to any designated site, since all works are confined to the bridge structure itself. As such, there are no likely significant effects for temporary or permanent habitat loss and so habitat loss is not considered further within this HRA.

3.3.3 The identification of LSEs on the European/Ramsar sites in terms of their conservation objectives from the Proposed Works considered:

- potential for effects pathways between the site and the Proposed Works;
- the ecological characteristics of the qualifying interests, taking into consideration the sites' conservation objectives; and
- potential for in-combination effects with other plans and projects (Section 5: In-combination Assessment).

3.3.4 Potential changes in water quality from pollution events (e.g. release of lead-based paint, paint removal chemicals, grit-blasting debris, accidental spillage and runoff) during works have the potential to have an indirect effect on the Firth of Forth. Deterioration of intertidal habitat could degrade the feeding resource for bird species, whilst for migratory fish species, increased siltation or a higher incidence of suspended solids could disrupt feeding behaviour, and increase of suspended solids or introduction of harmful chemicals could impact gill physiology and reduce oxygen uptake. However, best practice construction methods (CIRIA, 2015) will be implemented to protect the wider environment, including the use of appropriate pollution controls (i.e. Guidance for Pollution Prevention (GPPs)), such as a strict re-fuelling protocol and removal of all loose materials from the intertidal area. These measures are embedded in the construction methodology via the Construction Environmental Management Plan (CEMP) and are a legal obligation to be employed irrespective of the European designation of the site, and are not specifically required to avoid LSE.

3.3.5 Table 2 provides the screening of European/Ramsar sites, recognising LSE from the Proposed Works where they have been identified.

Table 2: Screening

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
Firth of Forth SPA (NatureScot, 2021b**)**				
To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; • distribution and extent of habitats supporting the species; • structure, function and supporting processes of habitats supporting the species; and • no significant disturbance of the species.	The FRB is located directly above the Firth of Forth SPA. As such, the maintenance works described in Section 2.2 and Appendix A being undertaken from the bridge structure over the five year period collectively have potential implications on the surrounding environment, including on qualifying interests of the SPA.	• bar-tailed godwit*, non-breeding • golden plover*, non-breeding • knot*, non-breeding • pink-footed goose*, non-breeding • red-throated diver*, non-breeding • redshank*, non-breeding • Sandwich tern, passage • shelduck*, non-breeding • Slavonian grebe*, non-breeding • turnstone, non-breeding Waterfowl assemblage (non-breeding): • common scoter • cormorant • curlew • dunlin • eider • goldeneye • great crested grebe • grey plover • lapwing	<u>Disturbance (noise, vibration, movement and lighting)</u> There is potential for disturbance to qualifying interests of the SPA which are found within the inner Forth during the Proposed Works from increased noise, vibration, human activity, vehicle and vessel movements, and temporary lighting. Disturbance could result in birds relocating from habitats used as high-tide roosts and feeding resources.	LSEs identified. Requirement to progress to AA (HRA Stage 2).

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
		• long-tailed duck • mallard • oystercatcher • red-breasted merganser • ringed plover • scaup • velvet scoter • wigeon		
Firth of Forth Ramsar (NatureScot, 2021a)				
The Ramsar Convention's mission is '*the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world*'. The site qualifies under Ramsar criterion 5 - *A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds* and Ramsar criterion 6 - *A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.*	The FRB is located directly above the Firth of Forth Ramsar. As such, the maintenance works described in Section 2.2 and Appendix A being undertaken from the bridge structure over the five year period collectively have potential implications on the surrounding environment, including on qualifying interests of the Ramsar.	• bar-tailed godwit, nonbreeding • goldeneye, non-breeding- • knot, non-breeding • pink-footed goose, non-breeding • redshank, non-breeding • Sandwich tern, passage • shelduck, non-breeding • Slavonian grebe, non-breeding • turnstone, non-breeding • waterfowl assemblage, non-breeding	<u>Disturbance (noise, vibration, movement and lighting)</u> There is potential for disturbance to qualifying interests of the Ramsar which are found within the inner Forth, during the Proposed Works from increased noise, vibration, human activity, vehicle and vessel movements, and temporary lighting. Disturbance could result in birds relocating from habitats used as high-tide roosts and feeding resources.	LSEs identified. Requirement to progress to AA (HRA Stage 2).
Forth Islands SPA (NatureScot, 2021c)				
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the	The FRB is directly above Long Craig Island which is part of	• Arctic tern, breeding • common tern, breeding	<u>Disturbance (noise, vibration, movement and lighting)</u> The nearest island of the SPA (Long Craig Island) is located directly below the FRB therefore there is potential for disturbance to qualifying interests of the SPA during the	LSEs identified.

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; • distribution and extent of habitats supporting the species; • structure, function and supporting processes of habitats supporting the species; and • no significant disturbance of the species.	the Forth Islands SPA. As such, the maintenance works described in Section 2.2 and Appendix A being undertaken from the bridge structure over the five year period collectively have potential implications on the surrounding environment, including on qualifying interests of the SPA.	• cormorant, breeding • gannet, breeding • guillemot, breeding • herring gull, breeding • kittiwake, breeding • lesser black-backed gull, breeding • puffin, breeding • razorbill, breeding • roseate tern, breeding • Sandwich tern, breeding • shag, breeding	Proposed Works from increased noise, vibration, human activity, vehicle and vessel movements, and temporary lighting, in particular in relation to terns nesting on Long Craig Island. There is also potential for tools or construction materials to be dropped onto the island from height. These disturbances could result in increased instances of lifting off nests or dreading, which is when the whole colony or a large part of takes silent flight, often followed by high levels of calling as the birds begin to settle (Jennings, 2012). These would potentially result in increased predation of chicks and/or eggs and associated energetic costs, and thus reduction in colony size.	Requirement to progress to AA (HRA Stage 2).
			<u>Direct Mortality</u> Although improbable, if items such as tools or other materials were to be dropped from works taking place directly above Long Craig Island on the bridge, direct mortality of adults or destruction of nests could occur.	Requirement to progress to AA (HRA Stage 2).
Outer Firth of Forth and St Andrews Bay Complex SPA (NatureScot 2021g)				
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution will be achieved through delivering the following objectives for each of the site's qualifying features:	The SPA is located approximately 2.5km to the east of the FRB. Qualifying bird species of the SPA may use the Firth of Forth in the vicinity of the bridge for foraging.	• common tern, breeding • red-throated diver, non-breeding • Slavonian grebe, non-breeding • black-headed gull, non-breeding • common gull, non-breeding • common scoter, non-breeding • eider, non-breeding • gannet, breeding • goldeneye, non-breeding • guillemot, breeding	<u>Disturbance (noise, vibration, movement and lighting)</u> Individuals of the qualifying species of the SPA could be disturbed should they forage in the open waters near the FRB, with potential effects on feeding rate and fitness. However, the Firth of Forth is the most substantial estuary on the east coast of Scotland (see Section 2.1) and, given the size of the Outer Firth of Forth and St Andrews Bay Complex SPA (272,068ha), and the extensive and diverse alternative habitat available to the qualifying species within the Forth Estuary that is comparable with that adjacent to the FRB but away from potential sources of disturbance, the Proposed Works are unlikely to cause significant disturbance or change the distribution of the species within the SPA.	No potential for LSE. AA (HRA Stage 2) is not required.

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term; b) To maintain the habitats and food resources of the qualifying features in favourable condition.		• herring gull, breeding • kittiwake, breeding • long-tailed duck, non-, breeding • puffin, breeding • razorbill , non-breeding • red-breasted merganser, non-breeding • shag, breeding • velvet scoter, non-breeding • Arctic tern, breeding • little gull, non-breeding • Manx shearwater, breeding		
Imperial Dock Lock, Leith SPA (NatureScot, 2021d)				
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; • distribution and extent of habitats supporting the species; • structure, function and supporting processes of habitats supporting the species; and	The SPA is located approximately 14.5km in a straight line, and 15.4km following the hydrological connection, east and downstream of the FRB. Qualifying bird species of the SPA (common tern) may use the Firth of Forth in the vicinity of the works for foraging.	• common tern, breeding	<u>Disturbance (Noise, vibration, movement and lighting)</u> The SPA is designated for supporting the largest nesting colony of common tern in the Forth. The man-made structure utilised by common tern within the Imperial Dock Lock, Leith, is 14.5km from the Proposed Works. The qualifying species will therefore not be disturbed as a result of the Proposed Works whilst breeding on the structure. Individuals from the tern breeding colony at Imperial Dock Lock, Leith, may be disturbed should they forage in the open waters near the FRB with potential knock on effects on fitness and thus breeding success. However, the Firth of Forth is the most substantial estuary on the east coast of Scotland and, due to the wide availability and diversity of alternative foraging habitats in the Forth Estuary away from disturbances (see Section 2.1), no potential for LSE during the works with regards to disturbance is identified.	No potential for LSE. AA (HRA Stage 2) is not required.

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
• no significant disturbance of the species.				
Loch Leven SPA (NatureScot, 2021f)				
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; • distribution and extent of habitats supporting the species; • structure, function and supporting processes of habitats supporting the species; and • no significant disturbance of the species.	The SPA is located approximately 24km north of the FRB. Cormorant from Loch Leven are known to travel to the Firth of Forth (Wright, 2003). The River Leven flows from Loch Leven to the Firth of Forth, downstream of the FRB, at Leven.	• whooper swan, non-breeding • pink-footed goose, non-breeding • cormorant, non-breeding • gadwall, non-breeding • goldeneye, non-breeding • pochard, non-breeding • shoveler, non-breeding • teal, non-breeding • tufted duck, non-breeding Waterfowl assemblage, non-breeding	<u>Disturbance (Noise, vibration, movement and lighting)</u> The SPA is designated for supporting important numbers of wintering birds. None of the qualifying species will be disturbed as a result of the Proposed Works whilst wintering on Loch Leven. Whilst cormorant may visit the Firth of Forth from Loch Leven, based on the number of birds (SPA population 391 as at March 2000) and the size of the extensive Firth of Forth estuary, the potential for them to be present within the vicinity of the FRB is considered negligible.	No potential for LSE. AA (HRA Stage 2) is not required.
River Teith SAC (NatureScot, 2021h)				
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and	The SAC is located approximately 35.8km in a straight line, and 49.3km following the hydrological connection, upstream of the FRB. Qualifying species of the SAC will migrate through the Firth of Forth.	• Atlantic salmon • brook lamprey • river lamprey • sea lamprey	<u>Disturbance (Noise, vibration, movement and lighting)</u> The FRB is located approximately 35.8km in a straight line, and 49.3km following the hydrological connection, downstream of the SAC, however lamprey species and Atlantic salmon will migrate through the Firth of Forth. The Firth of Forth is a wide estuary and the Proposed Works and, aside from a small number of barge movements associated with the New Suspended Span Underdeck Access Gantry and Repair of Cathodic Protection Systems works packages, all works are localised to the bridge itself. At all times, a sufficient migratory corridor would therefore be maintained during works, and no potential for LSE during the works with regards to disturbance is identified.	No potential for LSE. AA (HRA Stage 2) is not required.

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
To ensure for the qualifying species that the following are maintained in the long term: • population of the species, including range of genetic types for salmon, as a viable component of the site; • distribution of the species within site; • distribution and extent of habitats supporting the species; • structure, function and supporting processes of habitats supporting the species; and • no significant disturbance of the species.				
Isle of May SAC (NatureScot, 2021e)				
To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitat that the following are maintained in the long term: • extent of the habitat on site; • distribution of the habitat within site; • structure and function of the habitat;	The SAC is located approximately 55km downstream of the FRB.	• reefs grey seal	<u>Disturbance (Noise, vibration, movement and lighting)</u> The SAC is designated for grey seal and reef habitats and is located approximately 55km from the Proposed Works. Due to the distance and wide availability of alternative habitat, grey seal will not be disturbed as a result of the Proposed Works whilst breeding in or near the SAC. Grey seal could potentially be disturbed if they were to forage or otherwise pass near to the bridge. However, seals are principally sensitive to disturbance at haul out sites. No designated haul out sites or pupping sites are located near the Proposed Works area, with the closest designated sites 8km and 16km east respectively. The closest records of summer counts made by the Sea Mammal Research Unit between 2011 and 2015 were 5km east (Marine Scotland, 2021). Whilst individual seals occasionally haul out at Port Edgar and North Queensferry, grey seals generally favour more exposed coasts and islands closest to the open sea (NatureScot, 2021i), where is most abundant, and disturbance from vessels that pass through the estuary is lower. There are extensive areas suitable for hauling out both locally to the FRB and within the extensive wider Firth of Forth. There is no potential for effects on reefs. Therefore, no potential for LSE during the works with regards to disturbance of grey seal or reefs is identified.	No potential for LSE. AA (HRA Stage 2) is not required.

Conservation Objectives	Connectivity to the Proposed Works	Qualifying Interests	Likely Significant Effects	Screening Conclusion
• processes supporting the habitat; • distribution of typical species of the habitat; • viability of typical species as components of the habitat; and • no significant disturbance of typical species of the habitat. To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: • population of the species as a viable component of the site • distribution of the species within site • distribution and extent of habitats supporting the species; and • structure, function and supporting processes of habitats supporting the species; no significant disturbance of the species.				

*species also an assemblage qualifier.

3.4 Screening Conclusion

3.4.1 The Proposed Works have the potential for LSEs on Firth of Forth SPA and Ramsar sites, and Forth Islands SPA as identified from the screening in Table 2 and therefore an Appropriate Assessment (HRA Stage Two) is required for these sites.

3.4.2 No LSEs were identified on the Outer Firth of Forth and St Andrews Bay Complex SPA, Imperial Dock Lock, Leith SPA, Loch Leven SPA, River Teith SAC and Isle of May SAC and therefore there is no requirement for further assessment for these designated sites, including any assessment of in-combination effects with other plans and projects.

4 Stage Two (Appropriate Assessment)

4.1 Introduction

4.1.1 This section forms the Stage Two (Appropriate Assessment (AA)) of the HRA process which was identified as required in Stage One (Screening). The AA considers the effect of the project or plan, either alone or in combination with other projects or plans, on the integrity of the European/Ramsar sites, with respect to the sites' structure and function, and their conservation objectives.

4.1.2 This HRA examines the implications from the Proposed Works for the conservation objectives of three sites based on the LSE identified in Stage One (Screening) and where applicable details the measures required to protect the conservation objectives and integrity of these sites.

4.1.3 Information on the distribution and abundance of bird species within the Firth of Forth was compiled through the sources identified in Section 1.6 above. Note that data collected by Jacobs as part of the Forth Replacement Crossing (FRC) project between 2007 and 2009 have been used to supplement the available WeBS data where appropriate. The dataset is considered to remain relevant due to the fact that the habitats in the vicinity of the bridges are largely unchanged. Absolute numbers have, however, generally been omitted, in recognition of the time elapsed and national trends in bird populations due to global factors such a climate change.

4.1.4 It should be noted that within the WeBS methodology, counting of gulls and terns is optional. Within the Forth Cult Ness survey area the species cover was noted as 'good' for all visits relating to these species. Within the Hound Point to South Queensferry survey area, a mix of 'good' and 'poor' species cover was recorded for each of the gull and tern species. As such it is noted that the WeBS data may not be a true reflection of the abundance of these species. With the use of supplementary data from FRC and the tern roost counts from Long Craig Island however, it is considered that a robust assessment can be made.

4.2 General mitigation

4.2.1 This section sets out mitigation that is required to safeguard the environment including ecological receptors.

4.2.2 Prior to the works commencing, the Contractor will develop a Construction Environmental Management Plan (CEMP) including a Construction Noise Management Plan (CNMP), which will detail the mitigation to be implemented and how this will be monitored. The CEMP will be developed in consultation with relevant stakeholders including NatureScot.

4.2.3 Plant and personnel will be constrained to the minimum required working area. This will comprise only the bridge structure itself, with only two exceptions, for which barge/boats are required, namely the New Suspended Span Underdeck Access Gantry activity and the Repair of Cathodic Protection Systems activity. Further mitigation relating to these works packages are detailed below. In addition, a safety boat is required to be available whenever activities requiring work outside of the carriageway and walkways are programmed. During such periods, the safety boat anchors in the water with a view of the works area and remains there for the standby period unless an emergency call is made. The boat does not patrol, and is moored at Port Edgar Marina when not in use.

4.2.4 A lighting plan and method statement will be required to be developed by the Contractor. The plan will detail specific mitigation requirements, including but not limited to measures to avoid light spill/reflections and avoidance of white-blue spectrum and high UV emitting lighting during the hours of darkness, to protect qualifying interests of the SPA and Ramsar sites. The

lighting plan will take into account published guidance on lighting (e.g. Institution of Lighting Professionals (2011), The Royal Commission on Environmental Pollution (2009) and Bat Conservation Trust and Institution of Lighting Professionals (2018)). The lighting design will be developed specifically to prevent illuminating sensitive bird habitats below and adjacent to the works areas, including during the hours of darkness or during night works. Where this is not possible the Contractor will agree any exceptions with the Ecological Clerk of Works (ECoW) during the tern breeding season, or an environmental representative of BEAR Scotland outwith the tern breeding season.

4.2.5 Standard working hours will be 08:00-17:00 (Monday to Friday), with occasional weekend working. Due to limited daylight length, some working during the hours of darkness will likely be unavoidable during winter, and there is a requirement for night working associated with some overnight closures of the carriageway for surfacing works. The lighting will need to avoid illuminating sensitive bird habitats below and adjacent to the works areas. Lighting management will be detailed within a lighting plan, as discussed above.

4.2.6 Standard work practices implemented to minimise environmental effects which are relevant to bird qualifying interests will include the use of tool tethers when working from suspended areas.

4.2.7 Wherever feasible and relevant to do so (due to potential pollution, dropping of tools, or other disturbance), appropriate mitigation measures will be employed to: provide a degree of visual screening; to contain the works and prevent any materials or tools dropped from falling onto areas below the bridge; and to contain waste arisings such as dust and paint flakes. Appropriate mitigation will be developed on a scheme-by-scheme basis following environmental screening, and may include (but not be limited to) measures such as: full encapsulation of the works area, use of tool tethers, installation of boarding, netting, and sheeting, etc.

4.3 Firth of Forth SPA and Ramsar Site

4.3.1 Conservation objectives of the Firth of Forth SPA are detailed in Table 2 above. Ramsar sites do not have specific conservation objectives however the aim of the Ramsar designation is to facilitate conservation of wetland habitat and populations of wildlife supported. Further, *"…it is Scottish Government policy to apply the same level of protection for Ramsar sites as is applied for Special Protection Areas classified under the EU Birds Directive"* and therefore the same objectives for SACs and SPAs are applicable (SNH, 2018a). The Firth of Forth SPA and Ramsar site occupy the same area and share considerable overlap in the species listed as qualifying species, with all specified qualifying interests of the Ramsar also being qualifying interests of the SPA. The conservation objectives for the SPA include avoiding significant disturbance to the qualifying interests and are considered to be an appropriate proxy for the Ramsar. As such, the assessment of the effects will be against the Firth of Forth SPA's conservation objectives. It is considered, based on the above similarities between the two sites, that the assessment can be undertaken parallel and captured within the same commentary text in Tables 4 to 6.

Likely Significant Effect: Disturbance

4.3.2 The only LSE identified at Stage One (Screening) that might compromise the conservation objectives of the Firth of Forth SPA and Ramsar site and cause an AESI is disturbance (noise, vibration, movement and visual).

4.3.3 Noise (including vibration), visual (including lighting, human activity) and movement (vehicles/vessels, presence on Long Craig Island, and items being dropped from above) disturbance from routine and non-routine maintenance works has the potential to disturb qualifying bird species of the SPA and Ramsar sites. This could lead to displacement of birds from areas used for foraging, loafing and roosting, and subsequently additional energy

expenditure and loss of condition. Disturbance could also result in the requirement for compensatory feeding at night, and increased associated energetic costs.

4.3.4 Noisy activities associated with the Proposed Works are expected to include grinding, welding, grit-blasting, use of impact wrenches/guns, pneumatic concrete breaking and, to a lesser extent, high pressure water jets. Noisy activities are typically defined as any construction activity that would result in an increase of ≥3dB(A) in the ambient noise level (dBLAeq) at sensitive receptors. Vibratory works are expected to include use of pneumatic concrete breakers and vibratory rollers (Appendix A).

4.3.5 For wetland birds, generally auditory disturbance of more than 70dB (as experienced by the bird) has the potential to elicit a high level disturbance effect (Cutts, Hemmingway and Spencer, 2013). However, variation in species' tolerance, the nature of the disturbance (for example sudden/gradual, intermittent/continuous) and the level of background noise can determine the behavioural response of birds to noise disturbance. Noise from some activities that are required as part of the Proposed Works are expected to be greater than 70dB at source, however, attenuation can be achieved over a relatively short distance (Diagram 2). It is therefore likely that any potential for significant disturbance from noise will be limited to birds within close proximity of the works area, with the distance at which this occurs varying by species (Cutts *et al.*, 2013).

4.3.6 Visual stimuli associated with the Proposed Works include human activity, lighting, and movements of vehicles and vessels. Visual stimuli can elicit a high-level disturbance response from wetland birds before noise starts, however, as with noise disturbances, there is interspecies variation. Roost sites can be particularly susceptible to visual disturbance as a flight response from one individual can cause all birds to be flushed from the area despite some species having a higher tolerance threshold (Cutts *et al.*, 2013). It should be noted that noise and visual stimuli are likely to be concurrent during the works.

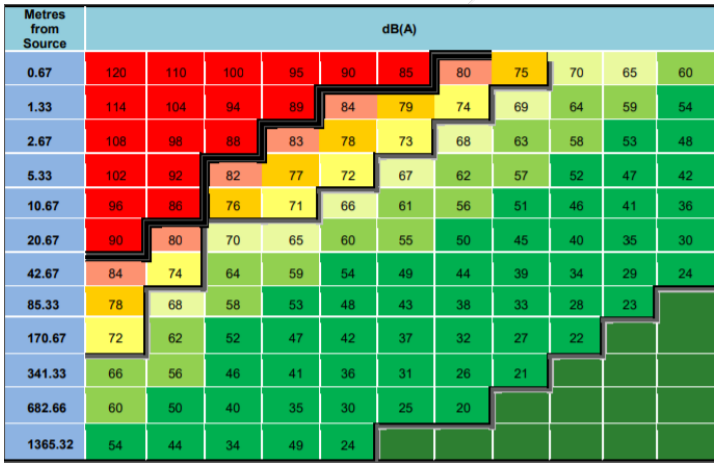

Diagram 2: Standard Distance Decay Rates for Noise from Source (Cutts et al., 2013)

4.3.7 A Zone of Influence (ZOI) of 300m from the edge of the bridge has been identified as appropriate for the assessment of implications of disturbance from the Proposed Works by reviewing studies on disturbance distance/response thresholds for each qualifying species of the Firth of Forth SPA and Ramsar site (Cutts *et al.*, 2013) (Table 3). The ZOI (for noise and visual disturbances) demarcates the area within which birds could be disturbed/displaced. The bridge is elevated above the Firth of Forth (approximately 50m to road level and approximately 44m to the underside of the walkway) however to facilitate this assessment the ZOI is considered in plan view. The distance to birds on the surface of the water would be slightly greater and as such this represents a precautionary assessment.

Table 3: Disturbance distance/response threshold for qualifying interests of the Firth of Forth SPA and Ramsar Site

Species	Disturbance distance/ response threshold	Description	References
Bar-tailed godwit	150-200m	Moderate sensitivity. Bar-tailed godwit is likely to be absent in highly disturbed areas and those that are present are likely to be highly stressed. Birds are particularly sensitive to disturbance at roost sites.	Laursen *et al.*, 2005 Cutts *et al.*, 2009 Cutts *et al.*, 2013
Common scoter	Large flocks recorded flushing from 300m	Highly sensitive. Very limited information available. Information which is available is mostly from offshore wind farm studies from research vessels.	Kaiser *et al.*, 2006 Goodship and Furness, 2019
Cormorant	100-200m	Cormorant tolerate high levels of human activity and the presence of artificial structures, so are less vulnerable to disturbance (i.e. noise, visual).	McKay *et al.*, 1999 Bregnballe *et al.*, 2009 Antill *et al.*, 2016 Dierschke *et al.*, 2016 Goodship and Furness, 2019
Curlew	300m	Moderate sensitivity. Curlew is a wary species that does not habituate to works rapidly and is also particularly intolerant of people, allowing approach to a range of 120-300m before flushing when confronted with a lone walker on a mudflat. More tolerant of vehicle movements.	Smit and Visser, 1993 IECS, 2007 Cutts *et al.*, 2009 Cutts *et al.*, 2013
Dunlin	75-300m	Low sensitivity. Dunlin is a relatively tolerant species in comparison to other wader species that habituate to various works. They are also relatively tolerant of people, allowing approach as close as 50-90m before flushing when confronted with a lone walker on a mudflat. Despite this dunlin can be displaced from up to a 300m range by regular high-level stimuli (e.g. on-going piling along the foreshore) with a gradual return to the area close to the disturbance.	Smit and Visser, 1993 Laursen *et al.*, 2005 IECS, 2007 Cutts *et al.*, 2009 Cutts *et al.*, 2013
Eider	200m	Medium sensitivity. Lack of research available.	Jarrett *et al.*, 2018
Goldeneye	200-300m	Goldeneye has shown a tolerance to passing fishing boats. However, can be disturbed by hand-harvesting seaweed at a distance of 200m. Lack of studies available.	Antill *et al.*, 2016 Goodship and Furness, 2019
Golden plover	100-300m	Moderate sensitivity. Little research however noted to exhibit more tolerance to moderate level visual disturbance than other waders.	Smit and Visser, 1993 Laursen et al., 2005 IECS, 2007 Cutts et al., 2013
Great crested grebe	150-300m	Medium sensitivity. Lack of studies available. Have been recorded roosting within 50m of passing vessels however less tolerant of disturbances from seaweed harvesting.	Cooke, 1987 Antill *et al.*, 2016 Goodship and Furness, 2019
Grey plover	250-300m	Moderate sensitivity. Considered relatively tolerant of disturbances. Lack of studies available.	Laursen *et al.*, 2005 Cutts *et al.*, 2013
Knot	100-260m	Low sensitivity. Relatively tolerant to visual disturbances. Birds occasionally flushed or show disturbed behaviour to larger vehicular movements which encompass a number of differing stimuli.	Brown and Grice, 2005 Cutts *et al.*, 2013
Lapwing	100-300m	Moderate sensitivity and similar to golden plover. Lack of research available.	Laursen *et al.*, 2005 IECS, 2007 Cutts *et al.*, 2013
Long-tailed duck	293m	Long-tailed duck is assessed to have a low sensitivity to human disturbance whilst hand-harvesting seaweed. A	Goodship and Furness, 2019

Species	Disturbance distance/ response threshold	Description	References
		maximum flight initiation distance value of 293m has been recorded for long-tailed duck when disturbed by commercial ferries during the non-breeding season.	
Mallard	200m	Moderate sensitivity. Noted to be relatively tolerant of moderate and high-level visual disturbance and will habituate rapidly to activity.	Laursen *et al*., 2005 IECS, 2007 Cutts *et al*, 2013
Oystercatcher	100-200m	Moderate sensitivity. Relatively tolerant and will habituate to activity.	Smit and Visser, 1993 Laursen *et al*., 2005 Cutts *et al*., 2013
Red-breasted merganser	50-300m	Limited research. High degree of sensitivity to marine traffic.	Liley *et al*., 2011 Antill *et al*., 2016 Gittings and O'Donoghue, 2016 Goodship and Furness, 2019
Red-throated diver	200-300m	Highly sensitive to shore activities and disturbances from boats. Noted to take flight in the 200-300m distance band from a passing ferry. Lack of studies available.	Goodship and Furness, 2019
Redshank	115-300m	Low sensitivity. Although highly sensitive to noise stimuli redshank are relatively tolerant to visual disturbances. May be displaced by workers at mudflat level and where facilitation occurs (i.e. when multiple stimuli occur at the same time).	Smit and Visser, 1993 Laursen *et al*., 2005 IECS, 2007 Cutts *et al*., 2009 Cutts *et al*., 2013
Ringed plover	50-300m	Low sensitivity. Lack of information available however thought to be an extremely tolerant species that habituates to anthropogenic activities rapidly. At distances of over 100m from activity, birds rarely showed any sign of disturbance and appeared often unperturbed when other species in their vicinity were reacting. Noted to have similar response as dunlin.	Laursen *et al*., 2005 IECS, 2007 Cutts *et al*., 2013
Sandwich tern	50m from colony edge	High sensitivity to human disturbance at breeding colonies. Lack of research available.	Goodship and Furness, 2019
Scaup	250m	Highly sensitive to human disturbances particularly marine traffic. Lack of studies available.	Borgmann, 2011 Goodship and Furness, 2019
Shelduck	200-300m	High sensitivity. Wary species, highly sensitive to visual disturbances during construction activities. Noted to have a moderate to low response level to disturbance during wintering months and shows signs of habituation. 145-250m recorded as the mean flight distance in response to disturbance from walkers. Minimum distance from the work without disturbance would appear to be between 200m and 300m. Birds will feed within 300-500m from works. One study (Laursen *et al*., 2005) had a 95% confidence interval of disturbance between 206-246m.	Smit and Visser, 1993 IECS, 2007 Liley *et al*., 2010 Liley *et al*., 2011 Laursen *et al*., 2005 Cutts *et al*., 2009 Cutts and Allen, 1999 Antill *et al*., 2016 Goodship and Furness, 2019 Triplet *et al*., 1998 van der Meer, 1985 Wolff *et al*., 1982
Slavonian grebe	300m	150m was considered the upper limit of active disturbance and 300m the upper limit of static disturbance. Currie and Elliott (1997) suggested safe working distances of 150-300m but this range represented differences in stage of breeding season. Very high sensitivity to boat disturbance; this species is	Ruddock and Whitfield, 2007 Liley *et al*., 2011 Goodship and Furness, 2019

Species	Disturbance distance/ response threshold	Description	References
		very likely to respond to a passing ferry at a distance of 200-300m.	Currie and Elliott, 1997
Turnstone	50m	Low sensitivity. Very tolerant of visual disturbances.	Cutts *et al.*, 2009 Cutts *et al.*, 2013
Velvet scoter	Considered to have a high sensitivity to marine activity in open waters	Lack of research available. Non-quantitative disturbance studies on velvet scoter show that this species has moderate to high sensitivity to both human and boat disturbance.	Goodship and Furness, 2019 Mendel *et al.*, 2008 Schwemmer *et al.*, 2011
Wigeon	100-250m	Less tolerant of some disturbances than other duck species.	Mathers *et al.*, 2000 Liley *et al.*, 2011 Antill *et al.*, 2016

4.3.8 The ZOI extends on the southern side from the eastern portion of Port Edgar to the area known as the Binks. On the northern side the ZOI grazes the north extent of the Queensferry Crossing to the west, and the western extent of North Queensferry harbour to the east. The habitats present within the ZOI comprise rocky shoreline, much of which has been modified by development, such as the harbours and breakwaters at Port Edgar and North Queensferry, and sections of retaining walls and reinforced coastline. At low tide areas of mudflats are exposed. The only unique functionally important habitats present for qualifying interests of the Firth of Forth SPA and Ramsar Site within the ZOI are considered Long Craig Island and Port Edgar Marina, both of which are important for Sandwich tern. As such they are considered separately from the non-breeding species and waterfowl assemblage in the assessment tables in the following section.

Assessment Tables

4.3.9 The tables in the following section provide the detailed assessment of Firth of Forth SPA/Ramsar qualifying interests, as follows:

- Table 4: HRA Stage Two (AA) for Firth of Forth SPA/Ramsar Non-breeding Species;
- Table 5: HRA Stage Two (AA) for Firth of Forth SPA/Ramsar Passage Species; and
- Table 6: HRA Stage Two (AA) for Firth of Forth SPA/Ramsar Waterfowl Assemblage.

4.3.10 Each individually cited qualifying interest of the SPA and/or Ramsar site (listed below) has been assessed against the conservation objectives relevant to disturbance separately (Tables 4 and 5), whilst those that are assemblage qualifiers only are assessed as a group (Table 6). With the exception of Sandwich tern, all are also assemblage qualifiers of the SPA and/or Ramsar site. With the exception of Sandwich tern which is designated as a passage species at both sites, all are designated as non-breeding interests.

4.3.11 The individually cited species are as follows:

- bar-tailed godwit (SPA and Ramsar site);
- golden plover (SPA);
- knot (SPA and Ramsar site);
- pink-footed goose (SPA and Ramsar site);
- redshank (SPA and Ramsar site);
- red-throated diver (SPA);
- Sandwich tern (SPA and Ramsar site);

- shelduck (SPA and Ramsar site);
- Slavonian grebe (SPA and Ramsar site); and
- turnstone (SPA and Ramsar site).

4.3.12 As detailed in Tables 4 to 6, although some qualifying species of the Firth of Forth SPA and Ramsar sites use habitats within the ZOI of the Proposed Works, the nature of the works being short duration maintenance, the infrequent use of the habitats, and/or the very low numbers of birds using these areas means there will be no AESI from the Proposed Works for over wintering species.

Mitigation specific to effects from Proposed Works during the Sandwich tern passage period

4.3.13 Mitigation measures to ensure no AESI arises from the Proposed Works are detailed below and replicated in Table 5. A tern Species Management Plan (SMP) has been developed and will form part of the CEMP (see Section 4.2) to consolidate mitigation relating to terns and provide additional information on monitoring and compliance. The tern SMP is provided in Appendix D.

4.3.14 Important habitat for roosting Sandwich tern has been identified at Long Craig Island and on the floating breakwater and tern raft at Port Edgar. Therefore, during the tern passage season (1 July and 30 September or whenever the last Sandwich tern leave the area if earlier), potentially noisy or otherwise disturbing works will not be undertaken at both ends of the bridge simultaneously, i.e. within 400m of both important habitat locations for Sandwich tern. It is acknowledged that due to the complexity of works planning and the requirement for emergency works, this may not always be possible, however this would be restricted to rare instances and likely to be of relatively short duration and will require additional measures as noted below.

4.3.15 Prior to any works commencing within 400m of habitat identified as important, a suitably qualified Ecological Clerk of Work (ECoW) will be appointed by BEAR Scotland to be available when required, as set out below. The ECoW will:

- be consulted to provide ecological advice as required in relation to works taking place within 400m of habitat important for roosting Sandwich tern (Long Craig Island and floating breakwater and tern raft at Port Edgar);
- only be required to provide site presence where it has not been possible to avoid undertaking potentially noisy works within 400m of the important habitats at both Port Edgar and Long Craig Island simultaneously[5]. In these instances, observations of tern numbers and responses to potential disturbance events will be monitored, and a stop works instruction will be issued if required, as detailed in Appendix D;
- when present on site as above, monitor the presence and numbers of Sandwich tern to further inform any additional mitigation required;
- when present on site as above, ensure mitigation measures as committed within this HRA and tern SMP are implemented; and
- when present on site as above, monitor the implementation of the mitigation measures to ensure compliance.

4.3.16 The ongoing requirement for the ECoW in relation to Sandwich tern will be reviewed and agreed with NatureScot after the first year of the licence, or earlier if relevant data becomes available from the 2021 season. Changes agreed with NatureScot will be reflected in updates to the Tern SMP.

[5] Note that between 1 July and 15 August, ECoW presence on site is required for any works taking place within 400m of Long Craig Island as detailed in Section 4.4.24.

4.3.17 Barges and other vessels required for the works should adhere strictly to the speed limits implemented by Forth Ports for the Firth of Forth.

4.3.18 Noise and vibration limits for Sandwich tern during the passage period will be agreed with NatureScot and these limits will be incorporated into the CEMP.

4.3.19 During the tern passage season , the Contractor will employ a 'soft-start' to all noisy activities undertaken within 400m of habitats used by Sandwich tern, to avoid sudden and unexpected disturbance during construction. Each time the activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds to habituate to the noise.

Table 4: HRA Stage Two (AA) for Firth of Forth SPA/Ramsar Non-breeding Species

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	Conclusion of AESI test
Disturbance as a result of noise, vibration, movement and visual stimuli from the Proposed Works	To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • distribution of the species within site; and • no significant disturbance of the species.	Screening identified the potential for disturbance to qualifying interests of the SPA/Ramsar, following high level review of the ecological requirements of the species and nature of the works activities. Noise, vibration, movement and visual disturbance related to the works could deter these species from the area adjacent to the bridge. <u>Bar-tailed godwit</u> The peak count of bar-tailed godwit from five years of WeBS counts in the two sectors was three in January 2019 (Hound Point to South Queensferry). Bar-tailed godwit was not recorded in the Forth Cult Ness sector. FRC data identified Hound Point as a key roosting, foraging and loafing site, and the west breakwater of Port Edgar as a loafing site but at relatively low numbers. Both are outside the ZOI. Bar-tailed godwit are moderately sensitive to disturbance compared to other waders (SNH, 2016b) although they habituate to works rapidly (Cutts *et al*., 2013). Disturbance leading to displacement due to noise and visual stimuli during works could occur, however based on the small numbers of bar-tailed godwit observations, the number of individuals within the ZOI is likely to be very low. If disturbed, this would be a short-term localised displacement, with birds redistributing to other areas within the Firth of Forth SPA. Displacement out of the SPA is not predicted given the availability of alternative habitat. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to bar-tailed godwit or change their distribution within the SPA, therefore no AESI is predicted. <u>Golden plover</u> The available WeBS data did not record golden plover within either survey sector, whilst FRC data observations were restricted to the Limekilns area. Furthermore, golden plover does not rely on the rocky shore habitats (SNH, 2016), which represent the dominant habitats adjacent to the bridge, and feeds on invertebrates in arable farmland and grassland in winter, with mudflats and saltmarshes mainly used for roosting (SNH, 2016). Disturbance to the species during the works is therefore unlikely.	No mitigation is required.	No adverse effect on site integrity

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	Conclusion of AESI test
		On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to golden plover or change their distribution within the SPA, therefore no AESI is predicted. <u>Knot</u> The available WeBS data did not record knot within either survey sector. FRC data identified Hound Point as a key roosting location, and Port Edgar as a key loafing location within the FRC study area, at least on occasional instances, with large numbers of individuals loafing on the floating breakwater in December 2008. Port Edgar is partially within the ZOI. Knot carry out widespread movements within the Forth Estuary and exhibit little site fidelity during the winter months (Pienkowski & Clark, 1979). Knot were not regularly observed within 1km of the FRC, an area which encompasses the immediate vicinity of the FRB, and no observations were made within the SPA area on the northern shore. Knot is primarily sensitive to disturbance at roost sites, which are not within the ZOI, and is relatively tolerant to visual disturbance, including people, and habituates to works rapidly (Cutts *et al*., 2013). Any aggregation at Port Edgar within the ZOI would likely already be habituated to boat movements due to the regular traffic in the area and would therefore not be substantially disturbed by the limited number of movements potentially required for the New Suspended Span Underdeck Access Gantry work and Repair of Cathodic Protection Systems works packages. If loafing knot were displaced as a result of the more prolonged presence of the barge, it would likely be for the short time period required to relocate locally to alternative suitable habitat beyond the range of the disturbing effects. Therefore, whilst knot may occasionally utilise areas within the ZOI, the transient nature of this species and fact that disturbed birds are likely to be able re-distribute to other areas within the Firth of Forth means adverse effects on the conservation objectives of the SPA are not predicted. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to knot or change their distribution within the SPA, therefore no AESI is predicted. <u>Pink-footed goose</u>		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	Conclusion of AESI test
		This species is a winter visitor to Scotland, breeding in Iceland and eastern Greenland. It feeds on farmland and inland improved grasslands, and typically roosts on estuaries at night (SNH, 2016b), so does not rely on mudflats and rocky shore habitats which represent the dominant habitats adjacent to the FRB. The available WeBS data did not record pink-footed goose within either of the survey sectors and they were rarely seen within 1km of the FRC, an area which encompasses the immediate vicinity of the FRB. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to pink-footed goose or change their distribution within the SPA, therefore no AESI is predicted. <u>Redshank</u> Redshank was recorded in both WeBS sectors, with a peak count of 63 in the Forth Cult Ness sector in August 2016. FRC data identify several key loafing, foraging and roosting sites close to the FRB, notably Port Edgar and North Queensferry Harbour which are within or partially within the ZOI, and also Inverkeithing Bay and Hopetoun Bank. At Port Edgar groups of birds were identified both on the floating breakwater and (since replaced) tern rafts within Port Edgar, as well as foraging on the mudflats within the marina. Redshank rely on small prey and require a longer feeding time than other waders. This makes them susceptible to disturbance in harsh winters as this can affect the amount of time they have to build up resources (SNH, 2016b). They are especially sensitive to disturbance at roost sites (SNH, 2016b) and as such could be deterred from Port Edgar and North Queensferry during works. Any redshank that are displaced are likely to relocate to other nearby areas such as Inverkeithing Bay, Hopetoun Bank and Limekilns, and the displacement would likely be for the short time period required to relocate locally to areas not affected. Other important habitats at Limekilns, Hopetoun Bank and Inverkeithing Bay would not be impacted, therefore disturbance is unlikely to have a significant effect on the species or on its distribution within the SPA/Ramsar. Displacement out of the SPA is not predicted given the availability of alternative feeding and roost site.		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	Conclusion of AESI test
		On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to redshank or change their distribution within the SPA, therefore no AESI is predicted. <u>Red-throated diver</u> Red-throated diver are predominantly a marine species, occurring on sheltered inshore waters, and in the largest numbers are in the outer Firth of Forth (SNH, 2016b). It is scarce within the inner Forth. No records are identified in the WeBS sectors, and only a small number of records were identified in the FRC data, primarily downstream of the Forth Rail Bridge. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to red-throated diver or change their distribution within the SPA, therefore no AESI is predicted. <u>Shelduck</u> Shelduck was recorded in low numbers in both WeBS sectors. A peak count of 28 birds was recorded in May 2019 in the Hound Point to South Queensferry sector. FRC data included regular observations in small numbers between May 2008 and April 2009. Peak observations within the wider area were recorded at Limekilns and Inverkeithing Bay. Shelduck are highly sensitive to visual disturbance but also exhibit a high degree of habituation (Cutts *et al*., 2013). Shelduck present in late summer are likely to be moulting birds and juveniles and may be flightless (individual birds are flightless for about one month during moult), which means that any relocation behaviour during that period would require swimming. However, if birds were displaced it would likely be a small number and for the short time period required to relocate locally to the alternative suitable habitat nearby, for example at Limekilns and Inverkeithing Bay. Shelduck are widespread and numerous within the inner Forth (SNH, 2016b), and based on the availability of alternative habitat, displacement out of the SPA is not predicted. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to shelduck or change their distribution within the SPA, therefore no AESI is predicted.		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	Conclusion of AESI test
		Slavonian grebe The presence of Slavonian grebe within the inner Forth is considered rare, and even within outer areas of the Forth is considered uncommon and found only locally (SNH, 2016b). No records were identified in the WeBS sectors, and FRC data indicates only a few observations during the winter of 2007/08, and none between May 2008 and April 2009. In winter they are predominantly a marine species, preferring sheltered open water sites. They are most regular between Musselburgh and Gullane on the south side of the Forth, and in Largo Bay in Fife. As such, disturbance to this species is unlikely and no impacts on Slavonian grebe in terms of distribution and extent of supporting habitat is expected. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to Slavonian grebe or change their distribution within the SPA, therefore no AESI is predicted. Turnstone Turnstone are considered scarce within the inner Forth (SNH, 2016b), although the species was recorded in low numbers in both WeBS sectors, with a peak count of 15 in February 2016 recorded in the Hound Point to South Queensferry sector. They were also identified in FRC data, with key locations for foraging and roosting with the FRC study area identified as Dalgety Bay and Limekilns, both outside the ZOI. Small numbers of turnstone were found to use the floating breakwater in Port Edgar marine and along adjacent areas, and as such there is potential for a small number of birds to be disturbed by the works. Turnstone are not particularly sensitive to disturbance compared to other wader species (SNH, 2016b), however they exhibit a high degree of fidelity to wintering and migration sites between and within estuaries during the winter (Cramp & Simmons, 1983). If feeding turnstone were displaced, it would likely be limited to a small number of birds within very close proximity of the works area only, and indeed turnstone have been found to forage within 10m of plant (Cutts *et al*., 2013). Further, the species also has a very wide diet, including invertebrates and carrion, found in habitat types present throughout the SPA such as rocky shores, mudflats, sandy shores and on tide wrack. Therefore, disturbance is unlikely to have a significant effect on the species or on its distribution within the SPA/Ramsar. Displacement out of		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	Conclusion of AESI test
		the SPA is not predicted given the availability of alternative feeding and roost sites. On the basis, any disturbance caused by the works is unlikely to result in significant disturbance to turnstone or change their distribution within the SPA, therefore no AESI is predicted.		

Table 5: HRA Stage Two (AA) for Firth of Forth SPA/Ramsar Passage Species

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
Disturbance as a result of noise, vibration, movement and visual stimuli from the Proposed Works	To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • distribution of the species within site; and • no significant disturbance of the species.	Screening identified the potential for disturbance to a qualifying interest of the SPA/Ramsar, Sandwich tern, following high level review of the ecological requirements of the species and nature of the works activities. Noise, vibration, movement and visual disturbance related to the works could deter Sandwich tern from the area adjacent to the bridge. Sandwich tern was recorded in both WeBS sectors[6], with a peak count of 12 birds recorded in July 2017 and July 2018 (Hound Point to South Queensferry sector) and in September 2018 (Forth Cult Ness sector). This peak corresponds with the main passage season (July to September) where this species is found in the Firth of Forth prior to migration (SNH, 2016b). Sandwich tern will roost across a range of habitats including offshore islands, rocks, estuaries and coastal lagoons, and can be displaced from roost sites due to disturbance, predation and gull colony presence. Although reported as uncommon in the inner Forth (SNH, 2016b), FRC data found Sandwich tern frequently foraged throughout the wider area around the bridges, and that flocks loafed and roosted around Port Edgar marina, especially the floating breakwater at the entrance of the harbour and the purpose-built tern raft, and Long Craig Island where they were reported to roost with other tern species. Peak numbers identified across the two locations combined in 2007 and 2008 respectively were 596 and 429 birds, which is over a quarter of the population cited SPA population. Both sites are within or partially within the ZOI around the bridge. As such, noise, vibration and visual activity could also result in disturbance to the birds.	To ensure that the conservation objectives for Sandwich tern are not compromised, the following avoidance and mitigation measures will be implemented. Important habitat for roosting Sandwich tern has been identified at Long Craig Island and on the floating breakwater and tern raft at Port Edgar. Therefore, during the tern passage season (1 July and 30 September or whenever the last Sandwich tern leave the area if earlier), potentially noisy or otherwise disturbing works will not be undertaken at both ends of the bridge simultaneously[7], i.e. within 400m of both important habitat locations for Sandwich tern. It is acknowledged that due to the complexity of works planning and the requirement for emergency works, this may not always be possible, however this would be restricted to rare instances and likely to be of relatively short duration and will require additional measures as noted below. Prior to any works commencing within 400m of habitat identified as important for roosting (non-breeding) Sandwich tern (namely Long Craig Island and Port Edgar), a suitably qualified ECoW will be appointed by BEAR Scotland to be available when required, as set out below. The ECoW will: • be consulted to provide ecological advice as required in relation to works taking place within 400m of habitat important for roosting Sandwich tern (Long Craig Island and floating breakwater and tern raft at Port Edgar);	No adverse effect on site integrity

[6] As noted in 4.1.4 gulls and terns are only optionally recorded within WeBS data and as such may be under-represented.

[7] Note that between 1 July and 15 August, ECoW presence on site is required for any works taking place within 400m of Long Craig Island as detailed in Section 4.4.24.

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		In respect of vessel movements, such as those required for the New Suspended Span Underdeck Access Gantry and Repair of Cathodic Protection Systems works packages, any aggregation of Sandwich tern at Port Edgar would likely already be habituated to boat movements due to the regular traffic in the area. Boat traffic is less frequent near to Long Craig Island, since it is situated approximately 500m from the northern shipping channel in the Forth Estuary. Although there are no restrictions on boat movements, boats do not normally pass close to the Island because the waters are shallow. In the Transport Scotland Strategic Transport Projects Review Firth of Forth Tern Survey (Jacobs, Faber Maunsell and AECOM, 2007) it was reported that on the rare occasions sailing craft were observed in close proximity to Long Craig Island, passing between the island and the northern cable tower of the FRB, terns appeared to be unaffected by the presence of vessels. Nevertheless, given the size of the barge required for the New Suspended Span Underdeck Access Gantry work and the likelihood of its sustained presence, rather than simply passing by, there is potential for disturbance to birds at both locations, and in particular at Long Craig Island, which is located closer to the likely location of the boat during operations. Whilst it is considered relatively unlikely that both roost locations would be impacted simultaneously, if disturbing works were being undertaken at both ends of the bridge, or along the length of it, birds may be forced to relocate elsewhere in the Forth Estuary, as there are apparently no other key roosting locations for this species nearby. This would constitute an impact on the distribution of the species within the site. There is suitable habitat available in the wider area and, given the size of the SPA/Ramsar and the likely short duration of disturbing works at both locations, displacement out of the SPA/Ramsar is not predicted. Disturbance during construction has the potential to alter the distribution of Sandwich tern within the SPA/Ramsar site. Mitigation is proposed to allow no AESI to be concluded.	• only be required to provide site presence where it has not been possible to avoid undertaking potentially noisy works within 400m of the important habitats at both Port Edgar and Long Craig Island simultaneously. In these instances, observations of tern numbers and responses to potential disturbance events will be monitored, and a stop works instruction will be issued if required, as detailed in Appendix D; • when present on site as above, monitor the presence and numbers of Sandwich tern to further inform any additional mitigation required; • when present on site as above, ensure mitigation measures as committed within this HRA and tern SMP are implemented; and • when present on site as above, monitor the implementation of the mitigation measures to ensure compliance. The ongoing requirement for the ECoW in relation to Sandwich tern will be reviewed and agreed with NatureScot after the first year of the licence, or earlier if relevant data becomes available from the 2021 season. Changes agreed with NatureScot will be reflected in updates to the Tern SMP. In addition: • Barges and other vessels required for the works should adhere strictly to the speed limits implemented by Forth Ports for the Firth of Forth. • Noise and vibration limits for Sandwich tern during the passage period will be agreed with NatureScot and these limits will be incorporated into the CEMP. • During the tern passage season, the Contractor will employ a 'soft-start' to all noisy activities undertaken within 400m of habitats used by Sandwich tern, to avoid sudden and unexpected disturbance during construction. Each time the	

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
			activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds to habituate to the noise.	

Table 6: HRA Stage Two (AA) for Firth of Forth SPA/Ramsar Waterfowl Assemblage

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
Disturbance as a result of noise, vibration, movement and visual stimuli from the Proposed Works	To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • distribution of the species within site; and • no significant disturbance of the species.	Screening identified the potential for disturbance to the waterfowl assemblage qualifying interest of the SPA/Ramsar, following high level review of the ecological requirements of the species and nature of the works activities. Noise, vibration, movement and visual disturbance related to the works could deter these species from feeding, loafing and roosting within the intertidal habitat adjacent to the bridge. Note that all species named are part of the waterfowl assemblage for the Firth of Forth SPA only, with the exception of goldeneye, which is an assemblage qualifier for both the SPA and Ramsar. The following assemblage qualifying interests were recorded during within one or both of the WeBS survey sectors considered: • common scoter; • cormorant; • curlew; • dunlin; • eider; • goldeneye; • great crested grebe; • mallard; • oystercatcher; • red-breasted merganser; • scaup; and • wigeon. The following species were recorded in small numbers within FRC data but are not considered to use habitats within the vicinity of the bridge on a regular basis. • grey plover; • long-tailed duck; • ringed plover; and • velvet scoter.	No mitigation is required.	No adverse effect on site integrity

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		Finally, lapwing was not identified within WeBS data but is considered to use habitats within the vicinity of the bridge on a regular basis, based on FRC data and understanding of the species' ecology. The following commentary relates to qualifying interests not already discussed as individually cited species in Tables 4 and 5 above. <u>Common scoter</u> The peak count of common scoter in these WeBS data was 3 in May 2018, in the Forth Cult Ness sector. The species was not recorded in the Hound Point to South Queensferry sector. It was recorded in very low numbers by FRC data, limited to the estuary downstream of the Forth Railway Bridge and not within the ZOI of the Proposed Works. <u>Cormorant</u> The peak count of cormorant in these data was 11 in September 2017 in the Forth Cult Ness sector. Cormorant was recorded in low numbers in both WeBS sectors. Important areas for the species within the vicinity of the bridges, as identified through FRC data, are Inch Garvie Island and Hound Point., both outwith the ZOI. <u>Curlew</u> The peak count of curlew was 500 in August 2016, in the Hound Point to South Queensferry sector. Curlew was also recorded in the Forth Cult Ness WeBS sector but in much lower numbers, with a peak of 7 individuals. FRC data identified Limekilns, Rosyth, Hopetoun Bank and Abercorn Point as key areas within the FRC study area, all of which are outwith the ZOI. <u>Dunlin</u> The peak count of dunlin was 17 in January 2017, in the Forth Cult Ness WeBS sector. Dunlin was not recorded in the Hound Point to South Queensferry sector.		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		FRC data identified Inverkeithing Bay and Port Edgar as important areas for the species within the ZOI, and Hopetoun Bank and Limekilns further afield. <u>Eider</u> Eider was recorded in both WeBS sectors, with a peak count of 118 recorded in September 2014 in the Hound Point to South Queensferry sector. FRC data identified Inch Garvie Island and Hound Point as important areas for the species within the FRC study area, both of which are outwith the ZOI. <u>Goldeneye</u> Goldeneye was recorded in low numbers in the Hound Point to South Queensferry sector, with a peak count of 8 in April 2019. The species was not recorded in the Forth Cult Ness WeBS sector. FRC identified very low numbers of the species within the vicinity of the bridges. <u>Great crested grebe</u> Great crested grebe was recorded in low numbers in the Hound Point to South Queensferry sector, with a peak count of 2 recorded in January 2016 and October 2016. The species was not recorded in the Forth Cult Ness sector. FRC data recorded the species throughout the survey period, peaking during the winter months but only small numbers were observed within the vicinity of the bridges. <u>Grey plover</u> Grey plover was not recorded in WeBS data, and within FRC data, only a single bird was seen between September 2007 to April 2009, and not at all within 1km of the bridges. <u>Lapwing</u>		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		Lapwing was not recorded in WeBS data. Within FRC data, Limekilns and Inverkeithing Bay were identified as key roosting locations within the FRC study area. Inverkeithing Bay lies partly within the ZOI. <u>Long tailed duck</u> Long tailed duck was not recorded in WeBS data, and was not identified within 1km of the bridges within FRC data. <u>Mallard</u> Mallard was recorded in both WeBS sectors. In the Forth Cult Ness sector, only low numbers were recorded, with a peak count of 3 birds. In the Hound Point to South Queensferry sector, the peak count was 65 birds in January 2019. FRC identified mallard mainly in large flocks at Limekilns, at some distance from the bridges, with few birds observed within 1km. <u>Oystercatcher</u> Oystercatcher was recorded in both WeBS sectors, but in greater numbers in the Hound Point to South Queensferry sector. A peak count of 210 was recorded in February 2019. FRC data indicated the species loafing, roosting and foraging in numerous locations including on Long Craig Island and Inverkeithing Bay within or partially within the ZOI, as well other locations within the wider area (Rosyth, Hound Point, Abercorn Point and South Queensferry harbour). Whilst it is likely that some roosting, loafing and foraging oystercatcher at Long Craig Island will be disturbed due to the Proposed Works, the magnitude of this effect in terms of the conservation objectives is considered negligible. This is based on the fact that birds are less sensitive to disturbance than other waders and any birds which are displaced are likely to be able to redistribute to other locations nearby, including those identified above. The fact that oystercatchers were roosting on Long Craig Island whilst the FRB was the main route for all traffic indicates that this species habituates to regular disturbance from a consistent noise source.		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		Red-breasted merganser Red-breasted merganser was recorded in both WeBS sectors. Typically, low numbers were recorded, however a peak count of 42 birds was recorded in March 2018 in the Hound Point to South Queensferry sector. FRC data recorded observations throughout most of the FRC study area but more frequently on the northern shoreline but outwith the ZOI The species generally winters at sea on secluded bays or estuaries but at high tide uses intertidal mud areas. It is considered widespread but uncommon in the inner Forth. Ringed plover Ringed plover was not recorded in WeBS data. FRC identified Limekilns as the key foraging and roosting location within the FRC study area, although smaller numbers were observed at Inverkeithing Bay (partly within the ZOI) and Dalgety Bay. Generally it is present in small numbers within the inner Forth (SNH, 2016b). Scaup Scaup was recorded on one occasion in the Hound Point to South Queensferry sector, with a peak count of 50 birds in March 2018, but was not recorded in the Forth Cult Ness sector. Very few observations were made within FRC data, including two scaup recorded to the west of the eastern breakwater at Port Edgar in November 2008. Velvet scoter Velvet scoter was not recorded in WeBS data. FRC data included two single observations of a velvet scoter within 1km of the bridges. It is considered rare within the inner Forth, with large flocks found primarily between Musselburgh and Gullane on the south side of the Forth, and in Largo Bay and St Andrews Bay in Fife (SNH, 2016b). Wigeon Wigeon was recorded in the Hound Point to South Queensferry WeBS sector, typically in low numbers but with a peak of 70 birds in February		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		2019. The species was not recorded in the Forth Cult Ness sector. Numbers in the Firth of Forth typically peak between November and February. FRC data identified Limekilns and Abercorn Point as key locations for the species within the FRC study area, congregating primarily upstream of the bridges. Important habitat for the species is not located in within the ZOI however SNH (2016b) notes that when disturbed, flocks fly to the safety of open water and take a while to come back to feed affecting their ability to forage if ongoing disturbance occurs. On the basis of the above, the LSE on the waterfowl assemblage resulting from disturbance will not compromise the conservation objectives for the species and therefore no AESI are predicted, as these species either do not use the ZOI on a regular basis, or have alternative suitable habitat within the immediate vicinity of the bridge.		

4.4 Forth Islands SPA

Likely Significant Effect: Disturbance

4.4.1 An LSE identified at Stage One (Screening) that might compromise the conservation objectives and cause an AESI of the Forth Islands SPA is disturbance (noise, vibration, movement and visual).

4.4.2 Noise (including vibration), visual (including lighting, human activity and vehicle/vessel movements) disturbance from routine and non-routine maintenance works has the potential to disturb qualifying bird species of the SPA. This could lead to displacement of birds from areas used for breeding, up to and including abandonment of a breeding colony. Disturbance could also result in the requirement for compensatory feeding at night, and increased instances of lifting off nests resulting in increased predation of chicks and/or eggs and associated energetic costs, and thus reduction in colony size. Consequently there is potential for adverse effects in relation to the maintenance in the long term of the population of the species as a viable component of the site.

4.4.3 As detailed in Tables 7 to 9, the majority of qualifying interests do not breed within the vicinity of the FRB, with their breeding sites generally on other islands that form part of the designation, which are some distance away in the wider outer Forth. The tern species do find breeding habitat on Long Craig Island. To a much lesser extent, gull species may also nest on rooftops within the vicinity of the FRB.

4.4.4 On this basis, and since the tern species have a far more restricted breeding sites than the gull species, the AA and determination of the ZOI for this LSE focuses on tern species. In determining a ZOI, the scientific literature and Jacobs' professional experience from other studies concerning response thresholds, or flight initiation distances (FIDs), for tern species during the breeding season was drawn upon.

4.4.5 Note that whilst a ZOI is different in nature to an exclusion buffer - the former being associated with and measured from a source of disturbance, and the latter measured from a receptor - an exclusion buffer is typically determined by a ZOI.

4.4.6 Based on the scientific literature and in line with Jacobs' professional experience, buffer distances for breeding terns rarely exceed 200m (Burger 1998; Erwin 1989; Rodgers and Smith 1995; Rodgers and Schwikert 2002), although distances of 200m to 300m have been recommended for colonies of terns during the early part of the season before birds have laid and become established on the colony (Erwin 1989). This peak sensitivity period in spring and early summer entails arrival, settling, prospecting and nest scraping. Terns are generally considered to be much less sensitive to disturbance once eggs are laid, and especially once chicks hatch.

4.4.7 As noted in Section 4.3 and Diagram 2 above, since noise attenuation can be achieved over a relatively short distance, it is likely that any potential for significant disturbance from noise will be limited to birds within close proximity of the works area. Common terns are considered to be reasonably resilient to human disturbance. Research done on the nearby common tern population at the Imperial Dock Lock, Leith SPA found the terns to be habituated to the constant low-level disturbance, with only high-level disturbance events having a significant effect (Jennings, 2012). The presence of gulls and other predatory bird species was shown to be far more likely to cause a disturbance event than anthropogenic noise.

4.4.8 Based on the above, a 300m ZOI from the edge of the bridge is defined for breeding terns in relation to disturbance. As noted in Section 4.3 above, distances are taken in plan view, although

the elevation of the bridge renders this a precautionary approach. The only habitat within the ZOI with potential to support breeding terns is Long Craig Island.

Likely Significant Effect: Direct Mortality

4.4.9 An LSE identified at Stage One (Screening) that might compromise the conservation objectives of the Forth Islands SPA leading to an AESI is direct mortality as a result of tools or other materials being dropped from the bridge.

4.4.10 The ZOI for this LSE is the area directly under the bridge. The only habitat within the ZOI with potential to support breeding terns is Long Craig Island.

Assessment Tables

4.4.11 The tables in the following section provide the detailed assessment of Forth Islands SPA qualifying interests as follows:

- Table 7: HRA Stage Two (AA) for Forth Islands SPA Tern Species;
- Table 8: HRA Stage Two (AA) for Forth Islands SPA Breeding Individually Cited Species; and
- Table 9: HRA Stage Two (AA) for Forth Islands SPA Seabird Assemblage.

4.4.12 All qualifying interests are designated as breeding interests.

4.4.13 Each individually cited qualifying interest of the SPA has been assessed against the conservation objectives relevant to disturbance separately (Tables 7 and 8), whereas those that are assemblage qualifiers only are assessed as a group (Table 9).

Mitigation specific to effects from Proposed Works during the tern breeding season

4.4.14 Mitigation measures to ensure no AESI arises from the Proposed Works are detailed below and summarised in Table 7. A tern SMP has been developed and will form part of the CEMP (see Section 4.2) to consolidate mitigation relating to terns and provide additional information on monitoring and compliance. The tern SMP is provided in Appendix D and includes:

- details of proposed protection measures, including any required exclusion zones;
- monitoring to be undertaken;
- restrictions on the timing of works; and
- appropriate watching briefs.

4.4.15 The primary means of avoidance of adverse effects has been to restrict the timing of the noisiest and otherwise most disturbing works to take place outwith the tern breeding season and/or to take place during the breeding season only at locations beyond an exclusion zone around Long Craig Island (i.e. at the southern and/or central sections of the bridge only).

4.4.16 During early consultation with NatureScot (Jacobs, 2020), they indicated that this exclusion zone should be 400m from Long Craig Island during the breeding season in the Firth of Forth (01 May to 15 August, as noted in Section 2.1). As noted in Section 4.4, the ZOI for breeding terns is identified as 300m, and as such 400m is considered precautionary. BEAR Scotland have reflected the 400m buffer in the works programme where possible. Based on Appendix A this has been implemented for the following works packages:

- Suspended Span Painting Contract;
- Suspended Span Strengthening Contract;
- Viaduct Span Painting Contract;

- Suspended Span Under Deck Access (SSUDA);Footpath Elastomeric Pads Replacement;
- Side Tower Lateral Thrust Bearing Strengthening;
- Main Tower Lateral Thrust Bearing Replacement;
- Side Tower Elastomeric Bearings Replacement;
- Pedestrian Balustrade Strengthening; and
- New Suspended Span Underdeck Access Gantry.

4.4.17 Packages for which it is not anticipated to be possible to time works near the island outside this period are:

- Viaduct and North Approach Resurfacing;
- Suspended Span Resurfacing;
- Footpath Resurfacing; and
- Main Cable Intrusive Investigation (no noisy or visually disturbing works required).

4.4.18 Some of these packages require a sustained period of carriageway closure, including overnight works, in order to complete the works efficiently. Others are more difficult to undertake during winter from an engineering perspective due to the requirement for waterproofing or exposure of cables to the elements. In addition, it is desirable by BEAR Scotland and Transport Scotland for the FRB to remain available as an alternate crossing point in the event that the Queensferry Crossing is forced to shut during bad weather.

4.4.19 In addition, some routine maintenance works, including emergency works may be required to be undertaken during the tern breeding season within 400m of Long Craig Island. The ECoW will be consulted in the first instance where this is the case.

4.4.20 The main bridge expansion joint replacement task is currently expected to be undertaken between April and September 2021, and as such it is not expected to fall into the works programme for the five-year licence. Whilst it is anticipated by BEAR Scotland that these works will be completed before the end of September 2021, the northbound joints may still be ongoing in October 2021 in the event of delays to the works. In order to avoid impacts on terns, these works are required to be completed prior to the start of the breeding season in spring 2022.

4.4.21 Plant and personnel will be constrained to the minimum required working area. This will comprise only the bridge structure itself, with only two exceptions, for which barge/boats are required, namely the New Suspended Span Underdeck Access Gantry activity and the Repair of Cathodic Protection Systems activity (Section 2.2.1). For the New Suspended Span Underdeck Access Gantry the use of a barge is essential to install the main span gantry. For the two side spans, access is feasible from either the estuary side or via a barge. In order to minimise disturbance to birds at Long Craig Island (see Table 5), access should be taken via whichever entails more distant activity.

4.4.22 Boat movements may also be required as part of the Repair of Cathodic Protection Systems activity but are not expected to require close access to Long Craig Island and are not time-sensitive, therefore for this activity, boat access within 400m of Long Craig Island should be undertaken outwith the tern breeding season.

4.4.23 In addition, a safety boat is required to be available whenever activities requiring work outside of the carriageway and walkways are programmed. When the safety boat is required, it is anchored in a suitable location as to be able to provide a safe and effective rescue service. During the tern breeding and passage period, the safety boat will not anchor within 200m of Long Craig Island

and will take relevant and appropriate measures to minimise any potential disturbance to Long Craig Island (e.g. will not leave the engine idling).

4.4.24 For any works taking place during the tern breeding season and within 400m of Long Craig Island, the following additional mitigation measures are required to be implemented.

- Prior to works commencing, a suitably qualified ECoW will be appointed by BEAR Scotland and will be responsible for implementation of the CEMP as it relates to terns. During the tern breeding season, the ECoW will:
    - provide ecological advice as required;
    - ensure mitigation measures as committed within this HRA and the CEMP are implemented; and
    - monitor the implementation of the mitigation measures to ensure compliance.
- The ongoing requirement for the ECoW in relation to breeding terns will be reviewed and agreed with NatureScot after the first year of the licence, or earlier if relevant data becomes available from the 2021 season. Changes agreed with NatureScot will be reflected in updates to the Tern SMP.
- Due to the complexity of the works programme and potential requirement for emergency works, the requirement for multiple maintenance packages to be undertaken concurrently cannot be precluded. Where this is the case, and where safe to do so, noisy or otherwise disturbing works will be timed so as not to coincide.
- No access beyond mean low water springs (MLWS) of Long Craig Island will be permitted under any circumstance during the tern breeding season as defined in Section 2.1 without written agreement of the ECoW and NatureScot. The sole exception to this would be access by the safety boat or rescue operatives during an emergency rescue.
- 'Soft-start' techniques will be used for all noisy activities to avoid sudden and unexpected disturbance during construction. For any such activity, each time the activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds to move away from the disturbance.
- Any requirement for noise and vibration limits for terns on Long Craig Island during the breeding season will be agreed with NatureScot and these limits will be incorporated into the CEMP. Measures contained within the CNMP will reduce construction noise and limit it to agreed noise thresholds.
- Should additional mitigation be identified as required to achieve the noise limits noted in the CEMP, as experienced at Long Craig Island, additional measures may be required, such as noise barriers or noise damping materials being installed within the encapsulation. The locations of screening or barriers should be agreed with an acoustics specialist prior to works, and checked periodically throughout works.
- In the rare instances where emergency repairs are required at short notice within 400m of Long Craig Island during the breeding or passage season, the implementation of certain additional mitigation measures as identified above may not be possible due to length of time required to put these measures in place. Emergency repairs would be defined as works identified at short notice that are required to prevent failure of the structure or to prevent a substantial risk to public health and safety. In such cases NatureScot, Marine Scotland and Transport Scotland will be consulted and notified prior to the commencement of works. In addition, works will be discussed with and monitored by the ECoW. A written record will be kept of why emergency repairs were required, what alternatives and mitigation was discussed and, where proposed mitigation was agreed as being feasible, and what that mitigation was.
- Monitoring of bird responses to works activities will be undertaken, as detailed within the Tern SMP (Appendix D). Observations of bird responses will be combined with ongoing noise

monitoring, which will also be set out in the CNMP, with relevant information repeated within the Tern SMP. Should monitoring data identify significant changes in the distribution or number of birds as a result of works, then works will be stopped as soon as this is identified until further mitigation is agreed with NatureScot. Further mitigation could include extension or expansion of the measures noted in this section, including: restrictions to the types or timing of noisy works; extending the 'soft-start' process; amendments to lighting plans; and changes to visual and noise screening.

Table 7: HRA Stage Two (AA) for Forth Islands SPA Tern Species

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
Disturbance as a result of noise, vibration, movement, and visual stimuli from the Proposed Works	To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; and • no significant disturbance of the species.	Screening identified the potential for disturbance to qualifying interests of the SPA following high level review of the ecological requirements of the species and nature of the works activities. Noise and visual disturbance related to the Proposed Works could deter tern species from feeding in the open water adjacent to the FRB and successfully breeding on Long Craig Island. Long Craig Island is the only area of the Forth Islands SPA that falls within the FRB ZOI and the only suitable habitat for breeding terns within the ZOI. Long Craig Island is only considered key supporting habitat for common and roseate terns, however Arctic and Sandwich tern have been included in this assessment on a precautionary basis. <u>Common tern</u> Common tern are the primary species known to nest on Long Craig Island, with a peak of 128 Apparently Occupied Nests (AONs) and 163 successfully fledged checks in 2019 (Knowles, 2019). This makes this location one of the most important, in terms of absolute numbers, in the Forth Islands SPA for this species. Common terns have arrived to breed in relatively similar numbers for at least the last 20 years, with the exception of 2012 when no pairs arrived. However, productivity has varied, with a sharp drop off between 2016-2018, most significantly in 2018 with only five chicks fledging when the colony was recorded as failing (Knowles, 2018). In 2019, however, the colony had the highest number of chicks and highest productivity since 2003, indicating the terns' fidelity to the site between years. The WeBS data recorded common terns throughout the breeding season each year; with a five-year peak count of 354 in June 2019, in the Hound Point to South Queensferry sector. Common terns are considered to be reasonably resilient to human disturbance. Research done on the nearby common tern population at the Imperial Dock Lock, Leith SPA found the terns to be habituated to the constant low-level disturbance, with only high-level disturbance events having a significant effect (Jennings, 2012). Furthermore, the presence of gulls and other predatory bird species was shown to be far more likely to cause a disturbance event than anthropogenic noise.	To ensure that the conservation objectives for common and roseate tern are not compromised, the following avoidance/mitigation measures will be required. The measures will prevent significant disturbance to the breeding colony at Long Craig Island. • A tern Species Management Plan (SMP) has been developed and will form part of the CEMP (see Section 4.2) to consolidate mitigation relating to terns and provide additional information on monitoring and compliance. The tern SMP is provided in Appendix D. • The timing of the noisiest and otherwise most disturbing works has been restricted to take place outwith the tern breeding season and/or to take place during the breeding season only at locations beyond 400m from Long Craig Island (i.e. at the southern and/or central sections of the bridge only). • The main bridge expansion joint replacement task is not expected to fall into the works programme for the five-year licence. In the event of delays to the works, however, these must be complete prior to the start of the breeding season in spring 2022. • For the New Suspended Span Underdeck Access Gantry the use of a barge is essential to install the main span gantry. For the two side spans, access is feasible from either the estuary side or via a barge. In order to minimise disturbance to birds at Long Craig Island, access should be taken via whichever entails more distant activity. Boat movements may also be required as part of the Repair of Cathodic Protection Systems activity but are not expected to require close access to Long Craig Island and are not	No adverse effect on site integrity No adverse effect on site integrity

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		However, a number of disturbance events, in addition to high tides and poor weather, have been linked to the abandonment of the colony at Long Craig Island in 2018, and significant disturbance was noted again in 2020. Whilst there is no proven causation, there is clearly potential for the works to result in significant disturbance. During the nesting period such disturbance events could have a significant impact on productivity due to increased chick/egg predation and associated energetic costs. This would constitute an impact on the population of the species as a viable component of the site. It should be noted that, since terns do not breed until 3 or 4 years old, the limited breeding success of the Long Craig Island tern colony in 2018 and 2020 can reasonably be expected to be reflected in a reduction in colony size emerging over the next few years, even if no further disturbance were to take place. As such, assurances around the population of the species being maintained as a viable component of the site and no significant disturbance of the species are particularly critical over the coming five years during which the Marine Licence will be in place. In addition, due to tern species' tendency to roost and nest in multi-species colonies, protection of the common tern population is essential to the ongoing conservation objective of restoring a roseate tern population to Long Craig Island, as roseate tern is reliant on the protection of common terns at nesting sites (SNH, 2011). Disturbance during the Proposed Works has the potential to negatively impact the conservation objectives for common tern in the Forth Islands SPA. <u>Roseate tern</u> Roseate tern is the rarest breeding seabird in the UK, and Long Craig Island was previously the site of the largest colony in the UK. In addition to its European designation, Long Craig Island is designated as a Site of Special Scientific Interest (SSSI) for roseate tern, and the species is additionally 'red-listed' in the Birds of Conservation Concern (RSPB, 2015). However, a successful pair has not bred on the island since 2009 (Knowles, 2019) and there have only been occasional hybrid pairs	time-sensitive. Boat access within 400m of Long Craig Island should be undertaken outwith the tern breeding season.. For any works taking place during the tern breeding season and within 400m of Long Craig Island, the following additional mitigation measures are required to be implemented. • Prior to works commencing within 400m of Long Craig Island, a suitably qualified ECoW will be appointed by BEAR Scotland and will be responsible for implementation of the CEMP as it relates to terns. During the tern breeding season the ECoW will: provide ecological advice as required; ensure mitigation measures as committed within this HRA and the CEMP are implemented; and monitor the implementation of the mitigation measures to ensure compliance. • The ongoing requirement for the ECoW in relation to breeding terns will be reviewed and agreed with NatureScot after the first year of the licence, or earlier if relevant data becomes available from the 2021 season. Changes agreed with NatureScot will be reflected in updates to the Tern SMP. • Due to the complexity of the works programme and potential requirement for emergency works, the requirement for multiple maintenance packages to be undertaken concurrently cannot be precluded. Where this is the case, and where safe to do so, noisy or otherwise disturbing works will be timed so as not to coincide. • No access beyond mean low water springs (MLWS) of Long Craig Island will be permitted under any circumstance during the tern breeding season as	

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		recorded in the Forth since that time. WeBS data[8] did not record the species. FRC data recorded roseate terns rarely flying and foraging from Port Edgar, over Inch Garvie Island and between the rail bridge and FRB. They were also observed loafing on Long Craig Island. In addition, in 2007 at least two pairs were recorded displaying at Long Craig Island early in the breeding season, and in 2008 one to two pairs were regularly observed there. The Forth Islands Tern Warden Season Report from 2018 noted that a single adult roseate tern was observed on several occasions in July 2018 loafing in the location that the last pair mated in 2008/9, however no courtship behaviour or attempts at mating with common terns was observed. Roseate tern rely on the protection of the more aggressive and numerous common (and where present Arctic) tern at nesting sites. Sandwich tern are known to outcompete roseate tern for nesting habitat, making colonies of only common tern ideal for roseate terns. In recent years, roseate tern has been observed in low numbers only, generally when visiting colonies of common terns (Knowles, 2019). As a result, the welfare of the other terns in the Forth is vital if roseate terns are successfully to reclaim their original nesting areas, and indeed NatureScot have identified Long Craig Island as essential to the recolonisation of the Firth of Forth by roseate tern. Any impact on the common tern population at Long Craig Island should be considered, by extension, to also have an impact on the conservation objectives for roseate tern. Disturbance during the Proposed Works has the potential to negatively impact the conservation objectives for roseate tern in the Forth Islands SPA.	defined in Section 2.1 without written agreement of the ECoW and NatureScot. The sole exception to this would be access by the safety boat or rescue operatives during an emergency rescue. • 'Soft-start' techniques will be used for all noisy activities to avoid sudden and unexpected disturbance during construction. For any such activities, each time the activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds to move away from the disturbance. • Any requirement for noise and vibration limits for terns during the breeding season will be agreed with NatureScot and these limits will be incorporated into the CEMP. Measures contained within the CNMP will reduce construction noise and limit it to agreed noise thresholds. • Should additional mitigation be identified as required to achieve the noise limits noted in the CEMP, as experienced at Long Craig Island, additional measures may be required, such as noise barriers or noise damping materials being installed within the encapsulation. The locations of screening or barriers should be agreed with an acoustics specialist prior to works, and checked periodically throughout works. • For emergency repairs, the implementation of certain additional mitigation measures as identified above, may not be possible due to length of time required to put these measures in place. In such cases agreement will be sought with NatureScot and Marine Scotland prior to the commencement of	

[8] As noted in 4.1.4 gulls and terns are only optionally recorded within WeBS data and as such may be under-represented.

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
			works. In addition, works will be discussed with and monitored by the ECoW. A written record will be kept of why emergency repairs were required, what alternatives and mitigation was discussed and, where proposed mitigation was agreed as being feasible, and what that mitigation was. • Monitoring of bird responses to works activities will be undertaken, as detailed within the Tern SMP (Appendix D). Observations of bird responses will be combined with ongoing noise monitoring, which will also be set out in the CNMP, with relevant information repeated within the Tern SMP. Should monitoring data identify significant changes in the distribution or number of birds as a result of works, then works will be stopped as soon as this is identified until further mitigation is agreed with NatureScot. Further mitigation could include extension or expansion of the measures noted in this section, including: restrictions to the types or timing of noisy works; extending the 'soft-start' process; amendments to lighting plans; and changes to visual and noise screening.	
		Arctic tern Historically Arctic tern nested on several of the Forth Islands but since 1998 have only been recorded nesting on the Isle of May (SNH, 2016b) and Great Carr (Knowles, 2018). The available WeBS data and the Forth Islands Tern Warden Season Reports (Knowles, 2017, 2018, 2019) did not indicate Arctic terns were present in the vicinity of the FRB. FRC data recorded small numbers of Arctic terns in the autumn/winter of 2007 and 2008. In 2008, most records were from Port Edgar. They were described as rarely observed in the wider survey area for estuarine birds and as making very little use of the inner Forth estuary in the vicinity of the FRC.	No mitigation is required.	No adverse effect on site integrity

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		The species feeds primarily in the outer Forth. Low numbers of Arctic tern are known to frequent the inner Forth, but due to the fact there is regular and ongoing monitoring of the terns on and around Long Craig Island yet they have not been regularly recorded, it is considered unlikely that the ZOI is an important area for this species. LSE on Arctic tern resulting from disturbance will not compromise the conservation objectives for the species and therefore no AESI are predicted.		
		<u>Sandwich tern</u> Sandwich tern was recorded in both WeBS sectors[9], as detailed in Table 5 above, and FRC data identified over a quarter of the population cited SPA population across Port Edgar and Long Craig Island. In respect of breeding, however, Sandwich tern has not bred on Long Craig Island in recent years, with their breeding site within the SPA being restricted to small numbers on the Isle of May (Knowles, 2017, 2018, 2019). Indeed since they are currently reported to be in unfavourable condition, the conservation objectives for this species within the Forth Islands SPA are not currently being met. Should a breeding colony re-establish in the Forth Estuary over the duration of the five-year licence, mitigation required in relation to breeding terns would also act to provide protection for Sandwich tern, and the tern SMP would be updated to reflect revised requirements. LSE on Sandwich tern resulting from disturbance will not compromise the conservation objectives for the species and therefore no AESI are predicted.	No mitigation is required.	No adverse effect on site integrity

[9] As noted in 4.1.4 gulls and terns are only optionally recorded within WeBS data and as such may be under-represented.

Table 8: HRA Stage Two (AA) for Forth Islands SPA Breeding Individually Cited Species

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
Disturbance as a result of noise, vibration, movement and visual stimuli from the Proposed Works	To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; and • no significant disturbance of the species.	Screening identified the potential for disturbance to qualifying interests of the SPA following high level review of the ecological requirements of the species and nature of the works activities, however none of the following qualifying interested have been recorded nesting on Long Craig Island in the previous three years (Knowles, 2017, 2018, 2019) and there are no suitable nesting habitat for them adjacent to the FRB otherwise. <u>Gannet</u> The only known Forth Island SPA breeding site for gannet in is on Bass Rock, 48km east of the FRB. The available data from WeBS and FRC data recorded gannet mainly during the autumn passage period, with the majority of records towards the north shore of the estuary and east of the rail bridge. Most breeding gannets forage within 60km of the nest site (Kirkham *et al.*, 1985) which the FRB does fall within, however the availability of suitable prey is considered to be higher in the outer Forth. On the basis, any disturbance caused by the works will not compromise the conservation objectives for gannet and therefore no AESI are predicted. <u>Lesser black-backed gull</u> The WeBS data[10] indicates lesser black-backed gulls are present in the vicinity of the FRB on the southern side (Hound Point to South Queensferry) in relatively high numbers throughout the year except winter, with a 5-year peak count of 43 in August 2017. WeBS data from the north side (Forth Cult Ness) only recorded presence three times over the five-year period, with a peak count of one. Large breeding colonies are found on many of the Forth islands and, in smaller numbers, on rooftops in urban areas surrounding the Forth (SNH, 2016b). FRC data identified the highest numbers at Inch Garvie Island,	No mitigation is required.	No adverse effect on site integrity

[10] As noted in 4.1.4 gulls and terns are only optionally recorded within WeBS data and as such may be under-represented.

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		South Queensferry, Rosyth Docks and Inverkeithing, with a few pairs breeding on Inch Garvie Island. The species is not recorded as nesting on Long Craig Island, however it is possible that some nesting pairs are present within the ZOI on building rooftops. There is little available information on the effects of disturbance on lesser black-backed gull, however the fact they often breed in urban environments indicates a degree of resilience and habituation to human disturbance. While the UK population has fluctuated significantly in recent years (Burns *et al.*, 2020) this accounts only for natural populations and it is believed increased use of man-made habitats has skewed this figure. Furthermore, the primary pressures on this species are culling and food availability. It is considered likely that any individuals nesting in the ZOI are likely to be habituated to human disturbance as they will be on building rooftops, and will be in low numbers. Disturbance to loafing and roosting individuals is considered likely to only have an impact on the south side of the bridge, and it is considered that the birds will be able to use alternative suitable habitat nearby. On the basis, any disturbance caused by the works will not compromise the conservation objectives for gannet and therefore no AESI are predicted. <u>Puffin</u> Puffin are only known to breed on islands in the outer Firth of Forth. They require suitable burrowing habitat and an absence of mammalian predators. The available data from WeBS and FRC did not indicate puffin were present in the vicinity of the FRB, and were recorded at Dalgety Bay on one occasion. Breeding puffin forage within 64km of the nest site (SNH, 2016b) which would include the FRB ZOI, however the availability of suitable prey is considered to be higher in the outer Forth. The main pressure driving population decline appears to be a loss of prey availability and introduction of predators to nest sites (BirdLife International, 2021). Disturbance to the species during the Proposed Works is therefore unlikely.		

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		On the basis, any disturbance caused by the works will not compromise the conservation objectives for puffin and therefore no AESI are predicted. <u>Shag</u> Shags are known to nest on most of the Forth Islands (SNH, 2016b) but not Long Craig Island. The available data from WeBS did not indicate shags were present in the vicinity of the FRB. FRC data indicated they were present in low numbers within the wider areas but with no particular 'hotspots', and indeed they are known not to forage far from their breeding sites. The species is considered rare within the inner Forth (SNH, 2016b). Due to the lack of suitable nesting habitat in the ZOI, any disturbance would be limited to rare instances of loafing and feeding individuals. With the available data indicating this is not an important location for these activities, it is considered that the birds would be able to use alternative suitable habitat in the wider area. On the basis, any disturbance caused by the works will not compromise the conservation objectives for shag and therefore no AESI are predicted		

Table 9: HRA Stage Two (AA) for Forth Islands SPA Seabird Assemblage

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
Disturbance as a result of noise, vibration, movement and visual stimuli from the Proposed Works	To avoid deterioration of the habitats of the qualifying interests or significant disturbance to the qualifying interests, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying interests that the following are maintained in the long term: • population of the species as a viable component of the site; • distribution of the species within site; and • no significant disturbance of the species.	Screening identified the potential for disturbance to the breeding seabird assemblage of the SPA, following high level review of the ecological requirements of the species and nature of the works activities. Noise, vibration, movement and visual disturbance related to the works could deter these species from feeding, loafing and roosting within the intertidal habitat adjacent to the bridge, however the species do not breed on Long Craig Island. They have been included in the AA on a precautionary basis due to the potential for disturbance to roosting, loafing and foraging birds. <u>Cormorant</u> The WeBS data indicates cormorants are present in the vicinity of the FRB in low numbers throughout the year. With a 5-year peak count of 11 in September 2017, which matches the overall trend for the Firth of Forth (SNH, 2016b). FRC data identified Inch Garvie Island, Lamb, Craigleith, Inchkeith, Car Craig and Haystack as key nesting, roosting and loafing sites, all of which are outside the ZOI. Cormorant are considered tolerant to high levels of human activity (SNH, 2016b), however numbers are declining in the Firth of Forth, matching national trends. Human disturbance is likely a factor driving this decline but primarily at nesting sites, where eggs and young are predated on by gulls when the adults are flushed off the nests (Gremillet, Schmid and Culik, 1995). While inland breeding populations do exist in the UK, resident cormorants in the Forth breed exclusively on island cliffs and stacks (SNH, 2016b). Due to the lack of suitable nesting habitat in the ZOI, disturbance is predicted to be on small numbers of loafing and feeding individuals only. With the available data indicating this is not an important location for these activities, it is considered that the birds will be able to use alternative suitable habitat. <u>Guillemot</u> Guillemot nest in large colonies and are known to be present on several of the Forth Islands in the outer Forth area. WeBS data did not record	No mitigation is required.	No adverse effect on site integrity

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		guillemot. Available data from FRC recorded some individuals in the vicinity of the bridges but in relatively low numbers. Guillemot feed in open water, and it is considered there is better such foraging habitat away from the bridges in the outer Forth, and as such they are unlikely to forage close to the FRB. Therefore, while being relatively sensitive to noise (Scottish Government, 2012), it is highly unlikely that there will be any disturbance on guillemot from the Proposed Works. <u>Herring gull</u> The WeBS data[11] indicate herring gulls are present in the vicinity of the FRB in relatively high numbers throughout the year, with a 5-year peak count of 280 in June 2019. Large breeding colonies are found on many of the Forth islands, notably on Inch Garvie Island, 8km east of the FRB. and, in smaller numbers, on rooftops in urban areas surrounding the Forth (SNH, 2016b). The species is not recorded as nesting on Long Craig Island, however it is possible that some nesting pairs are present within the ZOI on building rooftops. FRC data reported herring gulls regularly, including flocks of roosting and loafing birds around Beamer Rock, where the central tower of the Queensferry Crossing now stands. Herring gulls are known to be extremely resilient to disturbance, often relying on humans for food which has led to habituation to human disturbance. There is no clear evidence that disturbance has a significant effect on nesting pairs (Nisbet, 2000), with herring gulls often benefitting from disturbance to other species. Disturbance is therefore considered unlikely to impact any nesting pairs in the ZOI. <u>Kittiwake</u> Kittiwake colonies breed primarily on the Forth Islands with suitable cliffs (SNH, 2016b) of which there are none on Long Craig Island. The available data from WeBS and FRC did not indicate kittiwake were		

[11] As noted in 4.1.4 gulls and terns are only optionally recorded within WeBS data and as such may be under-represented.

LSE	Conservation Objectives Potentially Affected	Commentary	Avoidance and Mitigation	AA Determination after Mitigation
		present in the vicinity of the FRB, with most records from FRC data from east of the rail bridge. Kittiwake primarily feed in open water, almost exclusively during the breeding season, and are only likely to forage in the inner Forth post breeding. Therefore, the ZOI is not considered an important area for this species and disturbance is unlikely to have an impact, particularly during the sensitive breeding season. Kittiwake are one of the seabirds with the largest long-term decline in the UK (Burns *et al.*, 2020) and are classed as vulnerable globally (IUCN, 2021). However, the main pressures driving this decline are believed to be overfishing and an increase in extreme weather events reducing nest success (BirdLife International, 2021). Studies on the effects of human disturbance are inconclusive (Beale and Monaghan 2004) but indicate that they are reasonably resilient to disturbance. <u>Razorbill</u> Razorbill are only known to breed on some Forth Islands in the outer Firth of Forth. This species requires sheer cliffs or boulder scree slopes (SNH, 2016b) of which there are none on Long Craig Island. The species forages in the open waters of the outer Firth of Forth, particularly during the breeding season. It is only likely to be found in the inner Forth, loafing, during the less sensitive winter months. The available data from WeBS and FRC did not indicate razorbill were present in the vicinity of the FRB, with most records from Inverkeithing Bay, outside the ZOI. Disturbance to the species as a result of the Proposed Works is therefore unlikely. On the basis of the above, the LSE on the seabird assemblage resulting from disturbance will not compromise the conservation objectives for the species and therefore no AESI are predicted, as these species do not breed in the vicinity of the FRB, and either do not use the ZOI on a regular basis for foraging, or have alternative suitable habitat within the immediate vicinity of the bridge.		

4.5 Appropriate Assessment Conclusion

4.5.1 Detailed assessment (Tables 4 to 9) of the implications from the Proposed Works on the three SPAs and Ramsar site: Firth of Forth SPA, Firth of Forth Ramsar and Forth Islands SPA concluded their conservation objectives would not be compromised and there would be no AESI if the required mitigation is implemented.

5 In-Combination Assessment

5.1 Introduction

5.1.1 Following screening (Section 3: Stage One (Screening)), LSEs from the Proposed Works were identified for the Firth of Forth SPA, Firth of Forth Ramsar and Forth Islands SPA. This section of the report describes the in-combination assessment that has been undertaken to identify whether there are any other plans and projects which could affect the integrity of these European sites in combination with the Scheme.

5.1.2 Article 48 of the Habitats Regulations requires that Appropriate Assessments of projects should include a consideration of other plans or projects which could affect site integrity in combination with the proposal under assessment.

5.1.3 There is potential for adverse effects on the integrity of the Firth of Forth SPA, Firth of Forth Ramsar and Forth Islands SPA to accrue as a result of the Proposed Works in combination with other proposed developments or works on, adjacent to, or within the area. Relevant developments might impact on the estuarine system and the qualifying species by causing disturbance and/or loss of habitat and/or introducing barriers to migration or normal ranging behaviour of the qualifying species within the estuarine catchment.

5.1.4 In terms of the potential for in-combination effects with the maintenance works, the key issue, based on the assessment above, is considered to be the potential for other developments to result in an increase in disturbance (and therefore also displacement) within the Firth of Forth estuary, which may impact on the qualifying species of the three sites.

5.1.5 The in-combination assessment may identify developments which are themselves considered likely to have a significant effect on the Firth of Forth SPA, Firth of Forth Ramsar and Forth Islands SPA, and which will also be required to undergo an Appropriate Assessment under Regulation 48 of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended). There may also be plans or projects which, when considered individually, may not adversely affect a European site, but which may have an adverse effect when combined with the Proposed Works.

5.2 Approach to Assessment

5.2.1 The approach adopted for the in-combination assessment of the Proposed Works in relation to the three sites was firstly to identify a search area for plans or projects with the potential to cause in-combination adverse effects on the integrity of the Firth of Forth SPA, Firth of Forth Ramsar or Forth Islands SPA with the Proposed Works. As the Firth of Forth SPA/Ramsar and Forth Islands SPA cover such large areas, it was considered appropriate that the search area captured all projects and plans within the Firth of Forth Catchment.

5.2.2 A search was undertaken on 7 January 2021 for any Marine Licence Applications within the Forth Estuary on the Scottish Government's website. Marine Licence applications within five years of the search date were identified.

5.2.3 A search was undertaken on 7 January 2021 for projects and plans with the potential to have an in-combination adverse effect within East Lothian Council, City of Edinburgh Council, Clackmannanshire Council, Falkirk Council, West Lothian and Fife Council. Each local authority's planning portal was searched for consented or pending applications within a three-year period of the search date. The following exclusions applied to the search to identify relevant proposals for inclusion within the assessment:

- householder applications for improvements/extensions;

- local commercial and business applications for minor improvement works and alterations;
- change of use (where external building work is not required);
- applications for advertisement consent;
- enforcement actions; and
- applications that have been withdrawn.

5.2.4 A review of documentation and information available for each proposal, including published HRAs, environmental impact assessments, consultation responses, decision notices or other relevant documentation were consulted to identify projects with potential for in-combination effects.

5.2.5 The findings of the search are presented in Table 10 below, along with a summary of the identified potential for in-combination effects.

Table 10: Other Plans and Projects and Potential for In-Combination Effects

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
Redevelop existing bungalow to form changing rooms; locate modular building adjacent and link structures; landscape externally inc. new disabled bay, paths, dingy parking and external seating area. *Port Edgar Yacht Club, Port Edgar, Shore Road, South Queensferry, EH30 9TD.*	0m	City of Edinburgh	19/01154/FUL	Granted	The proposal is for the redevelopment of an existing bungalow structure, and additional external works to improve landscaping, parking and external amenities at the Yacht Club. The development site boundary is partially situated underneath the FRB at South Queensferry, however the main works are localised to the dilapidated Port Edgar Yacht Club building and a derelict outbuilding to the existing Port Edgar clubhouse approximately 250m from the bridge. The rest of the site comprises unmaintained land. It is considered that there is the potential for some disturbance during the works from machinery, vehicles and personnel. However, the decision notice issued by the City of Edinburgh Council, which granted the application, did not place any conditions pertaining to environmental protection on the development, although detailed landscape plans must be submitted and approved by the Planning Authority prior to commencement of the works. Whilst there is the potential for the development to be undertaken at the same time as Proposed Works, given the location and nature of the development, the potential for in-combination effects is unlikely. The works are set back from the Firth of Forth (by c.60m) and within an already disturbed environment, therefore, visual and noise disturbance to qualifying interests of the designated sites is unlikely to be above baseline level. Furthermore, the operational phase of the development will not differ significantly from baseline conditions as Port Edgar is an existing harbour. It is considered there will therefore be no in-combination effect and no adverse effect on site integrity. **No potential for in-combination effects.**
EIA screening in regard to the construction of a pontoon and capital dredging and sea deposit of dredge material, Port Edgar Marina. *West Pier, Shore Road, South Queensferry.*	500m	City of Edinburgh	20/01851/SCR Marine Licence Application – (0008766) and (00008879)	EIA Not Required Marine Licence Application Submitted	There is currently a maintenance dredging licence for another area with Port Edgar which is also dredged to allow operations to occur (licence number 06629/19/0). However, with increased demand of use within the port the requirement to use the west pier has brought on the requirement for these works, which will include the construction of a new pontoon, capital dredging (i.e. dredging to a depth not previously dredged, or to a depth not dredged within the last 10 years) and disposal of the dredge material. Initial consultation with Marine Scotland and SNH indicated that west pier dredging and pontoon installation work would need to be screened for the

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
					requirement for Environmental Impact Assessment (EIA) process, however a screening opinion was sought and determined that EIA was not required. However, as the development site partially lies within the Firth of Forth SPA/Ramsar and there are also common terns, considered to be part of the Forth Islands SPA population, using a newly installed tern raft in Port Edgar Marina, HRA is required. An HRA Screening for the Proposed Works was undertaken in April 2020 which concluded no LSE for Firth of Forth SPA or Forth Islands SPA. The Marine Licence Application for the pontoon states that the works will be undertaken in March 2020, prior to the tern breeding season and at the end of the wintering season, and that the capital dredging will be undertaken by February 2021 over a period of 30 days in total. Neither licence has been granted and there is no further information on the works programmes. There is the potential for the proposal to be undertaken concurrently with the Proposed Works; however, it is unlikely that, provided the working methodologies identified within the licence applications are adhered to, there would be any in-combination effects. **No potential for in-combination effects.**
Installation of a pontoon walkway along the length of each side of the existing West Pier within Port Edgar Marina. Single galvanized steel columns will be bolted to each of the existing concrete Pier supports using 4 no. fixing plates. *West Pier, Shore Road, South Queensferry.*	550m	City of Edinburgh	20/01207/LBC	Application Granted	The proposal is for a pontoon walkway to be installed within Port Edgar Marina, an established marina on the Firth of Forth, in South Queensferry. The proposal is to install the pontoon walkway structure to the existing pier supports. The work will facilitate the use of the West Pier for mooring and disembarking. Listed building consent is granted, and no environmental issues were presented. Construction will require use of a crane and workboats/barges from Port Edgar, and will take approximately four weeks to complete. Once completed, the new pontoon is expected to enhance the use of the marina. Whilst there is the potential for the pontoon walkway installation to be undertaken at the same time as Proposed Works, given the location and nature of the pontoon works, the potential for in-combination effects is unlikely. The works are associated with an existing structure within an already disturbed environment, therefore, visual and noise disturbance to qualifying interests of the Firth of Forth SPA/Ramsar and Forth Islands SPA is unlikely to be above baseline level. Furthermore, the operational phase of the development will not differ significantly from baseline conditions as Port Edgar is an existing harbour, and the Firth of Forth already experiences traffic from both leisure and commercial vessels. It is considered there will therefore be no in-combination effect and no adverse effect on site integrity.

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
					No potential for in-combination effects.
Erect new standalone workshop / studio building with separate access. *13 Edinburgh Road, Edinburgh, EH30 9HR.*	860m	City of Edinburgh	20/05222/FUL	Awaiting Assessment	The proposed development comprises a new building in direct view of the Firth of Forth, on the coast in South Queensferry. The building will function as a studio/workshop. No ecological assessment or HRA have been undertaken for the works. Due to the proximity of the works to the Firth of Forth, it is considered that there is the potential for disturbance (visual and noise) from the works to birds within the Firth of Forth SPA and Ramsar site during construction, however once the building is completed it is considered generally fit in with existing infrastructure along the coast, and there would be no operational effects. Due to the distance from Long Craig Island (over 2km) there is no potential for effects on qualifying interests of the Forth Islands SPA. The construction phase for this proposal may be undertaken concurrently with the Proposed Works however the development has yet to be consented. Given the location of the development it is possible that there will be some localised disturbance/displacement of qualifying interests of the Firth of Forth SPA and Ramsar site, however the small scale of the development and the context of the location within the urbanised area of South Queensferry and existing noise baseline mean in-combination effects with the Proposed Works are unlikely. **Based on the information available, in-combination effects are unlikely.**
Development of a Forth Bridge Walk Reception Centre; new sections of bridge access system; new viewing platforms; associated car parking; landscaping; servicing and alterations to existing vehicular and pedestrian accesses. (as amended) *Forth Rail Bridge, Hawes Brae, South Queensferry.*	1.4km	City of Edinburgh Council	19/04116/FUL	Granted	The proposal is for the development of: a Forth Rail Bridge Walk Reception Centre at Hawes Brae, South Queensferry; new sections of bridge access system; new viewing platforms; associated car parking; landscaping; and servicing and alterations to existing vehicular and pedestrian accesses. The development focuses on further promoting the Forth Rail Bridge as a visitor attraction through providing visitors an opportunity to undertake bridge walks. An HRA for the proposal was undertaken in 2019 and identified potential LSEs on qualifying interests of the Firth of Forth SPA and Ramsar site from construction and operational disturbance, However, it stated that construction best practice and adherence to a CEMP would mitigate for construction disturbance, and operational disturbance would not be above that already experienced in the locality, and subsequently concluded no AESI. SNH supported the conclusion that the proposal will not "*adversely affect the integrity of the site*". The works associated with this proposal have the potential for disturbance to qualifying interests within the Firth of Forth SPA and Ramsar around

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
					Hawes Brae, and may be undertaken concurrently with the Proposed Works. However, the majority of the construction works are set back from the Firth of Forth. Given the location of the development, and the implementation of mitigation as specified in the HRA, along with the disturbance already experienced from leisure and commercial vessels for example, the potential for any in-combination effects with the Proposed Works is considered unlikely. **No potential for in-combination effects.**
Granton Harbour Redevelopment: Proposed marine works associated with the Granton Harbour development comprises: length of stone revetment to harbour, length of vertical quay to harbour, backfilling of land protected by quay wall and stone revetment, formation of marina, extension to existing north mole breakwater and harbour dredging. *Granton Harbour, Edinburgh.*	11.5km	City of Edinburgh Council	Marine Licence Application – (06806) and (06807)	Granted	The development comprises the construction of a new marina in the western side of Granton Harbour, Edinburgh. The works were due to commence in the latter half of 2019. The scoping report for the development stated that Firth of Forth SPA qualifying species had been recorded foraging and roosting in the vicinity of the harbour. It was stated that within the report that an HRA would be undertaken. In initial consultation SNH advised that the qualifying species could be subject to disturbance and displacement during construction and operation and that there was the potential for temporary or permanent habitat loss through sediment release/changes in coastal processes. An HRA was undertaken and identified a potential long-term impact of displacement from foraging habitat for qualifying interests of the Firth of Forth SPA (except pink-footed goose) and Forth Islands SPA, although it was considered that there is sufficient alternative foraging habitat available such that it would not impact long term population viability. The HRA concluded that the potential long-term displacement impact would not result in AESI. Furthermore, sediment transport would be negligible and therefore have no effects on supporting habitat. SNH further supported the conclusion of the HRA report that there would be no AESI from the Proposed Works. A licence for the main works was granted by Marine Scotland in April 2019 (subject to conditions) and an application for listed building consent on the Western Breakwater Pier was submitted to Edinburgh City Council in January 2020 (ref: 20/00033/LBC, decision pending). The conditions on the Marine Licence included adherence to good practice measures including Guidance for Pollution Prevention and, where practicable, works being carried out at times of day which avoid low-tide feeding activity in order to minimise disturbance to birds.

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
					Given the distance of this development from the Proposed Works, and the conclusions and measures identified within the HRA, it is considered that the potential for in-combination effects is unlikely. **No potential for in-combination effects.**
Erection of Storage Warehouse Buildings (Class 6) with Associated Landscaping, Land to the South. *Midtown Blackgrange Road, Cambus, Clackmannanshire.*	31.5km	Clackmannanshire Council	18/00239/PAN	Response to Notice Issued	The proposal concerns the erection of storage warehouse buildings approximately 600m from the Firth of Forth SPA and Ramsar site and over 30km from the Forth Islands SPA, in Cambus. The proposal has been subject to a scoping opinion and SNH stated that it had concerns about the potential to disturb or displace the qualifying species or to reduce their foraging/roosting habitat. No further information is currently available. The proposal has not developed beyond scoping; no environmental information is available, nor an HRA. A timescale for this information is not available. Given the distances of this development from the Forth Islands SPA (over 30km) and the Firth of Forth SPA and Ramsar site (set back 600m from the River Forth), and likely construction methods and plant for a development of this nature, it is considered that in-combination effects are unlikely. **Based on the information available, in-combination effects are unlikely.**
Application for planning permission in principle for the construction, operation and decommissioning of an onshore substation, underground electricity cables and associated infrastructure required to export electricity from Inch Cape Offshore Limited's proposed offshore wind farm to the National Electricity Transmission System	28km	East Lothian Council	16/00021/PAN 17/00008/PAN 18/00189/PPM	Planning Permission in Principle Granted	The proposed Inch Cape Offshore Wind Farm would be located in the outer Firth of Tay, 15km off the Angus coast. A network of low voltage electricity cables would be required to connect the wind turbines to offshore substation platforms. The export electricity cables would be brought ashore at Cockenzie, in East Lothian, where a short section of underground cables would take the power to an onshore substation for conversion to national grid voltage. A further run of cables would lead to the grid connection point at the existing Cockenzie power station substation. The Offshore Export Cable passes through the Firth of Forth SPA where it makes landfall at Cockenzie. A previous Information to Inform a HRA (IIHRA) document covered a landfall location 300m further east along the shore and concluded that there would be no adverse impact on the integrity of the Firth of Forth SPA. An updated document (SDIC/Red Rock Power Limited, 2018) was produced and utilised the same qualifying species information as the original assessments. The updated IIHRA concluded that the conclusions from the original HRA remained valid and no adverse effects on the integrity of the Firth of Forth SPA were predicted.

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
Former Cockenzie Power Station Site, Prestonpans, East Lothian.					The application was called in by Scottish Ministers in April 2018, planning permission was granted in February 2019 and consent to construct the scheme was granted in June 2019. The works associated with this proposal have the potential for disturbance to qualifying interests within the Firth of Forth SPA and Ramsar. However, given the location of the project in relation to the FRB, and the conclusions of the HRA, including the requirement for the proposal to adopt mitigation measures in consultation with NatureScot to be approved by the Council, it is considered unlikely for there to be potential for any in-combination effects. **No potential for in-combination effects.**
Musselburgh Flood Protection Scheme *Musselburgh, East Lothian.*	22km	East Lothian Council	n/a	Options Appraisal	Flood defences are proposed to be constructed along the River Esk and along the coastal boundary of the Firth of Forth SPA and Ramsar site for approximately 1.9km. The site is 22km from LCI and over 10km from the area designated around Inchmickery Island, both part of the Forth Islands SPA. An options appraisal process has been undertaken and the preferred Scheme was approved by the Council's cabinet on 21 January 2020. No further information is currently available. The scheme is in development, with the EIA Report and HRA currently in progress. There is the potential for the scheme to be constructed concurrently with the FRB maintenance works, however there is currently no further information publicly available. It is therefore not possible to undertake a full in-combination assessment with the Proposed Works. Based on the distance of this development from the Forth Islands SPA however, no in-combination effects are predicted with this site. Whilst construction may result in localised disturbance and small-scale habitat loss for qualifying interests of the Firth of Forth SPA and Ramsar, based on the limited predicted effects resulting from the Proposed Works on qualifying interests of this site, it is considered that in-combination effects are unlikely. **An in-combination assessment is not possible at this time; however, based on the information available, in-combination effects are unlikely.**
Restoration of remaining ash lagoons (numbers 6 and 8)	23km	East Lothian Council	17/00015/PAN	Unknown	The project is to cap and restore the remaining ash lagoons (Lagoons 6 and 8) at Levenhall Links, Musselburgh. The concept for Lagoon 8, which is part of the Firth of Forth SPA, is to create an area similar to that which the birds had when the lagoon was in operation, as this proved successful in attracting wading birds, but required better protection from predators and human disturbance. Lagoon 8 is therefore to become an island with a moat

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
Site At Levenhall Links, Musselburgh, East Lothian.					surrounding the lagoon which will act as a natural barrier from human disturbance and predation. Lagoon 6 is outside of the SPA boundary and is to be restored to have a large naturally developing area, with footpath and water supply. The base of the lagoon will be profiled to create low areas covered with clay which will flood to create environments to encourage birds. The HRA stated that it is "*considered that a significant level of disturbance currently exists within and adjacent to the Application Site*." In addition, survey results suggested a significant reduction in the bird populations at Lagoon 8 and therefore "*the temporary loss of habitat and potential displacement (from habitat loss and disturbance) at Lagoon 8 will not be significant for the qualifying species*" of the SPA. The HRA concluded no adverse effect on site integrity. The HRA also concluded that, "*with the implementation of the proposed restoration plan it is considered that the habitat suitability for the Firth of Forth SPA bird species will be significantly increased, and it is anticipated that this will have a positive effect on the SPA conservation objectives*." (Neo Environmental Ltd, 2018). Construction was intended to commence in the first quarter of 2019, however there is no evidence to suggest this has happened. There is the potential for the scheme to be constructed concurrently with the FRB maintenance works, however there is currently no further information available on the timing of the delivery of this project. Given the location of the ash lagoons, and the conclusions of the HRA, it is considered the potential for any in-combination effects is unlikely. **No potential for in-combination effects.**
Erection of rowing boat store/clubhouse *Car Park At Fisherrow Harbour, New Street, Musselburgh, East Lothian.*	21.5km	East Lothian Council	19/00370/P	Grant Planning Permission	Construction of a boat house for Eskmuthe Rowing Club to store coastal rowing skiffs. The building was consented in September 2019 and is to be constructed in a car park and adjacent to existing buildings. There is the potential for the building to be erected when the Proposed Works are taking place, however the timescale and programme is not provided with the application. The proposed building is approximately 45m from the SPA/Ramsar and in an already disturbed area with people frequently using the beach and vehicular movement in Fisherrow Harbour car park. There is considered to be no significant increase in visual disturbance and noise will likely attenuate to acceptable levels. Planning permission is granted, however it is stated that other consents under relevant statutory enactments as required must also be in place. Therefore, it is assumed that the development will be required to undertake an HRA if it is considered that there is any potential for the

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
					works to impact the SPA/Ramsar. Given the location of the project in relation to the FRB, and the requirement for the proposal to demonstrate no adverse effects on the Firth of Forth SPA/Ramsar, it is considered unlikely for there to be any in-combination effects. **No potential for in-combination effects.**
Onshore substation, underground electricity cables and associated temporary and permanent infrastructure to export electricity from the Seagreen Offshore Wind Farm into the national electricity transmission system network *Land Adjacent To Cockenzie Substation, Cockenzie, East Lothian.*	27km	East Lothian Council	20/00010/PAN	Granted	A proposal of application notice has been submitted for an onshore substation, underground cables and associated temporary and permanent infrastructure to export electricity from Seagreen Offshore Wind Farm. The proposed activity was considered to be acceptable by East Lothian Council in November 2020. A Marine Licence pre-application has been submitted. Given the location of the proposal, there is the potential for the works to cause disturbance to qualifying interests of the designated sites, however no ecological assessment has been made available to accompany the application yet. Full planning application has yet to be granted for the works, and a Marine Licence is also yet to be consented. Given the location of the project in relation to the FRB, and the requirement for the proposal to demonstrate no adverse effects on European sites, it is considered unlikely for there to be potential for any in-combination effects. However, as timescales and further details are not yet known an in-combination assessment cannot be undertaken. **An in-combination assessment is not possible at this time; however, based on the information available, in-combination effects are unlikely.**
Grangemouth Flood Protection Scheme *Grangemouth, Falkirk.*	39km	Falkirk Council		Options Appraisal	The flood protection scheme is being advanced as a formal flood protection scheme under the Flood Risk Management (Scotland) Act 2009. The environmental impact assessment is ongoing. The programme currently assumes construction will start in 2024. The scheme is in development, with the EIA Report and HRA currently in progress. There is the potential for the scheme to be constructed concurrently with the Proposed Works. As further details are not yet known a full in-combination assessment cannot be undertaken. Based on the distance of this development from the Forth Islands SPA however (39km), no in-combination effects are predicted with this site. Whilst construction of the development may result in some disturbance and habitat loss for qualifying interests of the Firth of Forth SPA and Ramsar, based on the limited predicted effects resulting from the Proposed Works on qualifying interests of this site, it is considered that in-combination effects are unlikely.**An in-combination assessment is not possible at this time;**

Project/Plan Application Name	Approximate Distance from Forth Road Bridge	Council	Planning Application and/or Marine Licence Reference Number	Status or Decision	Description of the Project/Plan and Potential for In-Combination Effects
					however, based on the information available, in-combination effects are unlikely.
Demolition and reconstruction of piled viaduct section of bridge, construction works to allow formation of temporary bridge, replacement of temporary safety barrier, refurbishment of timber jetties, replacement of bridge drainage system, installation of navigation lights and gauge boards, and general maintenance including bearing maintenance, replacement of sliding plates at bridge half joints, concrete repairs, repainting and resurfacing / re-waterproofing *Kincardine Bridge, Airth.*	21.5km	Falkirk Council	P/20/0595/LBC	Awaiting decision	The proposal relates to listed building consent for works to the Kincardine Bridge. Transport Scotland have undertaken an EIA Report and an HRA for the Proposed Works, which are published on their website (Transport Scotland 2020a, 2020b). The HRA concludes no AESI on the Firth of Forth SPA/Ramsar, alone or in combination with other projects and plans. The assessments identified the potential for disturbance of qualifying interests of the Firth of Forth SPA/Ramsar/SSSI, and temporary loss of habitat within these designated sites. However, with the application of mitigation, the EIA Report concluded no significant residual effects with regard to ecology, and the HRA concluded no AESI. A Marine Licence application is not yet available for the scheme, however the EIA Report and HRA indicate a proposed start date for construction of summer 2021, with a construction period of 18-24 months. Currently the scheme is awaiting consents, however, if consented, the Proposed Works are likely to be concurrent with this scheme. However, with the implementation of mitigation identified within the HRA and EIA Report to safeguard the Firth of Forth SPA and Ramsar site, it is considered that there are no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Maintenance dredging - Port of Grangemouth *Port of Grangemouth, Grangemouth.*	18km	Falkirk Council	Marine Licence Application – (07120)	Granted consent	The licence application covers the maintenance dredging at the Port of Grangemouth in the training channel, bellmouth and docks. This site has been previously dredged (periodic maintenance), under licence, to maintain safety of navigation. The proposed start date stated in the application was 01/02/2020 with a proposed completion date of 31/01/2023. These works are ongoing and will be concurrent with the Proposed Works. Dredging in the bellmouth is carried out over approximately four to five days each month and dredging within the docks is carried out in conjunction usually taking place over a four month period towards the latter half of the year. The Best Practice Environmental Option Report which accompanies the application states that "*[g]iven that disposal*

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					was an existing activity and ongoing disposal is at a similar scale to previous disposal activities it is considered that the proposals will not have significant effects on the qualifying interest of the SPA." As the dredging is an ongoing activity that has been undertaken previously it is considered that qualifying interests of the European sites will be habituated to these activities and the works will be no more disturbing than background levels. It is therefore considered that there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Water injection maintenance dredging - Grangemouth and Leith Locks *Grangemouth Locks, Grangemouth and Leith Locks, Leith.*	18km	Falkirk Council and City of Edinburgh Council	Marine Licence Application – (00008842)	Application	A Marine Licence application has been submitted for Water Injection Dredging (WID) of engineered surfaces within Forth Ports jurisdiction e.g. Grangemouth and Leith locks and dock entrances. The works will include flushing the agitated material back into the estuary, from where it originated. The site at Grangemouth has been previously dredged (periodic maintenance), under licence, to maintain safety of navigation. The proposed start date stated in the application was 10/08/2020 with a proposed completion date of 09/08/2023. No detrimental impacts to the surrounding environment were identified. Furthermore, Forth Ports do not foresee any negative impacts from this work based on the results of analysis of sediment samples from recent licence applications. Dredging would be expected to be carried out over approximately three to four days during each campaign as part of the routine maintenance at the locks. The proposal is small scale and dredging activities will be short-term nature over the period for which the licence is granted. Furthermore, as dredging has been undertaken previously, and is ongoing as part of maintenance, it is considered that qualifying interests of the European sites will be habituated to these activities and the works will be no more disturbing than background levels. It is therefore considered that there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Final capping of remaining ash lagoons and associated engineering works, including the erection of a wind turbine of up to 11.8m blade-tip height	12.5km	Fife Council	18/01662/FULL 18/00339/SCR	Application permitted with conditions October 2020	Proposals to cap the final three ash lagoons located at Low Valleyfield, east of Culross, to preserve their integrity and promote biodiversity. This will also include re-grading and the removal of physical infrastructure. The area is immediately adjacent to the Firth of Forth SPA and Ramsar site. SNH considered that two of the lagoons acted as supporting habitat for qualifying species of the Firth of Forth SPA. Furthermore, they stated that did not agree with the conclusions of the applicant's HRA which concluded that there would be no adverse effect on the integrity of the SPA. It was

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Valleyfield Ash Lagoons, Main Street, Low Valleyfield Dunfermline, Fife KY12 8TY.					NatureScot's view that the proposed mitigation within the HRA was not adequate to avoid an adverse effect on the integrity of the SPA (SNH, 2018b). One of the conditions of the application approval is for a final, detailed restoration scheme for the application site to be submitted to Fife Council as Planning Authority for approval, in consultation with NatureScot and RSPB Scotland. Therefore, for the proposal to go ahead either appropriate mitigation or compensation would be required. The project now includes the erection of a wind turbine of a height <11.8m to blade tip. The final details of the proposed wind turbine shall be submitted for the written approval of Fife Council as Planning Authority. The capping of the lagoons may result in a loss of supporting habitat for qualifying species of the Firth of Forth SPA. However, the Proposed Works are localised to the FRB and will not result in a loss of habitat within the Firth of Forth; therefore, there is no potential for in-combination effects with regard to habitat loss. There is the potential for the capping of the lagoons (and associated works) to be undertaken concurrently with the Proposed Works, however, the proposal is considered to be sufficiently distant for there to be no likely in-combination effects with regard to disturbance of qualifying interests. Furthermore, the planning permission is conditional on approval of a detailed restoration scheme, CEMP, specification of the wind turbine, amongst others, to ensure protection of environmental features including the Firth of Forth SPA and Ramsar. Therefore, it is considered there will therefore be no in-combination effect and no adverse effect on site integrity. **No potential for in-combination effects.**
Change of use from car park/storage area for the siting of three shipping containers for use as studio/workshop units (Class 10), siting of two shipping containers for storage space, siting of toilet unit and external alterations and re-	230m	Fife Council	19/03689/FULL	Application Permitted with Conditions	The proposed development is for the siting of shipping containers within an area at North Queensferry Harbour to be used as studio/workshop, storage and addition of a toilet unit. The development site is an area of hard standing used as a car park approximately 630m^2 in size, set back from the Firth of Forth. The construction phase of the development has the potential to be undertaken at the same time as the Proposed Works, however, given the location and the nature of the development it is considered likely that there would not be considerable disturbance above background level. Furthermore, ecological concerns were not identified in the planning application, nor were there conditions within the permission that related to

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roofing of existing store *North Queensferry Harbour, Ferry Road, North Queensferry, Inverkeithing, Fife, KY11 1HW.*					protection of designated sites. It is considered that, despite the proximity to the bridge, there is no potential for in-combination disturbance with the Proposed Works. **No potential for in-combination effects.**
Temporary testing of a reactive engine on moveable test bed; storage of ancillary equipment within isocontainers; short-term (up to five days) storage within pre-fabricated bunds of 400kg of kerosene and 2000kg of hydrogen peroxide. (Maximum of three tests per month/duration of tests 1-3 minutes). *Land To West Of Caledonia Road, Rosyth Business Park, Rosyth, Fife.*	4km	Fife Council	19/02632/CLP	Application Permitted - no conditions	A certificate of lawfulness was approved for the temporary testing of a reactive engine and storage of kerosene, hydrogen peroxide and ancillary equipment. A noise and environmental assessment were undertaken to accompany the application which identified that the level of noise at 150m would be 72dB. Given the location of the engine site to the Firth of Forth (i.e. set back from the estuary), it is unlikely that the noise generated would have a significant disturbing effect on qualifying interests. In relation to the potential for accidental spillage of harmful materials, it was concluded that dilution with water would minimise the impact on the environment. The proposed testing regime states a maximum of three tests a month of 1-3 minutes' duration. It is not clear if this testing regime has been completed; however, in absence of further information, it is considered that this may be ongoing. However, given the nature of the works, in-combination disturbance effects with the Proposed Works is unlikely. **No potential for in-combination effects.**
Maintenance dredging and sea deposit - Port of Rosyth, Fife *Port of Rosyth, Fife.*	400m	Fife Council	Marine Licence Application – (00008987)	Application	The licence application covers the maintenance dredging at the Port of Rosyth and Rosyth Approach Channel to ensure appropriate depths of water to maintain operations. The site has been maintained previously under licence (06448/18/2) which expires on 11/02/2021. The proposed start date stated in the application is 12/02/2021 with a proposed completion date of 11/02/2024. Dredging would be expected to be carried out over approximately four to five days during each campaign, during the spring and autumn, as part of the routine maintenance at the ports, with disposal of material (up to 520,000 tonnes per year) to east of Inchcolm Island, east of the FRB. The proposal is small scale and dredging

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					activities will be of a short-term nature, undertaken over a three year period. Furthermore, as dredging has been undertaken previously, and is ongoing as part of maintenance, it is considered that qualifying interests of the European sites will be habituated to these activities and the works will be no more disturbing than background levels. It is therefore considered that there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Proposal of application notice for mixed use development including approximately 180 residential units, holiday lodges, access, open space, landscaping, SUDS and associated infrastructure. Proposal of application notice for mixed use development including approximately 180 residential units, holiday lodges, access, open space, landscaping, SUDS and associated infrastructure. *Prestonhill Quarry, Preston, Crescent, Inverkeithing, Fife.*	2.5km	Fife Council	20/02785/PAN 20/03263/PAN 20/02468/SCR 19/00784/PREAPP	Awaiting Decision	The proposed development is a large residential development on land adjacent to the Firth of Forth at Inverkeithing, Fife. Full planning application for the proposal has yet to be submitted, and the proposal of application notice has yet to be decided. No environmental information is available, nor an HRA. A timescale for this information is not available and as such it is not possible to determine what, if any, LSEs or adverse effects may occur on the Firth of Forth SPA. **An in-combination assessment is not possible at this time.**
Section 42 application to amend Conditions 3 and 15 of approval 17/00551/EIA (re-profiling of foreshore and placement of	5km	Fife Council	20/01617/FULL 17/00551/EIA	Application Permitted with Conditions	Application to amend conditions of approved consent for works to the foreshore and jetty at Dalgety Bay. The proposal comprises: the re-profiling of the foreshore and placement of a geotextile membrane and a rock armour cover system to isolate radium contamination; the removal of higher activity radium material from targeted foreshore areas; and the removal and replacement of jetty and slipways. The site was contaminated

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geotextile membrane and rock armour cover system to isolate radium contamination; removal of higher activity radium material from targeted foreshore areas; removal of existing jetty and slipways to allow screening/removal of radioactive particles and replacement with new slipway and jetty structure; creation of compound and ancillary works) - to amend timing of works and jetty requirements. *Land To The East Of The Wynd, Dalgety Bay, Fife.*					with radium-226, potentially as a result of the incineration and burial of military instruments containing luminescent paint. The application site boundary includes a small area of the Firth of Forth SPA, Ramsar and SSSI, therefore there will be a small area of habitat loss (0.09ha of mudflat), as well as the potential for disturbance to qualifying interests of the designated sites. The application is permitted, however, conditions of the approval include the requirement for a CEMP to be prepared before works start, in addition to further documents to be submitted to the council, appointment of an ECoW, amongst others. The initial consultation response from SNH stated that the proposal would not have an AESI on Firth of Forth SPA/Ramsar or Forth Islands SPA provided conditional and legal agreements are adhered to, to ensure that the proposed working methods will not cause disturbance. The original planning application was approved in 2017, but this amendment seeks to extend the planning application validity until three years from the date of decision. The first phase of the Proposed Works was due to start in in April 2020 and be completed in September 2020. The second phase of work is planned to begin in April 2021 and be completed in September 2021 (UK Parliament, 2020).Therefore, whilst some works are likely to be concurrent with some of the Proposed Works, there is likely to be only a limited overlap. Therefore, given this timescale, and the mitigation in place for the development, the potential for in-combination disturbance effects with the Proposed Works on the FRB are unlikely. **No potential for in-combination effects.**
Redevelopment of former Power Station site with a mix of Class 4 (Business), 5 (General Industrial) and 6 (Storage and distribution) Uses, service facilities, SUDS, landscape works and associated development at Longannet Power Station, Fife.	24km	Fife Council	19/02331/EIA 19/00627/PAN	Application Permitted with Conditions	Planning permission has been granted for the redevelopment of the former power station. The total development area is 122.8ha on the site of Longannet Power Station, and is adjacent to the Firth of Forth, albeit set back from the shore front. The boiler house at the power station was demolished by controlled explosion on 4 February 2021 (BBC, 2021). The remaining redevelopment works at Longannet Power Station may be concurrent with the Proposed Works. Supporting documentation for the proposal included an EIA report and an HRA, the latter of which concluded no adverse effect on site integrity for the Firth of Forth SPA. The HRA concluded that due to the nature of the development and the responses of birds to disturbances, there would be no adverse effect on site integrity of the Firth of Forth SPA. Furthermore, there is no land-take from the Firth of Forth SPA/Ramsar proposed as part of the

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Longannet Power Station, Fife.					redevelopment, therefore the availability of habitat for waders and waterfowl will not change. It is therefore considered that there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Fife Energy Park Offshore Demonstration Wind Turbine / 2-b Energy Demonstrator Turbine / Forthwind Offshore Windfarm - Methil. *Fife Energy Park, High Street, Methil, Fife.*	31km	Fife Council	18/03383/FULL Marine Licence Application – (06652)	Application Permitted with Conditions Marine licence granted	Construction and operation of an offshore demonstration wind turbine approximately 45 m offshore, with a total area of 0.54 km^2. The EIA for the project identified that birds in the Firth of Forth SPA may be affected by the loss or change of habitats to accommodate the development, disturbance due to construction/ decommissioning or the presence and operation of the turbines, acting as a barrier to regular movements of birds and collision with the rotors. The potential effects of the project were considered in combination with the consented Hydrogen Office turbine located to the north east of Methil at Innerleven. A demonstration turbine (of various types) on a platform is located within the intertidal zone at Methil, Fife. In August 2018 the existing consent was varied to extend the operational life by a further 10 years, i.e. up to 15 years. The Appropriate Assessment concluded that the area immediately adjacent to the development site did not appear to be particularly high-value foraging habitat, and the SPA would not be adversely affected. It furthermore stated that "*any potential cumulative and in combination effects will not adversely effect the integrity of any SPA*". Marine licence application for the continued operation and deposit of the Demonstration Turbine was consented in 2018. Given the location of the project in relation to the FRB, and the conclusions of the Appropriate Assessment for the proposal, it is considered unlikely for there to be potential for any in-combination effects. **No potential for in-combination effects.**
Creation of an international container terminal capable of simultaneously accommodating two container ships with a capacity in the range of 500 - 2000 Twenty-foot Equivalent Units (TEU)	2.5km	Fife Council	Marine Licence Application - (n/a)	Pre-application	The proposal is for the development of a container port at Rosyth. The site is adjacent to the Firth of Forth SPA and dredging within the Firth of Forth itself would be required. The proposal went through public local inquiry in 2012 and revised Harbour Revision Orders were submitted in 2013. In response to this, an application for a Marine Licence for all in-estuary works was initiated by production of a scoping report. However, a Marine Licence was not submitted, although the terminal may still be under consideration for development.

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Rosyth, Fife.					The revised Harbour Revision Orders requires a successful application for a Marine Licence to allow it to proceed. An HRA is required to accompany that application. No licence has been submitted and it is therefore not possible to determine what, if any, LSEs or adverse effects on European sites may occur. In addition, no timescale is available for further development of this Marine Licence. An in-combination assessment is therefore not possible. **An in-combination assessment is not possible at this time.**
Section 36 Consent – Construction and operation of wind farm, Seagreen Alpha and Bravo Wind Farm Area, Firth of Forth (including revised design and Optimised Project). *Firth of Forth.*		Scottish Offshore Waters	Marine Licence Applications – (051/OW/SG1-10), (04676), (04677), (04678).	Granted	Windfarm development under construction. A number of licence applications relate to this development. Seagreen Alpha and Seagreen Bravo Offshore Wind Farms and associated Transmission Infrastructure were awarded Marine Licences and Section 36 consents in October 2014. An application to vary the existing Section 36 consents was submitted in March 2018 and approved in August 2018, removing the maximum generating capacity of 525 MW from each consent. The Marine Licences for Seagreen Alpha and Seagreen Bravo were amended in August 2018 to bring them in line with the varied Section 36 consents. The Scottish Ministers authorised the assignation of the Seagreen Bravo Offshore Wind Farm Section 36 consent and transfer of the Marine Licence from Seagreen Bravo Wind Energy Limited to Seagreen Alpha Wind Energy Limited in December 2019. Works started in 2020, with 2023 identified as the final year of construction according to construction programme which was signed off in August 2020. Consent was conditional on this programme being submitted. A Marine Licence was initially granted in 2014, but subsequent consents have been awarded, including in 2019 where the licence transferred. Licence was granted subject to conditions, and in August 2020 these conditions were signed off and multi-stage consent given. Appropriate assessment for the windfarm concluded not AESI on designated sites (although not Firth of Forth not included) subject to compliance with conditions. Given the location of the windfarm, in addition to the conclusions of the Appropriate Assessment, it is considered there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Floating LiDAR System – Seagreen Offshore	>25km	Scottish Offshore Waters	Marine Licence Application – (06980)	Application	The application is for the deployment of a floating, buoy-mounted, LiDAR system within the Seagreen 2 project area for the measurement of wind speeds and other metocean data, including atmospheric temperature and

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Windfarm (Phase 2), Firth of Forth *Firth of Forth.*					pressure, water temperature and conductivity, waves and current speed and direction. Given the location and nature of the proposal, it is considered there is no potential for in-combination effects. **No potential for in-combination effects.**
Marine Licence application for the construction, operation and decommissioning of the Seagreen 1A offshore export cable to transport electricity from the Seagreen Offshore Wind Farm to landfall at Cockenzie, East Lothian *Land Adjacent To Cockenzie Substation, Cockenzie, East Lothian.*	2km	Scottish Offshore Waters	(n/a)	Pre-application	Pre-application for infrastructure works for the Seagreen Windfarm. The offshore transmission infrastructure for the Seagreen 1A Project consists of one high voltage export cable to mean high water springs (MHWS), cable landfall and connection to the onshore infrastructure. A separate planning application will be submitted to East Lothian Council for the onshore electricity transmission infrastructure (see planning application notice 20/00010/PAN East Lothian Council). A virtual public exhibition on the proposals will be available online from Monday 11th January 2021 to Monday 1st February 2021. As the Marine Licence has yet to be submitted, and subsequently consented, the timescales for the development are currently unknown. Given the location of the project in relation to the FRB, and the requirement for the proposal to demonstrate no adverse effects on the Firth of Forth SPA/Ramsar, it is considered unlikely for there to be potential for any in-combination effects. However, as timescales and further details are not yet known an in-combination assessment cannot be undertaken. **An in-combination assessment is not possible at this time; however, based on the information available, in-combination effects are unlikely.**
Section 36 Consent - Construction and Operation of Offshore Windfarm Transmission Works - Neart na Gaoithe Offshore Windfarm (Revised Design), Firth of Forth *Firth of Forth.*	>25km	Scottish Offshore Waters	Marine Licence Application - (050/OW/MainS-10), and (06677), (06678)	Granted	Section 36 consent granted on 3 December 2018 to Neart na Gaoithe Offshore Wind Limited ("NnNOWL") for the construction, operation and maintenance of the Neart Na Gaoithe Offshore Wind Farm, approximately 15.5km east of Fife Ness. On 8 January 2019, NnGOWL submitted an application to the Scottish Ministers for a variation to the existing Section 36 Consent to remove of references to transmission infrastructure (i.e. offshore substation platforms, interconnector cables and offshore export cables) from the Description of the Development in Annex 1 and from Conditions 12 and 22 of Annex 2 and amend the reference to maximum blade width in Annex 1 from 4.5m to 5.5m. A Validation of Appropriate Assessment was undertaken to corroborate the robustness and validity of the exiting AA for the development. SNH advised that it had no comments to provide in respect of the Variation Application but noted that the proposed changes make some very slight improvements to collision risk estimates for some seabird species.

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					Given the location of the windfarm, in addition to the conclusions of the Appropriate Assessment, it is considered there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Section 36 Consent Variation - Construction and Operation of Offshore Windfarm and Transmission Works - Inch Cape Offshore Windfarm (Revised Design), Firth of Forth *Firth of Forth.*	>25km	Scottish Offshore Waters	Marine Licence Application – (048/OW/RRP – 10)	Granted	This application refers to amendments to the consented Inch Cape Offshore Windfarm. The application made under Section 36C of the Electricity Act 1989, seeks to amend the maximum generating capacity of the Inch Cape Offshore Wind Farm from approximately 700MW to 1000MW. No amendments to physical parameters of the wind turbine generators or associated infrastructure are sought through this amendment. SNH had no further comments on the variation application, and the existing HRA and EIA Report remain valid. The Appropriate Assessment undertaken in 2019 stated *"SNH advised that there would be no adverse effect on the site integrity of any SPA or pSPA as a result of the Development in isolation."* Given the location of the windfarm, and the conclusions of the Appropriate Assessment undertaken for the windfarm, it is considered that there is no potential for in-combination effects with the Proposed Works. **No potential for in-combination effects.**
Demolition of existing buildings and erection of a 2850m^2 distillery building with access road, service buildings, landscaping and parking and conversion of Midhope Castle to provide visitor accommodation. *Midhope Castle Grounds, Abercorn, Newton, West Lothian, EH30 9SL.*	4.8km	West Lothian	0543/FUL/20	Awaiting Decision	The proposed development is for the demolition of existing buildings, the erection of distillery buildings and conversion of Midhope Castle for visitor accommodation. An Extended Phase 1 Habitat Survey was undertaken in March/April 2020 which noted the Firth of Forth SPA, Ramsar and SSSI being 580m north of the application site, however further recommendations or assessment were not undertaken. NatureScot's consultation response on the application states that an HRA is required due to the potential for the scheme to impact the Firth of Forth SPA. NatureScot state that there is likely to be LSE on the SPA (disturbance to birds that travel inland, and pollution/hydrological impacts) and an AA will be needed. Currently they object to the proposal. An HRA will be required for the development, and within this the developer will be required to demonstrate no AESI on any European site, of the project alone, or in-combination with other projects/plans (which will include the Proposed Works on the FRB). As the development will only be consented once it can be determined that it will not have an AESI, it is considered unlikely for there to be potential for in-combination effects with the Proposed Works.

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					An in-combination assessment is not possible at this time; however, based on the information available, in-combination effects are unlikely.

5.3 Assessment of the Firth of Forth SPA, Firth of Forth Ramsar and Forth Islands SPA

5.3.1 No projects or plans were identified that have the potential to act in-combination with the maintenance works to result in a cumulative effect on the Firth of Forth SPA, Firth of Forth Ramsar site or Forth Islands SPA.

5.3.2 As a result, it is concluded that there are no in-combination effects on the three sites. It is acknowledged, however, that potential future proposals adjacent to the estuary may act in combination with the Proposed Works, but it would therefore be for these future developments to take into account the results of this assessment, especially if works are concurrent.

6 Summary and Conclusions

6.1 Screening Assessment

6.1.1 Relevant European and Ramsar sites were selected by identifying ecological connectivity and the potential effects pathways from the project, particularly with regards to disturbance and direct mortality. Following further assessment of potential effects pathways from the Proposed Works, and consultation with NatureScot, including advice provided in relation to other Firth of Forth HRAs, eight sites were identified to be considered within the screening: Firth of Forth SPA and Ramsar; Forth Islands SPA, Outer Firth of Forth and St Andrews Bay Complex SPA; Imperial Dock Lock, Leith SPA; Loch Leven SPA; River Teith SAC; and Isle of May SAC.

6.1.2 Following the screening, it was concluded that the Proposed Works have the potential to result in LSEs on some of the qualifying features of the Firth of Forth SPA and Ramsar site and Forth Islands SPA, therefore there was a requirement to progress to Stage Two (AA) for those three sites. No LSEs were identified on the remaining five designated sites, and therefore no requirement for further assessment of these sites.

6.2 Appropriate Assessment

6.2.1 Implications for the Firth of Forth SPA and Ramsar and Forth Islands SPA's conservation objectives were avoided through design of the works programme and through application of mitigation measures. It is identified that mitigation to safeguard the conservation objectives of the breeding tern qualifying interests, through prevention of significant disturbance, will also contribute to safeguarding the conservation of other species of the SPAs and Ramsar sites.

6.2.2 Although a precautionary approach has been taken in relation to the anticipated programme and methods for the Proposed Works included in this HRA, the Contractor may identify requirements to amend these, for example due to bad weather delaying activities, or improved methods. If Proposed Works do change in nature or timing then a no worse environmental test will be undertaken by the Contractor, and NatureScot and/or Marine Scotland (as appropriate) will be consulted to confirm the protection of European and Ramsar sites is assured and the conclusions of the HRA remain valid.

6.2.3 With mitigation in place it is concluded that there will be no implications for the conservation objectives of the Firth of Forth SPA and Ramsar sites and the Forth Islands SPA for the five year duration of the Proposed Works. There will therefore be no adverse effects on site integrity (AESI) for the sites, either alone or in combination with other plans and projects.

7 References

Amey (2018) Local Investigation Report Forth Bridges Unit.

Amey (2019) Appropriate Assessment Forth Road Bridge Maintenance Works. Revision 0, dated 20/12/2019.

Antill, R., Buisson, R. and Pérez-Domínguez, R. (2016). Review of potential impact to ecological receptors of the Stour Estuary Several Order Application. APEM Scientific Report for Wash Mussels Ltd. Ref. 414003., May 2016, Final, 45 pp.

Bat Conservation Trust and Institution of Lighting Professionals (2018). Guidance Note 08/18 Bats and artificial lighting in the UK Bats and the Built Environment series. [Online] Available at: https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229 [Accessed February 2021].

Borgmann, K.L. (2011). A Review of Human Disturbance Impacts on Waterbirds. Audubon California 376.

Bregnballe, T., Aaen, K. and Fox, A.D. (2009). Escape distances from human pedestrians by staging waterbirds in a Danish wetland. Wildfowl Sp Iss 2: 115-130.

Brown, A. and Grice, P. (2005). Birds in England. T and AD Poyser, London.

Beale, C. M. and Monaghan, P. (2004) Human disturbance: people as predation-free predators? Applied Ecology. Vol: 41. Iss: 2. 335-343.

BirdLife International (2021) IUCN Red List for birds. [Online] Available at: http://www.birdlife.org [Accessed February 2021].

Burger, J. (1998) Effects of Motorboats and Personal Watercraft on Flight Behaviour over a Colony of Common Terns. The Condor. Vol: 100. Iss: 3. 528-534.

Burns, F., Eaton, M.A., Balmer, D.E., Banks, A., Caldow, R., Donelan, J.L., Douse, A., Duigan, C., Foster, S., Frost, T., Grice, P.V., Hall, C., Hanmer, H.J., Harris, S.J., Johnstone, I., Lindley, P., McCulloch, N., Noble, D.G., Risely, K., Robinson, R.A. & Wotton, S. (2020) The State of the UK's Birds. RSPB, BTO, WWT, DAERA, JNCC, NatureScot, NE and NRW.

BBC (2021). Boiler house demolished at Longannet in Fife controlled explosion. [Online] Available at: https://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-55936720. [Accessed February 2021]

CIRIA (2015). Coastal and Marine Environmental Site Guide (Second edition).

Cooke, A.S. (1987). Disturbance by anglers of birds at Grafham Water. Pp 15-22 in: Maitland & Turner (Eds) 1987 Angling and Wildlife in Fresh Waters. ITE Symposium No. 9. ITE, Merlewood.

Cramp, S., and K. E. L. Simmons (1983). The Birds of the Western Palearctic, Volume 3: Waders to Gulls. Oxford University Press, Oxford, United Kingdom.

Currie, F. & Elliott, G. (1997). Forests and Birds: A Guide to Managing Forests for Rare Birds. Forestry Authority, Cambridge and Royal Society for the Protection of Birds, Sandy, UK.

Cutts, N. and J. Allen. (1999). Avifaunal Disturbance Assessment, Flood Defence Work, Saltend. Report to the Environment Agency.

Cutts, N., Phelps, A. and Burdon, D. (2009). Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Available from: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010001/EN010001-005116-HPC-NNBPEA-XX-000-RET-

000089%201.pdf.

Cutts, N., Hemmingway, K. and Spences, J. (2013). Waterbird Disturbance Mitigation Toolkit Version 3.2. Informing Estuarine Planning & Construction Projects [Online] Available at: http://bailey.persona-pi.com/Public-Inquiries/M4%20-%20Revised/11.3.67.pdf [Accessed February 2021]

David Tyldesley and Associates (2015). Habitats Regulations Appraisal of Plans: Guidance for Plan-making Bodies in Scotland. Version 3.0. January 2015.

Dierschke, V., Furness, R. and Garthe, S. (2016). Seabirds and offshore wind farms in European waters: Avoidance and attraction. Biological Conservation. 202. 59-68. 10.1016/j.biocon.2016.08.016.

Erwin, R. M. (1989) Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. Colonial Waterbirds. Vol: 12 No: 1. 104-108.

European Commission (2000a). Managing Natura 2000 Sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b). Communication from the Commission on the Precautionary Principle.

European Commission (2001). Assessment of plans and projects significantly affecting Natura 2000 sites Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

European Commission (2007). Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the Concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission. January 2007.

European Commission (2011). Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones: With particular attention to port development and dredging. January 2011.

European Commission (2018) Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.

Gittings, T. and O'Donoghue, P. (2016). Disturbance Response of Red-breasted Mergansers *Mergus serrator* to Boat Traffic in Wexford Harbour. Irish Birds. 10. 329-334.

Goodship, N. and Furness, R.W. (2019). Seaweed Hand-Harvesting: Literature Review of Disturbance Distances and Vulnerabilities of Marine and Coastal Birds. Scottish Natural Heritage Research Report No. 1096.

Gremillet, D., Schmid, D. Culik, B. Energy requirements of breeding great cormorants *Phalacrorax sinensis*. Mar Ecol Prog Ser. Vol:121. 1-9.

IECS (2007) Collision Risk Assessment: Humber Gateway Offshore Wind farm, IECS.

Institution of Lighting Professionals (2011). Guidance Notes for the Reduction of Obtrusive Light GN01:2011 [Online] Available at: https://www.theilp.org.uk/documents/obtrusive-light/ [Accessed February 2021]

IUCN (2021). The IUCN Red List of Threatened Species. Version 2020-3. [Online] Available at: https://www.iucnredlist.org [Accessed: February 2021]

Jacobs Arup (on behalf of Transport Scotland) (2009). Forth Replacement Crossing. Report to inform

an Appropriate Assessment for the Firth of Forth SPA.

Jacobs Arup (on behalf of Transport Scotland) (2009). Forth Replacement Crossing. Report to inform an Appropriate Assessment for the Forth Islands and Imperial Dock Lock, Leith SPAs.

Jacobs Arup (2018). Forth Replacement Crossing End of Project Report on Estuarine Bird Ecology: 2008 to 2017.

Jacobs (2020) Notes from meeting between Jacobs, NatureScot and Marine Scotland, 5 October 2020 (*internal communication*)

Jacobs / Faber Maunsell / AECOM (2007). Transport Scotland Strategic Transport Projects Review. Firth of Forth Tern Survey 2007. Report by Faber Maunsell/AECOM to Jacobs, November 2007

Jarret, D., Cook, A.S.C.P., Woodward, I., Ross, K., Horswill, C., Dadam, D. and Humphreys, E.M. (2018). Short-Term Behavioural Responses of Wintering Waterbirds to Marine Activity. Scottish Marine and Freshwater Science Vol 9 No 7.

Jennings, G. (2012) The Ecology of an Urban Colony of Common Terns *Sterna hirundo* in Leith Docks, Scotland.

Kaiser, M.J., Galanidi, M., Showler, D.A., Elliott, A.J., Caldow, R.W.G., Rees, E.I.S., Stillman, R.A. and Sutherland, W.J. (2006). Distribution and behaviour of common scoter relative to prey resources and environmental parameters. In Wind, Fire and Water: Renewable Energy and Birds. Ibis 148 (Suppl. 1): 110–128.

Kirkham, I. R., P. L. McLaren and W. A. Montevecchi. (1985). The food habits and distribution of Northern Gannets, *Sula bassanus*, off eastern Newfoundland and Labrador. Canadian Journal of Zoology 63:181-18

Knowles, C (2017). Forth Islands Tern Warden – Season Report 2017. Roseate Tern LIFE Recovery Project. *Unpublished document.*

Knowles, C (2018). Forth Islands Tern Warden – Season Report 2018. Roseate Tern LIFE Recovery Project. *Unpublished document.*

Knowles, C (2019). Forth Islands Tern Warden – Season Report 2019. Roseate Tern LIFE Recovery Project. *Unpublished document.*

Knowles, C (2021). Long Craig Island Tern Colony Report 2015-2020. *Unpublished document.*

Laursen, K., Kahlert, J. and Frikke, J. (2005). Factors affecting escape distances of staging waterbirds. - Wildl. Biol. 11: 13-19.

Liley, D., Stillman, R. and Fearnley, H. (2010). The Solent Disturbance and Mitigation Project Phase 2: Results of Bird Disturbance Fieldwork 2009/10. Footprint Ecology / Solent Forum.

Liley, D., Cruickshanks, K., Waldon, J. and Fearnley, H. (2011). Exe Estuary Disturbance Study. Footprint Ecology, Wareham. Ibis (2006), 148, 110–128.

Marine Scotland (2021). National Marine Plan Interactive. Available at: https://marinescotland.atkinsgeospatial.com/nmpi/ [Accessed February 2021].

Mathers, R.G., Watson, S., Stone, R. and Montgomery, I. (2000) A study of the impact of human disturbance on Wigeon *Anas penelope* and Brent Geese *Branta bernicla hrota* on an Irish sea loch. Wildfowl 51:67-81.

Mendel, B., Sonntag, N., Wahl, J., Schwemmer, P., Dries, H., Guse, N., Müller, S. and Garthe, S. (2008). Profiles of seabirds and waterbirds of the German North and Baltic Seas. Distribution, ecology and sensitivities to human activities within the marine environment. Naturschutz und Biologische Vielfalt 61. Bundesamt für Naturschutz. Bonn–Bad Godesberg, Germany

Met Office (2021). Cold Weather Alerts. [Online] Available at: https://www.metoffice.gov.uk/weather/warnings-and-advice/seasonal-advice/cold-weather-alerts [Accessed February 2021]

McKay, H., Furness, R., Russell, L. I., Parrott, D., Rehfisch, M., Watola, G., Packer, J., Armitage, M., Gill, E. and Robertson, P. (1999). The assessment of the effectiveness of management measures to control change by fish-eating birds to inland fisheries in England and Wales. York: MAFF.

NatureScot (2020a). Ramsar sites [Online] Available at:: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/international-designations/ramsar-sites [Accessed December 2020].

NatureScot (2020b). Habitats Regulations Appraisal (HRA) [Online] Available at: https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra [Accessed December 2020]

NatureScot (2021a). Firth of Forth Ramsar [Online] Available at: https://sitelink.nature.scot/site/8424 [Accessed February 2021].

NatureScot (2021b). Firth of Forth SPA [Online] Available at: https://sitelink.nature.scot/site/8499 [Accessed February 2021].

NatureScot (2021c). Forth Islands SPA [Online] Available at: https://sitelink.nature.scot/site/8500 [Accessed February 2021].

NatureScot (2021d). Imperial Dock Lock, Leith SPA [Online] Available at: https://sitelink.nature.scot/site/8668 [Accessed February 2021].

NatureScot (2021e). Isle of May SAC [Online] Available at: https://sitelink.nature.scot/site/8278 [Accessed February 2021].

NatureScot (2021f). Loch Leven SPA [Online] Available at: https://sitelink.nature.scot/site/8530 [Accessed February 2021].

NatureScot (2021g). Loch Leven RAMSAR [Online] Available at: https://sitelink.nature.scot/site/8436 [Accessed February 2021].

NatureScot (2021h). Outer Firth of Forth and St Andrews Bay Complex SPA [Online] Available at: https://sitelink.nature.scot/site/10478 [Accessed February 2021].

NatureScot (2021i). River Teith SAC [Online] Available at: https://sitelink.nature.scot/site/8367 [Accessed February 2021].

NatureScot (2021j). Seals. Available at: https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/seals [Accessed February 2021].

NatureScot (2021k) Habitats Regulations Appraisal (HRA): likely significant effects, Available at: https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-likely [Accessed February 2021].

NatureScot (2021l) Transport Scotland (per BEAR Scotland) - 5 Year Maintenance - Forth Road Bridge. Consultation response dated 17 March 2021.

Neo Environmental (2018). Habitats Regulations Appraisal (HRA). Restoration of remaining ash lagoons at Levenhall Links, Musselburgh.

Nisbet, I. C. T. (2000). Disturbance, habituation, and management of waterbird colonies - Commentary. Waterbirds 23 (2):312-332.Pienkowski, M.W. and Clark, H.A. (1979). Preliminary results of winter dye-marking on the Firth of Forth, Scotland. Wader Study Group Bulletin 27: 16–18.

Rodgers Jr, J. A. and Smith, H. A. (1995) Set-Back Distances to Protect Nesting Bird Colonies from Human Disturbance in Florida. Conservation Biology. Vol: 9. No:1. 89-99.

Rodgers Jr, J. A. and Schwikert, S. T. (2002) Buffe-Zone Distances to Protect Foraging and Loafing Waterbirds from Disturbance by Personal Watercraft and Outboard-Powered Boats. Conservation Biology. Vol: 16, No: 1. 216-224.

Royal Society for the Protection of Birds (2015) Birds of Conservation Concern 4. Available at: https://www.rspb.org.uk/globalassets/downloads/documents/birds-and-wildlife/birds-of-conservation-concern-4--the-population-status-of-birds-in-the-united-kingdom-channel-islands-and-the-isle-of-man.pdf [Accessed February 2021].

Ruddock, M. and Whitfield, D.P. (2007). A Review of Disturbance Distances in Selected Bird Species. Natural Research Ltd – Scottish Natural Heritage

Schwemmer, P., Mendel, B., Sonntag, N., Dierschke, V. and Garthe, S. (2011). Effects of ship traffic on seabirds in offshore waters: Implications for marine conservation and spatial planning. Ecological applications: a publication of the Ecological Society of America. 21. 1851-60. 10.2307/23023122.

Scottish Government (2012) Impact Assessment: Vulnerability of Scottish Seabirds to Offshore Wind [Online] Available at: https://www.gov.scot/publications/ [Accessed: February 2021]

Scottish Government (2019). Policy Note: The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 [Online] Available at: https://www.legislation.gov.uk/ssi/2019/113/policy-note/contents [Accessed February 2021]

Scottish Natural Heritage (2011) Long Craig Island Site of Special Scientific Interest Site Management Statement. [Online] Available at: https://sitelink.nature.scot/site/1658 [Accessed: February 2021]

Scottish Natural Heritage (2016a). Guidance: Assessing Connectivity with Special Protection Areas (SPAs). Version 3 - June 2016.

Scottish Natural Heritage (2016b) Habitats Regulations Appraisal (HRA) on the Firth of Forth. A Guide for Developers and Regulators. SNH, Inverness.

Scottish Natural Heritage (2018a). Planning e-bulletin - Scottish Government policy on protection of Ramsar sites.

Scottish Natural Heritage (2018b). Letter to Fife Council 3 August 2018 Reference CDM151211/A2680669.

Smit, C.J. and Visser, G.J.M. (1993). Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area. Wader Study Group Bulletin, 68, 6–19

The Royal Commission on Environmental Pollution (2009). Artificial Light in the Environment. The Stationery Office, Norwich, UK.

Transport Scotland (2009). Forth Replacement Crossing: Environmental Statement.

Transport Scotland (2020a) A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement – Environmental Impact Assessment Report.

Transport Scotland (2020b) A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement – Habitats Regulations Appraisal.

Triplet, P., Bacquet, S., Morand, M. E. and Lahilaire, L. (1998). La distance d'envol, un indicateur de dérangements: l'exemple de quelques espèces d'oiseaux en milieu estuarien. Alauda 66: 199–206.

van der Meer, J. (1985) De verstoring van vogels op de slikken van de Oosterschelde. Middelburg, Deltadienst Milieu en Inrichting

UK Parliament (2020). Radioactive Waste: Dalgety Bay: Written question – 241447. Asked on 5 April 2019. Available at: https://www.parliament.uk/business/publications/written-questions-answers-statements/written-question/Commons/2019-04-05/241447/ [Accessed January 2021]

Wolff, W. J., Reijenders, P. J. H. & Smit, C. J. (1982) The effects of recreation on the Wadden Sea ecosystem: many questions but few answers. Wissensch, 275, 85-107

Wright, G.A. (2003). Impact of cormorants on the Loch Leven trout fishery and the effectiveness of shooting as mitigation. In: I.G. Cowx (editor) Interactions between Fish and Birds: Implications for Management. Oxford: Fishing News Books, Blackwell Science.

Yalden, D. W., Yalden, P. E. (1989) The sensitivity of breeding Golden Plovers *Pluvialis apricaria* to human intruders. Bird Study. 36: 49-55.

Legislation

Birds Directive (2009). Directive 2009/147/EC on the conservation of wild birds (codified version of Directive 79/409/EEC) [2009]

Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019

Conservation (Natural Habitats &c.) Regulations 1994 (as amended).

Conservation of Habitats and Species Regulations 2017

Conservation of Offshore Marine Habitats and Species Regulations 2017

European Union (1992). Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna [1992].

Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001