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Forth Replacement Crossing Study Strategic Environmental Assessment Information to Inform Appropriate Assessment



Grant Thornton 

TRIBAL

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This report has been prepared to inform the Appropriate Assessment of the Forth Replacement Crossing Strategy. This document comprises the full version of the report with minor amendments to remove specific references to potentially vulnerable protected species. However, the removal of this specific information does not change the sense, conclusions or recommendations of this report.

Authorisation

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1 Introduction

1.1 Forth Replacement Crossing

1.1.1 Background

The existing Forth Road Bridge is showing signs of deterioration, mainly as a result of the growth and increase in weight of traffic together with the influence of the weather and climate. Due to this deterioration, it has been forecast that, at worst, restrictions on heavy traffic using the Forth Road Bridge may have to be imposed as early as 2013 with further restrictions to follow.

A Forth Replacement Crossing is therefore being considered as there is a lack of certainty that the existing Forth Road Bridge will be available in the future. Additionally, concerns over the future of the Forth Road Bridge have been exacerbated because it is recognised that the repair or refurbishment of the existing crossing is likely to have a severe impact on the east of Scotland economy if the bridge were to be closed or even severely restricted for a period of time during repair works.

The Forth Replacement Crossing Study (FRCS) is being progressed concurrently with the Strategic Transport Projects Review (STPR). The STPR, being undertaken by Transport Scotland, seeks to identify a programme of interventions that will make a significant contribution to the delivery of the National Transport Strategy (NTS) for the period 2012 – 2022. The Forth Replacement Crossing will form part of the STPR; however, due to its national significance and the implications of the forecasted restriction or closure of the Forth Road Bridge, it has been fast-tracked and is being progressed separately from the STPR.

Work undertaken on the FRCS to date has followed Scottish Transport Appraisal Guidance (STAG), an appraisal framework designed to aid transport planners and decision-makers in the development of transport policies, plans, programmes and projects in Scotland. The objective of this work has been to examine possible options for a replacement crossing and to recommend an option to the Scottish Ministers to be developed. The FRCS study comprises:

- *Report 1: Network Performance;*
- *Report 2: Gaps and Shortfalls;*
- *Report 3: Option Generation and Sifting;*
- *Report 4: Appraisal Report; and*
- *Report 5: Final Report.*

Following completion of the STAG appraisal, the Scottish Ministers expressed their support for a replacement crossing of the Forth although currently no final decision on the scope, form or location of the crossing has been made. Consequently, the Scottish Ministers decided that four fixed crossings options comprising three tunnel options and one bridge option should be subject to detailed consideration.

1.2 Appropriate Assessment

In considering these options, the Scottish Ministers determined that the study represented a *Strategy* for the replacement fixed crossing across the Firth of Forth. The wording of the draft Strategy for the Forth Replacement Crossing is as follows:

The Forth Replacement Crossing Strategy addresses the need to provide a fixed link across the Forth to replace the existing Forth Road Bridge. The draft Strategy includes a number of options which are currently under consideration including a bridge and tunnels at several locations. The final Strategy will set out the preferred option to be taken forward.

As such, it is subject to Strategic Environmental Assessment (SEA), as defined by the Environmental Assessment (Scotland) Act 2005, where an SEA is a systematic method for considering the likely environmental effects of plans, programmes and strategies.

Furthermore, article 6 (3) and (4) of the ‘Habitats Directive’¹ requires that plans and projects be subject to appropriate assessment where there is a potential impact on any Natura 2000 site. Specifically, article 6 requires that “*any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessments of its implications for the site in view of the site’s conservation objectives*”.

The requirements of the Habitats Directive are transposed into UK law through the Conservation (Natural Habitats, &c.) Regulations 1994, with subsequent amendments, including those contained within the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007.

As there are a number of Natura 2000 sites within and close to the Firth of Forth which may be subject to impact by the Forth Replacement Crossing Strategy, it was determined in consultation with Scottish Natural Heritage (SNH) that an appropriate assessment (AA) of the Forth Replacement Crossing Strategy should be undertaken. This report contains the information to inform the AA.

It should be noted that as the AA relates to the Forth Replacement Crossing Strategy it has been carried out at the strategic level, rather than the project level, in conjunction with the Strategic Environmental Assessment. However, as options for the crossing have already been determined at this stage, known components of the identified options have been incorporated into the appraisal where relevant and where a sufficient level of detail is available at present.

Once a preferred option for the Forth Replacement Crossing has been identified and taken forward, further assessment will be undertaken at all subsequent stages of the project, as required, including assessment of the final option at the detailed project level.

¹ Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, 1992.

1.3 Guidance

Guidance on the content and scope of this report has been derived from meeting consultations with SNH and Transport Scotland. In addition the following publications have also been taken into consideration:

- European Commission. Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC;
- Scottish Executive (2006). Assessing Development Plans in Terms of the Need for Appropriate Assessment, Interim Guidance;
- European Commission Environment DG (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; and
- Scott Wilson, Levett-Therivel Sustainability Consultants, Tweek Environmental Consultants and Land Use Consultants (2006) Appropriate Assessment of Plans.

2 Option Selection Process

2.1 Forth Replacement Crossing Study

A considerable amount of work has been undertaken on the FRCS to date following the approach set out in Scottish Transport Appraisal Guidance (STAG), including the consideration of alternatives. To provide some background to the AA, this section briefly summarises STAG, the option generation and sifting process and the appraisal process.

2.2 Scottish Transport Appraisal Guidance

STAG is the official appraisal framework developed by Transport Scotland to aid transport planners and decision-makers in the development of transport policies, plans, programmes and projects in Scotland. It is a requirement that all transport projects, for which Transport Scotland support or approval is required, are appraised in accordance with STAG.

The first element of the STAG process is the consideration of problems, opportunities, constraints and uncertainties. This is accompanied by the development of planning objectives, described below. After confirmation of the objectives, there is a process of option generation and sifting. These elements of the FRCS have been presented within *Report 1 (Network Performance)*, *Report 2 (Gaps and Shortfalls)* and *Report 3 (Option Generation and Sifting)*.

The planning objectives developed for the FRCS are:

- To maintain the cross-Forth transport links for all modes of transport to at least the level of service offered in 2006;
- To connect to the strategic transport network to aid optimisation of the network as a whole;
- To improve the reliability of journey times for all modes;
- To improve accessibility and social inclusion;
- To minimise the impacts of maintenance on the effective operation of the transport network;
- To support sustainable development and economic growth; and
- To minimise the impact on people, the natural and cultural heritage of the Forth area.

2.3 Option Selection Process

The various stages in the option appraisal carried out to date are summarised in *Forth Replacement Crossing Study Report 3: Option Generation and Sifting* and *Report 4: Appraisal Report (May 2007)*². These reports set out the alternatives that were considered and the reasons why the majority of options were excluded from further consideration.

² <http://www.transportscotland.gov.uk/defaultpage1221cde0.aspx?pageID=704>

Overall, a long list of 65 potential options was developed and was then subject to an initial sifting process. The list included heavy and light rail, causeways, tidal barrages, hovercraft and ferry options as well as bridges and tunnels. The majority of options were rejected either because they were not technically feasible or because they did not satisfy the planning objectives described above, principally the objective of maintaining the cross Forth transport links for all modes to at least the level of service offered in 2006. Other options, including the tidal barrages and causeways, were rejected on environmental grounds.

The Initial Sifting saw 46 options taken forward for further consideration. These options were considered within seven broad categories:

- Crossing location;
- Bridge crossings;
- Tunnel crossings;
- Capacity/operational configuration;
- Multi modal capability;
- Operational options; and
- Miscellaneous others.

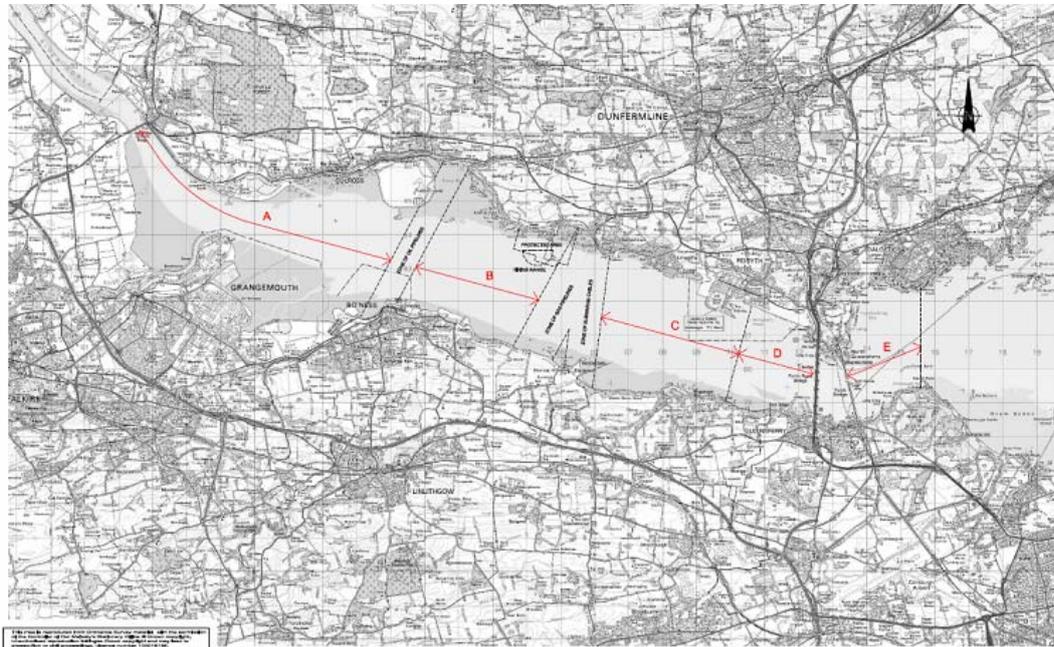
A hierarchical approach to the appraisal was followed to ensure that the major issues were dealt with. The approach adopted was to consider the first three categories above; namely crossing location, bridge crossings and tunnel crossings.

The remainder of the option appraisal process therefore considered bridge and tunnel options in the following five corridors:

- A – Grangemouth (West of Bo’ness);
- B – East of Bo’ness;
- C – West of Rosyth;
- D - East of Rosyth/West of South Queensferry; and
- E – East of South Queensferry.

Each corridor was defined by the environmental and physical constraints in and around the Firth of Forth and is illustrated below in Figure 2.1.

Figure 2.1 Identified Crossing Corridors



Each of these corridors, containing either a bridge or tunnel, was then assessed against the FRCS planning objectives discussed above and the STAG objectives of Environment, Economy, Safety, Accessibility/Social Inclusion and Integration.

The remote location of Corridor A (in terms of distance from the existing Forth Road Bridge) resulted in it performing poorly against the objectives and this corridor was subsequently dismissed. In addition, it was considered likely that this corridor would have significant environmental impacts on people and the natural and built environment, particularly in relation to the Firth of Forth SPA.

Corridor B also performed poorly in part due to its distance from the existing Forth Road Bridge. Additionally, there were significant environmental constraints within Corridor B associated with the Firth of Forth SPA. This corridor was dismissed as it was likely to have significant environmental impacts on people and the natural and built environment.

It was therefore concluded that Corridors A and B would not be considered further within the study. However, it was considered that Corridors C, D and E did perform well to varying degrees against the objectives and these were taken forward to the STAG Part 1 Appraisal, with bridge and tunnel options considered for all three corridors.

Whilst the majority of the planning objectives were met by each of the proposals, it was evident that the degree to which they were met varied across corridors and crossing types.

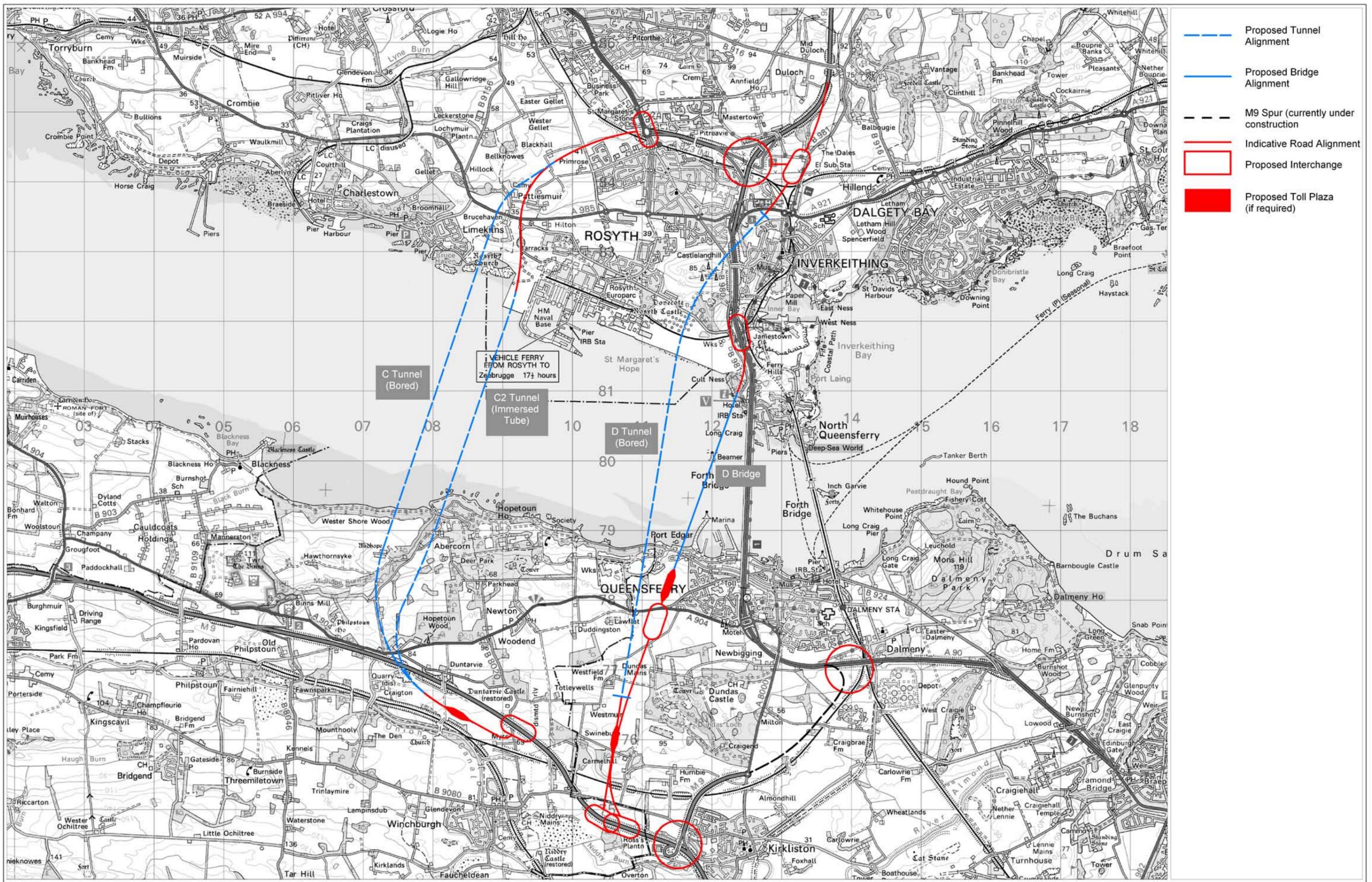
The subsequent assessment reduced the number of options under consideration to four, comprising three corridors considering tunnels only and a fourth corridor considering either tunnel or a bridge. These options were subject to a more detailed assessment following STAG Part 2 methodology such that Tunnels in Corridors C, D and E together with a Bridge in Corridor D were taken forward.

These options were presented in the final report where the Corridor D Bridge option, comprising a cable stayed bridge, was recommended to the Scottish Ministers.

Subsequently the Scottish Ministers decided that further consideration was required for the remaining options, which were developed to include the following:

- Tunnel C (Bored Construction)
- Tunnel C2 (Immersed Tube Construction)
- Tunnel D (Bored Construction)
- Bridge D (Cable Stayed or Suspension)

Therefore these four options are those that are considered within this Information to Inform the AA report. The proposed location of each corridor is illustrated on Figure 2.2.



- Proposed Tunnel Alignment
- Proposed Bridge Alignment
- M9 Spur (currently under construction)
- Indicative Road Alignment
- Proposed Interchange
- Proposed Toll Plaza (if required)

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Project	FORTH REPLACEMENT CROSSING STUDY		
Title	FIG 2.2 APPROPRIATE ASSESSMENT FORTH REPLACEMENT CROSSING OPTIONS		
Project No.	49550	Drawing No.	49550/FRCAA/01
Rev.	1		

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3 Natura 2000 Sites

3.1 Background Information

Natura 2000 sites form a network of protected sites within the European Community which represent the most important/threatened areas for natural habitats and species of plants and animals considered to be rare, endangered or vulnerable. There are two types of Natura 2000 sites; Special Areas of Conservation (SAC) and Special Protection Areas (SPA). In addition, Ramsar sites³ are also treated, in terms of Scottish Government policy, in the same way as Natura sites.

In Scotland, there are currently 240 SACs⁴ and 153 SPAs⁵, including Scotland/England cross-border sites, as well as candidate/draft SACs and potential SPAs, respectively. Of these sites, the following are within or in the vicinity of the Firth of Forth:

- Firth of Forth SPA;
- Forth Islands SPA;
- River Teith SAC;
- Imperial Dock Lock, Leith SPA; and
- Firth of Forth Ramsar.

In conducting an AA there is a requirement under Article 6 of the Habitats Directive to consider within the AA those Natura 2000 sites where there is a likelihood of significant effects from the strategy.

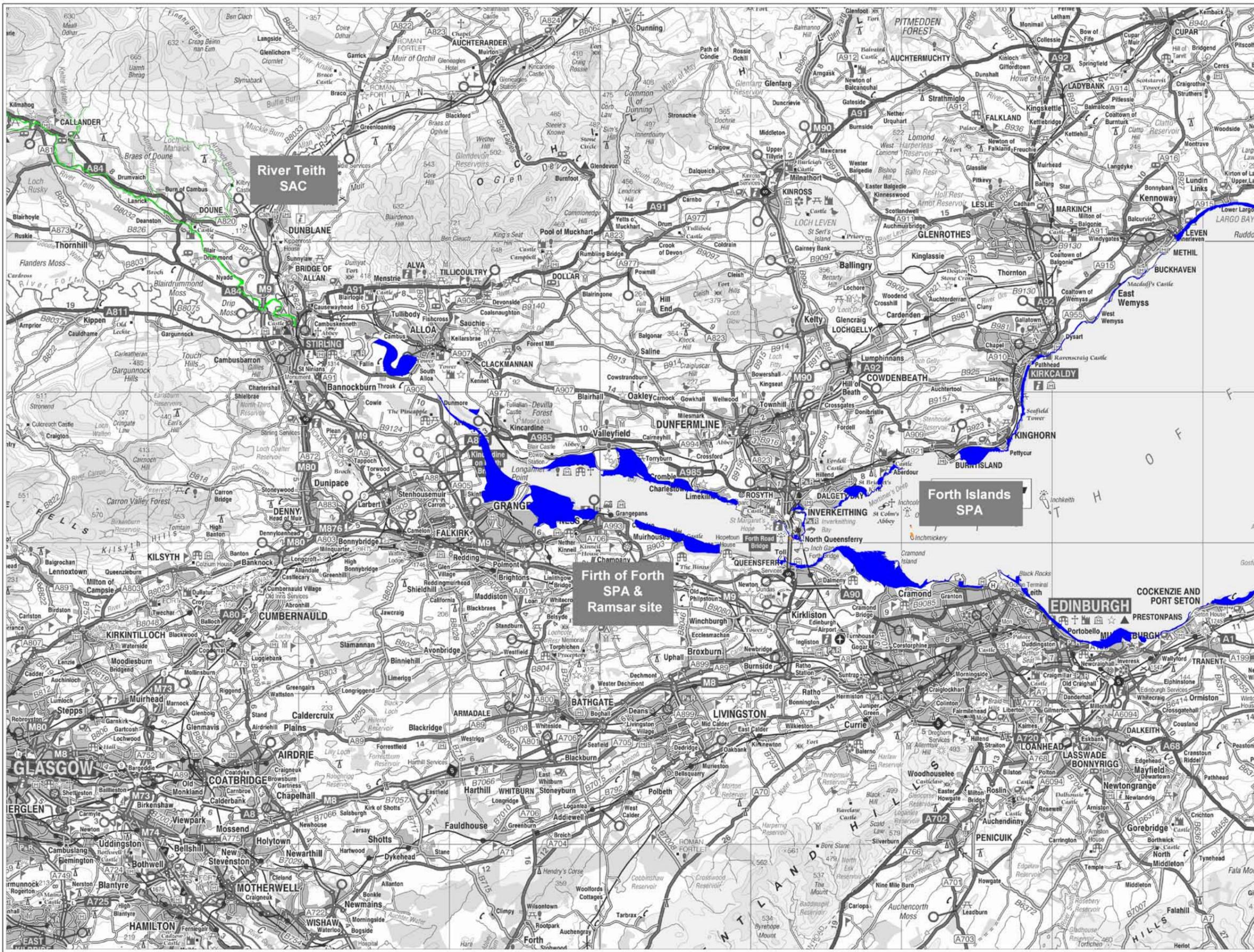
This requirement has been translated into domestic legislation under regulation 48 of the Conservation (Natural Habitats &c) Regulations 1994 as amended, which requires that any plan or project that is likely to have a significant effect on a European site must be subject to AA with regard to the conservation objectives of that site.

For the Forth Replacement Crossing Strategy the scope of the AA was discussed with SNH and it was agreed that this AA would be restricted to examining the potential impacts of the strategy on the Firth of Forth SPA including the Firth of Forth Ramsar site, the Forth Islands SPA and the River Teith SAC. It was agreed that the Imperial Dock Lock, Leith SPA would not be considered within the AA. Figure 3.1 shows the locations of each of the three Natura 2000 sites considered within this AA. Each of these is described further in the sections which follow.

³ The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

⁴ <http://www.jncc.gov.uk/page-1456>, comprising 235 SACs in Scotland, 3 cross border SACs, 1 candidate SAC and 1 possible/draft SAC.

⁵ <http://www.jncc.gov.uk/page-1399>, comprising 141 SPAs in Scotland, 1 cross border SPA and 11 potential SPAs.



- Forth Islands Special Protection Area
- Firth of Forth Special Protection Area and Ramsar site
- River Teith Special Area of Conservation

Note: This figure only displays the Natura 2000 sites addressed within the Appropriate Assessment.

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Project	FORTH REPLACEMENT CROSSING STUDY		
Title	FIG 3.1 APPROPRIATE ASSESSMENT NATURA 2000 SITES		
Project No.	49550	Drawing No.	49550/FRCAA/02
Rev.			2

3.2 Firth of Forth SPA

3.2.1 Qualifying Features

The following description of the Firth of Forth SPA is taken from the Joint Nature Conservation Committee (JNCC) website page for this SPA⁶

The Firth of Forth is located on the east coast of central Scotland. It is a complex estuarine site, stretching for over 100 km from the River Forth at Stirling eastwards past Edinburgh and along the coasts of Fife and East Lothian to a wide estuary mouth. A wide range of coastal and intertidal habitats is found within the site, including saltmarshes, dune systems, maritime grasslands, heath and fen, cliff slopes, shingle and brackish lagoons.

*Extensive mud-flats occur particularly in the Inner Firth, notably at Kinneil Kerse and Skinflats on the south shore and Torry Bay on the north shore. Typically, the flats support a rich invertebrate fauna, with Eelgrass *Zostera* spp. growing on the main mud-flats, both features providing important food sources for the large numbers of migrating and wintering waterbirds that depend on the estuary.*

In the Outer Firth, the shoreline diversifies, with sandy shores, some rocky outcrops, mussel beds and some artificial sea walls. The North Berwick coast includes cliffs and dune grassland, with extensive dune systems at Aberlady. The Firth is of major importance for a rich assemblage of waterbirds in the migration periods and through the winter, including divers, sea-ducks, geese, other ducks, waders and terns. Some of these species, notably the sea-ducks and divers, also feed, loaf and roost outside the SPA in the open waters of the estuary.

3.2.2 Conservation Objectives

The Conservation Objectives for the Firth of Forth SPA are as follows:

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.

⁶ <http://www.jncc.gov.uk/default.aspx?page=1979>

Full details of the Natura Citation and Conservation Objectives for the Firth of Forth SPA and the Ramsar Citation are included in Appendix A. It is worth noting that all of the qualifying species of the Firth of Forth Ramsar site are included within the list of qualifying species for the Firth of Forth SPA.

3.2.3 Proximity to FRCS Options

The Firth of Forth SPA extends for a considerable distance to the west and east of each of the crossing options and includes the majority of the intertidal habitat. However, in the vicinity of the crossings there is a gap in the designated area; on the northern shore in the vicinity of Rosyth Docks and on the southern shore between the Midhope Burn and Port Edgar. The locations of the four options in relation to the SPA are as follows:

- Corridor C Tunnel (bored): runs beneath the northern shore of the SPA at Limekilns and beneath the southern shore of the SPA just to the west of the Midhope Burn. No excavations are required within or close to the SPA at any point and the tunnel portals are not located close to the SPA. However, it is possible that where the tunnel alignment encounters dolerite or another major obstruction beneath the firth that access to the tunnel will be required by use of a caisson or similar placed outwith the SPA.
- Corridor C2 Tunnel (immersed tube) lies slightly east of the Tunnel C alignment and does not enter the SPA, although it lies close to it at the western end of Rosyth Docks on the northern shore and just to the east of the Midhope Burn on the southern shore. At these intertidal areas the tunnel will be constructed using cut and cover techniques. The tunnel alignment across the firth will be dredged to allow emplacement of the immersed tube sections.
- Corridor D Bridge crosses over a narrow section of the SPA at the northern shore between Cult Ness and North Queensferry, although no infrastructure would be placed within the Natura site. On the southern shore the bridge makes landfall 150m to the west of Port Edgar but does not enter the SPA.
- Corridor D Tunnel (bored) does not cross beneath the SPA and the tunnel portals are not located close to the SPA. However, it is possible that where the tunnel alignment encounters dolerite or another major obstruction beneath the firth that access to the tunnel will be required by use of a caisson or similar placed outwith the SPA.

3.2.4 Vulnerability

The Natura 2000 citation document refers to coastal development as posing the greatest potential impact to the SPA. Tipping and commercial bait digging are considered as under control. Rising sea levels are anticipated and managed retreat is being considered as an option to offset this impact. Recreational pressures are currently not considered to be problematic.

3.2.5 Integrity Status

Currently it can be stated that the integrity of the site is good with the site condition being regarded as 'Favourable Maintained'⁷. The recent trends in the population estimates of key species have been relatively stable albeit showing slight fluctuations.

3.3 Firth of Forth Ramsar Site

3.3.1 Qualifying Features

The following description of the Firth of Forth Ramsar site is taken from the Information Sheet on Ramsar Wetlands available from the JNCC website⁸:

The Firth of Forth is a large coastal area comprising a complex of estuaries, mudflats, rocky shorelines, beaches and saltmarshes. It stretches from Alloa Inches in the River Forth to Fife Ness and Dunbar in the east. It is considered to act as a single ecological unit. Several large urban areas, including Edinburgh, are adjacent to the site and these include several areas of heavy industry. Furthermore the Forth is one of the most important shipping areas in Scotland. The site is important for a large number of wintering waders and wildfowl, many in nationally and internationally important numbers.

The Firth of Forth Ramsar site is almost entirely contiguous with the Firth of Forth SPA.

The citation for the Ramsar site is included in Appendix A. It identifies the qualifying species for the Ramsar site, all of which are also qualifying features of the Firth of Forth SPA.

3.3.2 Conservation Objectives

SNH has not published conservation objectives for the Firth of Forth Ramsar site. However, for the purposes of the AA, we have assumed that the conservation objectives are identical to those for the Firth of Forth SPA.

3.3.3 Proximity to FRCS Options

Proximity to the FRCS options is identical to the Firth of Forth SPA discussed above.

3.3.4 Vulnerability

No details given in citation document but likely to be identical to the Firth of Forth SPA.

3.3.5 Integrity Status

No details given in citation document but likely to be identical to the Firth of Forth SPA.

⁷ SNH SiteLink Website, December 2007

⁸ <http://www.jncc.gov.uk/pdf/RIS/UK13017.pdf>

3.4 Forth Islands SPA

3.4.1 Qualifying Features

The following description of the Firth of Forth SPA is taken from the JNCC website page for this SPA⁹:

The Firth of Forth Islands are located in or near to the Firth of Forth on the east coast of central Scotland. The SPA comprises a number of separate islands or island groups, principally Inchmickery (together with the nearby Cow and Calves) off Edinburgh, Fidra, Lamb and Craig Leith together with the Bass Rock off North Berwick, and the much larger Isle of May in the outer part of the Firth. The site also includes additional other small islands.

*The inner islands are very low lying whilst those in the outer Firth are higher, steeper and rockier. This applies especially to the Bass Rock which is a volcanic plug rising to over 100m, and to the Isle of May, which is surrounded by cliffs up to 50 m. The islands support important numbers of a range of breeding seabirds, in particular terns, auks and gulls. The colony of Gannets *Morus bassanus* is the largest on the east coast of the UK. The seabirds feed outside the SPA in nearby waters, as well as more distantly in the North Sea.*

3.4.2 Conservation Objectives

The Conservation Objectives for the Forth Islands SPA are as follows:

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.

Full details of the Natura Citation and Conservation Objectives for the Forth Islands SPA are included in Appendix B.

⁹ <http://www.jncc.gov.uk/default.aspx?page=1970>

3.4.3 Proximity to FRCS Options

The closest part of the Forth Islands SPA to the FRCS options is Long Craig Island, which lies immediately beneath the existing Forth Road Bridge, extending approximately 200m to the east of it. Its location puts it approximately 400m at its closest point from the Bridge D alignment and approximately 1000m from the alignment of Tunnel D, which is the closest tunnel to this SPA. Other islands within the Forth Islands SPA are located downstream and to the east of the Forth Rail Bridge. Beamer Rock, which is located approximately 500m to the west of the existing Forth Road Bridge, is not included within the SPA.

3.4.4 Vulnerability

There are few man made threats to the site, with the majority of the islands being under the management of nature conservation organisations. The tern numbers have declined in recent years, probably, at least partly, due to increasing gull numbers. Measures to prevent disturbance to breeding birds by increased visitor numbers have been undertaken, such as the installation of remotely-operated cameras to allow close up views without disturbance to the birds, such as on the Isle of May and the Bass Rock.

3.4.5 Integrity Status

The integrity of the Forth Islands SPA would currently appear to be relatively good. The majority of tern species are considered to be of a 'Favourable Maintained' status. However, kittiwake and sandwich tern are reported to be 'Unfavourable Declining' whilst shag is said to be 'Unfavourable Recovering'¹⁰. The overall number of birds in total has shown a slight increase in the last ten years.

3.5 River Teith SAC

3.5.1 Qualifying Features

The River Teith rises and flows through upland areas before crossing the Highland Boundary Fault, at the Falls of Leny and meandering through the central lowlands to the River Forth.

The River Teith in eastern Scotland represents part of the east coast range of the sea lamprey (*Petromyzon marinus*) in the UK. The River Teith is the most significant tributary of the River Forth and young sea lampreys have been recorded throughout the lower reaches of the main river. The conservation importance of the River Teith is increased by the fact that, unlike many British rivers, it supports populations of all three lamprey species.

The river system supports a strong brook lamprey (*Lampetra planeri*) population. Brook lampreys have been recorded from the headwaters downstream to the lower reaches. The river provides excellent habitat with usually pristine water quality, well-vegetated banks and a substantially unaltered river channel. The River Teith supports high densities of brook/river lamprey ammocoetes and also supports a healthy population of sea lamprey.

¹⁰SNH SiteLink Website, September 2007

The River Teith also supports a strong population of river lamprey (*Lampetra fluviatilis*). The river lacks any significant artificial barriers to migration, has good water quality and the necessary habitat types (extensive gravel beds and marginal silt beds) to support the river lamprey's full life-cycle.

The River Teith SAC also supports a significant population of the Annex II species, Atlantic salmon (*Salmo salar*).

3.5.2 Conservation Objectives

The Conservation Objectives for the River Teith SAC are as follows:

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, 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.

Full details of the Natura Citation and Conservation Objectives for the River Teith SAC are included in Appendix C.

3.5.3 Proximity to FRCS Options

The River Teith SAC is located approximately 36km upstream of the existing Forth Road Bridge. However, although it is located some distance from the FRCS options, qualifying species of the SAC, comprising Atlantic salmon, River lamprey and Sea lamprey migrate through the Firth of Forth to and from the SAC. The other qualifying species, Brook lamprey, is non-migratory.

3.5.4 Vulnerability

There are few reported threats to the qualifying features at present. Water quality is generally high, with modern forestry practices minimising the disturbance to the river system in the heavily afforested upper catchments.

3.5.5 Integrity Status

The data from the SNH website states that the status of all three lamprey species is at 'Favourable Maintained' level, whilst Atlantic salmon is 'Unfavourable Recovering'¹¹.

¹¹ *ibid.*

4 Methodology

4.1 Impacts Sources

The information to inform AA considers whether the options within the Forth Replacement Crossing Strategy, alone or in combination with other plans or projects, could cause an adverse effect on the integrity of a Natura 2000 site, where there is a certainty or a possibility that the conservation objectives for the site may be compromised.

This section describes the type of impacts with the potential to cause adverse effects, and gives an approach to assessing whether or not this will cause an adverse effect based upon the spatial and temporal scale of the impact.

4.2 Approach for Determining Potential Impact

Note that for the purposes of this report a distinction has been made between *potential impacts* and *adverse effects*, where:

- *Potential impact* describes an issue that has the potential to affect the conservation objectives and integrity of the Natura site prior to mitigation; and
- *Adverse effect* describes only those potential impacts where it is considered that these cannot be effectively mitigated or avoided and therefore there is a certainty or a possibility that the conservation objectives and integrity of the Natura site will be compromised, where site integrity has been defined as “*the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified.*”¹².

Adverse effect takes into account the potential scale and duration of the activity that may affect the receptor. With reference to the Conservation Objectives in Section 3, and the stated vulnerability of the Natura 2000 sites, potential impacts fall into the following broad types:

- Destruction and/or deterioration of habitats within or adjacent to sites; and
- Mortality and/or non-lethal disturbance to qualifying species, within or adjacent to sites.

4.2.1 Destruction and/or Deterioration of Habitat

Guidance¹³ states that deterioration of habitats is:

- Any event which contributes to the reduction of the areas covered by a natural habitat for which the site has been designated; and
- Any impairment of the factors necessary for the long-term maintenance of the habitats.

¹² Scottish Executive Revised Guidance updating Scottish Office Circular 6/1995 (June 2000)

¹³ Managing Natura 2000 sites. The provision of article 6 of the Habitats Directive 92/43/CEE, The European Commission

Loss of habitat is considered from within the Natura site and also outwith the Natura site boundary. Loss of habitat outwith the boundary can have equal indications of adverse effect if used by significant numbers of the qualifying species, as adverse effect is always considered in relation to the stated conservation objectives.

The main functions of the Firth of Forth SPA and Ramsar mudflats are to provide food and feeding habitat for over-wintering birds, and areas for birds to roost, loaf and moult in surroundings that offer a clear view of predators.

The Forth Islands SPA provides secure, undisturbed breeding sites for sea birds. The surrounding Firth also provides suitable feeding habitat for these bird species.

The function of the Firth of Forth in relation to the River Teith SAC is to provide a commutable connection for migrating lamprey species and Atlantic salmon between open sea and their spawning grounds upstream in the River Teith.

The undesignated open water habitat of the firth holds importance for all three Natura sites, supporting broader functions of the qualifying species than offered by the designated sites. The importance of the open water habitat is recognised in the assessment. It should be noted in particular, that the Firth of Forth SPA and Ramsar site is designated for open water birds such as divers, red breasted merganser and grebes.

Potential pollution events or long term contamination are considered in the assessment related to the ability of the site and supporting habitats of the qualifying species to function. For instance, pollution may impact on prey availability within habitats for qualifying birds.

4.2.2 Mortality of and/or Disturbance to Qualifying Species

Guidance¹⁴ states that an assessment of the significance of disturbance should be undertaken, with significant disturbance being:

- Any event which contributes to the long term decline of the population of the species on the site;
- An event contributing to the reduction or to the risk of reduction of the range of the species within the site; and
- Any event which contributes to the reduction of the size of the habitat of the species.

Disturbance can be either temporary, as in construction works, or permanent, as a result of the ongoing operation of a development.

The impact of disturbance is not easily quantified. Responses of birds to disturbance vary from species to species, site to site, type of disturbance, ability to habituate, differences in response seasonally and in relation to the number of birds in a flock. It is therefore necessary to consider a generalised zone of impact against which to consider disturbance.

¹⁴ *ibid.*

Birds may become habituated to constant levels of predictable disturbance; the effects of construction activities that represent unpredictable 'disturbance events' are given more importance in the assessment.

4.3 Predicting Adverse Effect

Adverse effect is predicted where there is a certainty or a possibility that the conservation objectives and integrity of the Natura site may be compromised.

When assessing adverse effect, the following parameters are considered to determine any compromise of the conservation objectives:

- The spatial scale of the potential impact;
- The magnitude of the potential impact; and
- The duration of the potential impact.

If there is any uncertainty whether an impact will cause adverse effect, or any uncertainty related to the efficacy of mitigation, then the assessment cannot conclude that there would be no impact and therefore no adverse effect on integrity.