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A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement

Environmental Impact Assessment Report

Non-Technical Summary

Preface

This document is the Non-Technical Summary (NTS) of the Environmental Impact Assessment (EIA) Report for the A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement scheme. The project is proposed by Transport Scotland, an agency of the Scottish Government.

Due to restrictions imposed by the Coronavirus pandemic, paper copies of the EIA Report have not been made available for inspection in the public domain. In accordance with the Coronavirus (Scotland) Act 2020, the EIA Report (including NTS) may be viewed online on the Transport Scotland website:

<https://www.transport.gov.scot/transport-network/roads/bridges-and-structures/a985-kincardine-bridge/#61983>

A bound paper copy of the EIA Report may be purchased at a cost of £150 or in USB format at a cost of £10 by writing to Transport Scotland at the address below.

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Copies of the NTS are available free of charge by writing to Transport Scotland at the above postal address or by email to: info@transport.gov.scot. Any person wishing to make representation on the EIA Report should write to Transport Scotland at the address provided above. Representations must be received within 42 days of the advertised date of the publication of the EIA Report.

Section 1: Introduction



Introduction

Background

The A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement scheme (hereafter referred to as the proposed scheme) is required to maintain the long-term use of the Kincardine Bridge.

The proposed scheme is located at the southern end of the Kincardine Bridge within Falkirk Council area. The Kincardine Bridge crosses the Firth of Forth between Higgins Neuk in Falkirk Council area and the town of Kincardine in Fife Council area. The Kincardine Bridge is used to carry the A985 Kincardine - Rosyth Trunk Road (A985) over the Firth of Forth, as illustrated on Image 1, via a two-lane single carriageway road. The A985 connects to the A876 at the Higgins Neuk Roundabout, which lies to the south-west of the Kincardine Bridge. The A876 extends north from the Higgins Neuk Roundabout and crosses the Firth of Forth on the Clackmannanshire Bridge.

An outline of the proposed scheme is provided in Section 2 (The Proposed Scheme) of this NTS. The proposed scheme would incorporate:

- the demolition of the existing piled viaduct at the southern end of the Kincardine Bridge;
- replacement of the existing piled viaduct with a new five span structure of similar appearance to the adjacent spans of the Kincardine Bridge; and
- temporary construction works.

In order to maintain traffic flow during construction works, a temporary bridge would be constructed adjacent to the north-west side of the existing piled viaduct. The temporary bridge would connect to the approach road to the southern end of the Kincardine Bridge. The connection of the temporary bridge to the Kincardine Bridge would be made to the north-east of the existing piled viaduct.



Image 1: A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement - Site Location and Context
©Google Maps, April 2020.

Environmental Impact Assessment (EIA)

An Environmental Impact Assessment (EIA) of the proposed scheme is required under European and UK legislation. The EIA Report reports the findings of the EIA.

The purpose of EIA is to investigate the likely significant effects of the proposed scheme on the biological, physical and historical environment, as well as on members of the public and on current or planned future use of the environment. This NTS presents a summary of the EIA Report, including key aspects of the proposed scheme and the associated beneficial and adverse impacts considered to be of particular importance/significance. A glossary is provided at the end of the NTS to assist the reader.

Further details about the likely significant effects of the proposed scheme can be found within the full text of the EIA Report. The EIA Report documents have been subdivided into four volumes for ease of use:

- NTS;
- Volume 1: Main Report;
- Volume 2: Technical Appendices; and
- Volume 3: Figures.

The EIA process provides a valuable opportunity to reduce potential environmental impacts. Environmental constraints and issues were identified through consultation with consultees and other stakeholders, environmental surveys and technical assessments. The information gathered has informed decision-making throughout the iterative design process, providing opportunities to address potentially significant effects where practicable, for example by the incorporation of measures to avoid or reduce potential adverse environmental impacts.

Impacts have been assessed by comparing the existing situation (the baseline conditions) to the conditions that would occur with the proposed scheme in place.

2017 Roads EIA Regulations

The proposed scheme EIA was undertaken in line with the Roads (Scotland) Act 1984 as amended by The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the 2017 Roads EIA Regulations).

The 2017 Roads EIA Regulations introduced a wider scope of environmental factors to be considered, where relevant, as part of the EIA process. These factors are:

- Climate;
- Major Accidents and Disasters;
- Population and Human Health; and

- Heat and Radiation.

Each of these topics have either been considered and addressed as part of the EIA process and reported in the EIA Report, or were scoped out from further assessment during the scoping process, as follows:

Climate

The climate topic is considered in Chapter 15 (Climate) of the EIA Report.

Major Accidents and Disasters

A major accident in the context of this EIA is an undesirable extreme event resulting in damage or harm, such as a major pollution incident. A disaster is taken to relate to extremes of natural occurrences, such as a major flood event or earthquake. Two aspects should be considered: the vulnerability of the project to a major accident or disaster, and the potential for the project to cause a major accident or disaster.

Given the nature and location of the proposed scheme, it is not considered particularly vulnerable to major accidents and disasters. In addition, the potential risk of a major accident or disaster resulting in significant environmental effects on the environment from the proposed scheme is considered unlikely and as such this topic was scoped out of the assessment and is therefore not covered within the EIA Report.

Population and Human Health

The potential impacts of the proposed scheme on population and human health are identified in Chapter 6 (Geology, Soils, and Groundwater), Chapter 7 (Road Drainage and the Water Environment), Chapter 11 (Air Quality) and Chapter 12 (Noise and Vibration). Additionally, a separate assessment on human health using output from those four EIA technical chapters was undertaken and reported in Chapter 14 (Human Health) of the EIA Report.

Impacts on land use and accessibility (population) were scoped out of the EIA as they were not anticipated to result in significant effects.

Heat and Radiation

No significant environmental effects are expected in relation to the emission of heat and radiation and as such this topic was scoped out of the EIA Report.

Further information on how the 2017 Roads EIA Regulations have been addressed can be found in Chapter 4 (Overview of Assessment Process) and Chapter 5 (Scoping and Consultation) of the EIA Report.

Need for the Scheme

The piled viaduct elements of the Kincardine Bridge structure were deemed substandard in 1984 following completion of an assessment. Interim measures to provide structural support, in the form of a steel propping system were installed in 1992 and remain in place.

Jacobs prepared an Improvement Options Report in 2007 in which it noted the assessment and interim measure referred to above and reviewed and further developed options for the refurbishment of the existing piled viaduct. The report recommended that the piled viaduct be replaced for the following reasons:

- The original piled viaduct has insufficient load carrying capacity, with the deck slab and transverse beams having insufficient strength.
- The original substructure is unsuitable due to the poor condition of the visible portions of the substructure piles. Furthermore, the condition of the buried portion of substructure piles cannot be assessed.
- The steel propping system is unsuitable for incorporation in the refurbished bridge.

Transport Scotland commissioned a study into the effects of traffic movements on closing Kincardine Bridge to carry out the piled viaduct replacement, and this concluded that there would be major congestion caused to the surrounding road network. For this reason, Transport Scotland now intends to replace the piled viaduct, whilst keeping the existing bridge open to traffic.

Alternatives Considered

The Improvement Options Report 2002 (Babtie Group 2002) considered options for the refurbishment of the piled viaduct at Kincardine Bridge and recommended the replacement of the existing piled viaduct with a piled embankment was preferred. The Improvement Options Report 2007 (Jacobs 2007) reassessed the options on the basis of costs, aesthetics, constructability as well as environmental issues and concluded that the replacement of the existing piled viaduct with a new piled viaduct structure rather than a piled embankment, was the best performing of the options considered.

Transport Scotland took cognisance of the previous options studies and determined that the preferred option remained the proposed replacement of the existing piled viaduct with a new piled viaduct structure comprising spans of similar appearance to the adjacent spans of the Kincardine Bridge (the piled viaduct replacement structure proposed in the Improvement Options Report 2007 (Jacobs 2007)).

The following options were considered for a bridge structure to allow traffic flow across the Kincardine Bridge during the construction of the piled viaduct replacement:

- a temporary bridge structure adjacent to the existing piled viaduct to allow construction of the new piled viaduct replacement structure online; and
- a permanent bridge structure constructed adjacent to the existing piled viaduct which would be slid into position to replace the existing piled viaduct.

It was assessed that a temporary bridge structure was likely to require only limited periods of single lane working or full closure while a permanent bridge was likely to require closures of a longer duration. The temporary bridge structure option was therefore selected as the preferred option to maintain traffic flow across the Kincardine Bridge during the construction of the piled viaduct replacement structure.

Section 2: The Proposed Scheme



The Proposed Scheme

The proposed scheme would incorporate:

- the demolition of the existing piled viaduct at the southern end of the Kincardine Bridge;
- replacement of the existing piled viaduct with a new five span structure of similar appearance to the adjacent spans of the Kincardine Bridge; and
- temporary construction works.

In order to maintain traffic flow during construction works, a temporary bridge would be constructed adjacent to the north-west side of the existing piled viaduct. The temporary bridge would connect to the approach road to the southern end of the Kincardine Bridge. The connection of the temporary bridge to the Kincardine Bridge would be made to the north-east of the existing piled viaduct.

The design of the replacement piled viaduct structure has been undertaken by Transport Scotland. It is anticipated that the Contractor would undertake both the design of the temporary works and the construction of the proposed scheme.

An indicative temporary bridge design and indicative construction methodology have been assessed during the EIA process and reported in the EIA Report. The indicative construction methodology includes an indicative temporary raised working platform located on either side of the existing piled viaduct and construction site accesses from the A876 and from the existing access track to the existing Sustainable Drainage System (SuDS) pond at the south of the Higgins Neuk Roundabout.

An overview of the various elements of the proposed scheme is shown on Figure 1 of this NTS and are described below.

It is proposed that two way traffic would be maintained on the temporary bridge during construction with the exception of limited periods of single lane working or full closure of the bridge for specific short-term duration activities. Traffic would be diverted onto the piled viaduct replacement structure on its completion. All

temporary access measures provided to facilitate construction of the piled viaduct replacement structure would be removed on completion of construction. The concrete footings of the temporary bridge would be removed, and the piles cut off 1m below the ground level. The working platform and the access from the A876 would be removed.

Existing Piled Viaduct

The existing piled viaduct which is to be demolished is a reinforced concrete structure which forms the southernmost approach to the existing Kincardine Bridge, and which extends approximately 80m from the south bank across the intertidal area of the Firth of Forth.

Piled Viaduct Replacement

The proposed scheme includes the construction of a new structure to replace the existing piled viaduct. An artist's impression of the proposed piled viaduct replacement structure is shown in Image 2.

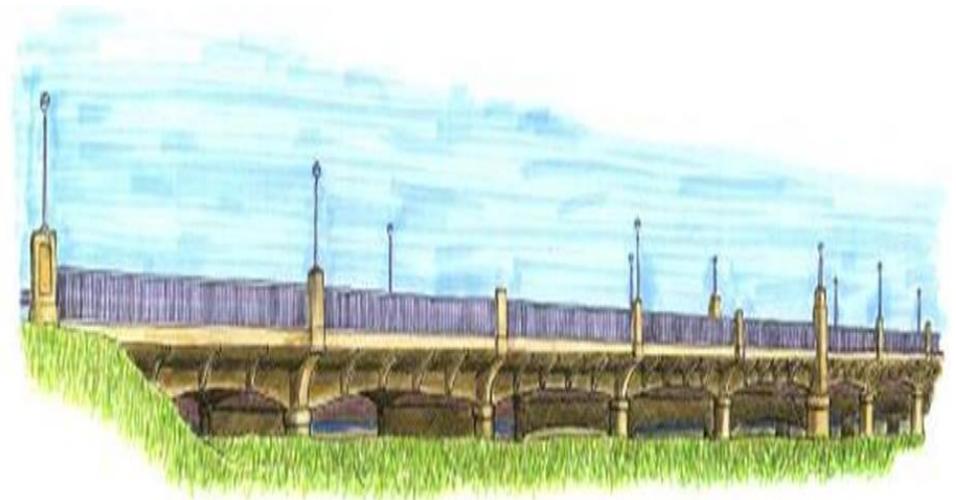


Image 2: Artist's impression of the proposed piled viaduct replacement structure

The piled viaduct replacement structure would comprise the following elements:

- A deck formed using in situ (cast on site) reinforced concrete beams with curved soffits. The deck would be supported at the north end by a new reinforced concrete pier on piled supports, independent from and adjacent to the existing pier at the adjacent 15m span of the Kincardine Bridge, and elsewhere by piled reinforced concrete piers of similar appearance to the existing piers of the adjacent 15m spans of the Kincardine Bridge.
- Large diameter bored cast in-situ (cast on site) concrete piles bearing onto bedrock to support the structure.
- A new permanent barrier (road safety barrier) to replace the temporary 'Varioguard' safety barriers over the length of the piled viaduct replacement structure.
- The existing parapet panels (guard railings) would be re-erected on the new structure where possible. Where existing parapets are not suitable for re-erection, new replacement parapets which resemble the design and materials of the existing parapets would be provided.
- The replacement reinforced concrete posts (pilasters) which are situated at the pier positions would match the design and materials of the originals.
- The existing lamp posts would be retained, refurbished and installed on the piled viaduct replacement structure.
- Pedestrian footways adjacent to the northbound and southbound carriageway.

Temporary Bridge

The temporary traffic diversion is proposed to be provided via a temporary bridge to be installed adjacent to the north-west side of the existing piled viaduct with a connection to the A985 trunk road at the south end of the Kincardine Bridge. The connection of the temporary structure to the Kincardine Bridge would be made to the north-east of the piled viaduct.

The temporary bridge structure would contain a pedestrian footway adjacent to the northbound carriageway.

Temporary Raised Working Platform

It is envisaged that a temporary raised working platform would be constructed to provide bearing capacity for the piling rig and to provide a dry working area for operatives and plant. The indicative extent of the temporary raised working platform is shown on Figure 1.

Delivering the Proposals

The EIA Report presents the results of the EIA of the proposed scheme. The proposed scheme may be refined further as part of the design of the temporary works and construction methodology by a Contractor that will be procured by Transport Scotland. The Contractor that delivers the proposed scheme must meet the requirements of the EIA documented in the EIA Report. Should the Contractor refine the design which has been assessed by this EIA, then an environmental review of those design refinements will be undertaken. If environmental review found that any future changes to the design resulted in new residual significant adverse effects and/or the significance levels of residual effects that are greater than those reported in this EIA Report, additional information would then be published for public consultation and comment in accordance with the EIA Regulations.

Construction is subject to completion of the statutory process; however, for the purpose of the EIA it has been assumed that construction would not commence before Summer 2021.

Overview of the EIA Process

The aims of the environmental assessment are to:

- Gather information about the environment, identify environmental constraints and opportunities which may influence, or be affected by the proposed scheme.
- Identify and assess potential (pre-mitigation) environmental impacts.
- Identify and incorporate into the proposed scheme design, features and measures to avoid, reduce or offset adverse effects, and where possible enhance beneficial effects.

- Assess the proposed scheme's residual effects (those remaining after mitigation measures are implemented to avoid or reduce potential impacts).

Impacts were assessed by comparing the existing situation (the baseline conditions) to the conditions that would occur with the proposed scheme in place to determine the residual effects of the scheme on environmental conditions.

Consultation and Scoping

As part of the design development and assessment process, a comprehensive consultation exercise was carried out with numerous stakeholders including Falkirk Council, Fife Council, Marine Scotland – Licencing Operations Team (MS-LOT), Historic Environment Scotland (HES), Scottish Environment Protection Agency (SEPA) and NatureScot (formerly Scottish Natural Heritage (SNH)).

As part of the Marine Licensing process, a pre-application consultation drop-in session was held on 29 October 2019. Members of the public, relevant bodies and organisations, and consultees were able to provide comment and feedback on the proposed licensable marine activity elements of the proposed scheme prior to the submission of the application for a Marine Licence. No significant comments pertinent to the design or principle of the proposed scheme were received during or in response to this event, and so no changes to the design have been considered as a direct result of this consultation. Feedback received at this event is summarised in the Pre-Application Consultation Report that forms part of the application for a Marine Licence.

Stakeholder feedback was reviewed by the project team and incorporated into the assessment and design process where appropriate.

Additional Statutory Processes and Assessments

In accordance with the Marine (Scotland) Act 2010, a Marine Licence is required to carry out certain activities within the marine environment. These activities include marine construction works, including bridge repair and construction, as required for the proposed scheme. An application for the marine licensable activities associated

with the proposed scheme has been submitted to Marine Scotland Licensing Operations Team (MS-LOT) by Transport Scotland. MS-LOT determine marine licence applications on behalf of the Scottish Ministers.

As the Kincardine Bridge is a Category A Listed Building, the proposed scheme works will require listed building consent and construction would be carried out in accordance with the conditions attached to such consent.

A detailed consideration of the potential for any likely significant effects on the conservation objectives of the following European sites, in the context of The Conservation (Natural Habitats, & c.) Regulations 1994 (as amended) (referred to as the Habitats Regulations), has been undertaken in a Habitats Regulations Appraisal (HRA) for the proposed scheme:

- Firth of Forth Special Protection Area (SPA);
- Firth of Forth Ramsar; and
- River Teith Special Area of Conservation (SAC).

Section 3: Environmental Effects and Mitigation



Environmental Effects and Mitigation

The following sections summarise the likely significant effects of the proposed scheme on the environment including relevant details of mitigation. Full details of each assessment, including the detailed methodology and limitations of assessment, and the associated findings of the EIA are presented in the individual chapters of the EIA Report (Volume 1: Main Report). Chapter 17 (Schedule of Environmental Commitments) and Appendix A3.2 (Outline Construction Environmental Management Plan) of the EIA Report collate and detail the mitigation measures from each chapter and outline legislative and monitoring requirements.

Geology, Soils and Groundwater

The effects of the proposed scheme on the existing geology, soils, contaminated land and hydrogeology within the surrounding area have been assessed.

Baseline conditions were established through desk-based assessment, consultation, site walkover and ground investigations. This process established that a large proportion of the land made available for temporary works and construction falls within the Firth of Forth Site of Special Scientific Interest (SSSI) which is designated for coastal geomorphology, bedrock geology and quaternary deposits, however the geological features for which it is designated fall outside the study area.

Soils containing organic rich/peaty saltings are present within the land made available for temporary works and construction. Superficial geology within the study area is composed of reclaimed intertidal deposits (organic rich/peaty clays and silts associated with marine and estuarine alluvium) underlain by glacial till. Made ground deposits were also observed within the A985 embankment. Bedrock geology at the site of the proposed scheme is composed of Carboniferous sedimentary rock of the Passage Group and Lower Coal Measures with limited mineral resource associated with the Lower Coal Measures. Identified areas of potential contaminated land are predominantly associated with the existing road infrastructure (A985 and A876 carriageways and the Kincardine Bridge structure).

Groundwater within the study area is considered to be of medium value with no groundwater abstractions or Groundwater Dependent Terrestrial Ecosystems identified within the study area.

Prior to mitigation, potential significant effects were identified for soils, groundwater quality and contaminated land arising from the proposed works.

Mitigation was proposed to include production of a Soil Management Plan, a soil re-use assessment, risk assessments for piling works to inform techniques, as well as adopting control measures for the onsite storage and use of chemicals and fuel.

With the implementation of these measures, no significant residual effects are anticipated for either construction or operation of the proposed scheme.

Road Drainage and the Water Environment

The effects of the proposed scheme on the water environment including flood risk, surface water quality and estuarine geomorphology have been assessed.

The assessment was informed by consultation, desk-based assessments and a site walkover. A detailed Flood Risk Assessment (FRA) and associated hydrodynamic modelling was scoped out following consultation with SEPA.

The proposed scheme is partly located within an intertidal area of the Forth Estuary. Within the 500m study area two Water Framework Directive (WFD) surface water features have been identified, in addition to several drainage channels and tidal creeks. The largest feature within the study area is the Forth Estuary, which is split into the Upper Forth Estuary and Middle Forth Estuary under WFD.

Significant potential effects from the proposed scheme during construction, in the absence of mitigation, include risk of flooding to construction activities, deterioration in surface water quality and disturbance of estuarine geomorphological features. No effects have been assessed as significant for the operational phase as operational changes to hydrodynamics from baseline conditions are considered to be localised and negligible. Therefore, any changes

to current baseline conditions during the operational phase of the new structure are generally considered to be negligible.

Measures were required to mitigate construction impacts which include the development and implementation of a Flood and Tidal Response Plan, Pollution Prevention Plan (PPP), Saltmarsh Management Plan (SMP) and an Environmental Clerk of Works (EnvCoW) to oversee and monitor these plans as well as other mitigation measures relating to the water environment.

With the implementation of the proposed mitigation, no significant residual effects are anticipated for either construction or operation of the proposed scheme.

Marine Ecology

The effects of the proposed scheme on marine species and habitats have been assessed.

Baseline conditions for marine ecological features were established through a desk-based assessment, consultation and site surveys. This process identified seven ecological features that could potentially be impacted by the proposed scheme. These were intertidal mudflats, saltmarsh, subtidal habitat and communities, non-migratory fish, migratory fish, cetaceans and seals. Four designated sites, the Firth of Forth Special Protection Area (SPA), the Firth of Forth Ramsar site, the Firth of Forth Site of Special Scientific Interest (SSSI), and the River Teith Special Area of Conservation (SAC) were also identified. These designated sites are discussed in the context of the Marine Ecology assessment, however potential effects on the designated sites are assessed within Geology, Soils and Groundwater and the Terrestrial Ecology assessments as appropriate, as summarised on pages 7 and 9 of this NTS. As stated on page 6, a Habitats Regulations Appraisal (HRA) has been undertaken to assess the potential for likely significant effects on the conservation objectives of Firth of Forth SPA, Firth of Forth Ramsar, and River Teith SAC.

Prior to the application of mitigation, potential significant effects on ecological features were identified during the construction phase of the proposed scheme. No potential significant effects were identified during the operation phase of the proposed scheme prior to the application of mitigation.

A hierarchical approach to mitigation was followed to address potential impacts. Where avoidance of impacts has not been possible, mitigation to reduce significant effects has been identified. Measures required to mitigate potential impacts include the implementation of a Saltmarsh Management Plan, an Ecological Management Plan, construction working methods and best working practices.

The saltmarsh temporarily lost during construction will be subject to mitigation measures to aid recovery and the existing National Vegetation Classification (NVC) community is predicted to re-establish in the long-term. Recovery of the saltmarsh will be monitored through the Saltmarsh Management Plan.

With the implementation of the proposed mitigation, it is anticipated that there will be no significant residual effects as a result of construction or the operation of the proposed scheme.



Photograph 1: View of saltmarsh from Kincardine Bridge looking south-west

Terrestrial Ecology

The effects of the proposed scheme on terrestrial species, habitats and ecosystems have been assessed.

Baseline conditions for terrestrial ecological features were established through a desk-based assessment, consultation and site surveys. This process identified nine ecological features that could potentially be impacted by the proposed scheme. These included three designated sites: The Firth of Forth Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI). In addition, terrestrial species that could potentially be impacted are wetland birds, bats, breeding birds, otter and peregrine.

Prior to the application of mitigation, potential significant effects on ecological features were identified for the construction and operation phases of the proposed scheme.

A hierarchical approach to mitigation was followed to address potential impacts. Where avoidance of impacts has not been possible, mitigation to reduce significant effects has been identified. Measures include the implementation of commitments and best working practices during the construction phase of the proposed scheme and monitoring including species surveys to determine the Contractor's compliance and the effectiveness of mitigation. In addition, a replacement artificial otter holt will be provided pre-construction to replace one lost as a result of the proposed scheme.

With the implementation of the proposed mitigation, it is anticipated that there will be no significant residual effects as a result of construction or the operation of the proposed scheme.

Cultural Heritage

The effects of the proposed scheme on cultural heritage assets comprising archaeological remains, historic buildings and the historic landscape have been assessed.

Baseline conditions were established through a desk-based survey and walkover survey. In total, 34 cultural heritage assets were considered as part of the baseline, comprising 13 archaeological remains, 17 historic buildings, and four historic landscape types (HLT).

No significant effects were identified for archaeological remains or the historic landscape as a result of the construction or operation of the proposed scheme.

Prior to mitigation, a significant potential effect during construction was identified on one historic building - the Kincardine Bridge (a Category A Listed Building). Mitigation proposed for this cultural heritage asset comprises an enhanced historic building recording. On completion of the reporting, analysis, publication and dissemination of the results associated with this mitigation, the residual effect on this asset has been assessed to be significant. The requirement for the appointed Contractor to submit an assessment report of the bridge parapet panels to provide a detailed condition assessment of the affected panels and a justified rationale for the proposed approach to their refurbishment is also identified. During operation, a significant adverse and a significant beneficial effect was identified on the Kincardine Bridge. As stated on page 6, the proposed scheme will require listed building consent and construction will be carried out in accordance with the conditions attached to such consent.

The potential for the presence of unknown archaeological remains below the Mean High Water Springs (MHWS) of the study area has been assessed to be medium. Where modern development (e.g. Higgins Neuk Roundabout and surrounding transport infrastructure) is likely to have disturbed or removed archaeological remains that may have been present above MHWS, the potential for unknown archaeological remains has been assessed to be low. Archaeological recording during construction (an archaeological watching brief) will be undertaken to make

a permanent record of any surviving unknown archaeological remains that may be identified.



Photograph 2: Remains of Higgins' Neuk Ferry Pier, looking south-east

Air Quality

The air quality effects associated with the proposed scheme during construction and operation have been assessed.

A review of the baseline conditions in the study area for the proposed scheme showed that the background map concentrations of particulate to be well within the annual mean Air Quality Objective for particulate matter (PM₁₀).

The assessment identified key receptors with the potential to be impacted by a change in air quality as a result of the proposed scheme. These included two high sensitive human receptors (i.e. residential properties), as well as ecological receptors the Firth of Forth Ramsar, Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) sites.

Working methods and mitigation measures required to mitigate construction impacts will be detailed within a Dust Management Plan to be agreed with Falkirk Council.

With the implementation of good practice mitigation measures, the likely effect of dust emissions on human health, amenity and ecological receptors during construction is not considered to be significant.

It is anticipated that the proposed scheme will not change the traffic flow, speed or composition of vehicles on the road network during operation and therefore, changes in pollutant concentrations from vehicle emissions are considered unlikely. There are no potentially significant air quality effects predicted during operation of the scheme.

Noise and Vibration

The noise and vibration effects as a result of the construction and operation of the proposed scheme have been assessed.

There were two receptors with the potential to be affected identified within the construction noise and vibration study areas: two dwellings at Higgins Neuk. As part of the assessment, a baseline noise survey was undertaken at Higgins Neuk to gain an understanding of the existing noise climate in the vicinity of the proposed scheme and to establish threshold noise levels at Higgins Neuk. Potential construction noise levels at Higgins Neuk were calculated based on the indicative construction methodology.

It is anticipated that limited short-term night-time closures would be required to alter the carriageway alignment where the temporary bridge structure ties-in to the existing Kincardine Bridge and A985. Due to the lower threshold levels during the night-time, these works have the potential to temporarily exceed the threshold levels, potentially resulting in significant adverse effects at Higgins Neuk prior to the application of mitigation summarised below and provided in detail in the EIA Report.

Given the distance between the construction works for the proposed scheme and the nearest receptor, vibration effects for activities such as piling and breaking concrete are not predicted to be significant at any receptors.

Measures required to mitigate noise and vibration impacts take into account best practice, legislation, guidance and professional experience and include restricted working methods, community liaison and a Noise and Vibration Management Plan. With the appropriate noise mitigation measures employed, it is considered that any adverse noise and vibration effects associated with construction of the proposed scheme are unlikely to be significant.

It is anticipated that the proposed scheme will not change the traffic flow, speed or composition on the local road network during the operational phase. Therefore, a material change in operational noise and vibration at receptors is considered to be unlikely.

Materials Assets and Waste

The potential effects of constructing the proposed scheme on material assets and waste within the boundary of the proposed scheme have been assessed, and wider study area delineated by the City of Edinburgh, Clackmannanshire, East Dunbartonshire, East Renfrewshire, Falkirk, Fife, Glasgow City, Midlothian, North Lanarkshire, Perth & Kinross, Renfrewshire, South Lanarkshire, Stirling, West Dunbartonshire, East Lothian, West Lothian and Scottish Borders Council areas.

The construction of the proposed scheme will unavoidably require the use and consumption of material assets including primary raw materials and manufactured construction products, and hence may result in potential impacts on the environment through the depletion of non-renewable natural resources. Conversely, the construction of the proposed scheme will also generate surplus materials and waste, leading to impacts on the available waste management capacity. Impacts to superficial and bedrock deposits, within the working area, will also occur as a result of excavations, piling and other earthworks during the construction of the proposed scheme.

There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the proposed scheme; and there are no minerals safeguarding sites or existing or potential peat extraction sites within or in close proximity to the proposed scheme extents. There is likely to be adequate waste management capacity within the study area to accommodate the majority of wastes arising from the construction of the proposed scheme, and there is unlikely to be any specific constraints with regards to managing inert and non-hazardous waste streams. However, there is limited hazardous landfill capacity in the study area, and Scotland's sole hazardous landfill is considered to be highly sensitive to disposing large quantities of hazardous waste given its limited remaining capacity.

Throughout the design process, a number of 'embedded mitigation' features have been included in the proposed scheme design with the potential to reduce materials consumption and waste generation. Where potential residual effect have been identified, these will be reduced, where possible, during the construction stage through efficiencies and via compliance with relevant legislation, policies and plans relating to the consumption of material assets and the management of waste.

With application of mitigation and best practice measures including responsible sourcing methods, the waste hierarchy, implementation of Site Waste Management Plans and inclusion of targets that support the delivery of the Zero Waste Plan targets, the potential effects relating to the consumption of material assets and generation of wastes have been assessed as not significant.

Human Health

The effects of the proposed scheme on the human health of communities have been assessed. The communities identified for the purposes of the human health assessment use Scottish census data and are referred to as 'West of Kincardine Bridge' and 'Kincardine' communities.

The human health assessment considers assessments from other EIA topics including: geology, soils and groundwater; road drainage and the water environment; air quality; and noise and vibration.

Beneficial and adverse changes to health determinants arising as a result of the proposed scheme have been considered and using evidence a conclusion has been drawn as to whether there is an overall Positive, Negative, Neutral or Uncertain health outcome for the communities of West of Kincardine Bridge and Kincardine. The assessment has taken into account the mitigation already proposed in this EIA Report, using the mitigated (residual) position to determine potential impacts and significance of effects on human health.

Due to the associated assessments within the EIA Report not reporting any significant residual effects, during construction of the proposed scheme, it is expected that the potential effect on human health from pollution, coastal flooding, dust, and noise and vibration, would not be significant.

Air quality and noise and vibration were scoped out of the assessment for operation. Due to the associated assessments within the EIA Report not reporting any significant residual effects, during operation of the proposed scheme, it is expected that the potential effect on human health from pollution and coastal flooding, would not be significant.

There are no significant effects on human health on the communities of West of Kincardine Bridge or Kincardine predicted as a result of the proposed scheme.

Climate

The potential significant effects of the proposed scheme on climate, resulting from estimated changes in emissions of Greenhouse Gases (GHG) have been assessed.

The proposed scheme is expected to result in an increase in GHG emissions during the construction phase due to the consumption of materials, fuel and energy and the treatment and transportation of waste. Construction and maintenance related GHG emissions were therefore estimated using Transport Scotland's Projects Carbon Tool and available design information.

Based on a comparison of the estimated change in GHG emission as a result of the proposed scheme with the relevant UK carbon budgets and Scottish carbon reduction targets, no significant effect is assessed in relation to climate, therefore

additional mitigation beyond what is embedded in the proposed scheme design is not required. Despite this conclusion, a number of mitigation measures, including production of a quarterly carbon report to monitor GHG emissions and development of a Travel Management Plan to optimise journeys, are proposed in order to further minimise the change in GHG emissions as a result of the proposed scheme.

Cumulative Effects

The cumulative effects arising from multiple impacts on the same receptor and impacts of the proposed scheme in-combination with any 'reasonably foreseeable' developments identified within the vicinity of the proposed scheme have also been assessed.

Cumulative effects have been assessed taking into consideration construction and operational residual effects identified by each environmental topic assessment.

No significant cumulative effects are expected as a result of the combined environmental impacts of the proposed scheme during construction or operation, provided appropriate mitigation is adhered to.

It has been noted that there is potential for cumulative effects to arise from overlapping construction periods with two other developments within vicinity to the proposed scheme. However, due to a number of factors, such as the distance of the other developments from the proposed scheme, or the timing and nature of the works, no significant cumulative effects are anticipated.

Compliance with Policies and Plans

The policy assessment conducted as part of the EIA process considers the proposed scheme's compliance with national and local planning policy.

In principle, the development of the proposed scheme is supported in planning policy with the aims and objectives reflected in national policy guidance, such as

the National Planning Framework 3 (NPF3) (Scottish Government 2014a) and Scottish Planning Policy (SPP) (Scottish Government 2014b).

The proposed scheme also supports local transport policy objectives by providing infrastructure which will satisfy the transport needs of the growing population, and to assist in the growth of the economy. Additionally, the proposed scheme supports local sustainability objectives which seek to '*protect, enhance and promote...[the] historic environment*' (Falkirk Council 2020).

This policy assessment has identified compliance with all relevant policies. Mitigation measures are proposed to address the potential impacts as outlined in the EIA topics. The mitigation commitments are expected to reduce potential impacts of the proposed scheme to a level that avoids any potential policy conflict.

References

Babtie Group (2002). Existing Kincardine Bridge Refurbishment Options Report.

Falkirk Council (2020). Falkirk Local Development Plan 2.

Jacobs (2007) Improvement Options Report.

Scottish Government (2014a). National Planning Framework 3.

Scottish Government (2014b). Scottish Planning Policy.

Glossary

Aggregate	Materials used in construction, including sand, gravel, crushed stone, slag, or recycled crushed concrete.
Archaeological remains	Ancient man-made objects, structures or ancient burials that have been preserved on the earth's surface, underground or underwater.
Assessment	An umbrella term for description, analysis and evaluation.
Baseline	The existing conditions which form the basis or start point of the environmental assessment.

Bedrock	Hard rock that lies beneath a superficial cover of soils and sediments.
Cetacean	A large aquatic mammal e.g. whale, dolphin or porpoise.
Climate	Long-term weather conditions prevailing over a region.
Community	Assemblage of interacting populations that occupy a given area.
Conservation	Preservation or restoration of the natural environment and wildlife. Land in such condition by reason of substances on or under the land that significant harm is being caused, there is a significant possibility of such harm being caused or pollution of controlled water is being, or likely to be caused.
Contaminated land	
Cumulative effect	Changes to the environment caused by an action in combination with other past, present and future actions.
Earthworks	Works created through the moving of quantities of soil or unformed rock.
Ecology	The branch of biology concerned with the relations of organisms to one another and to their physical surroundings.
Ecosystem	A biological community of organisms interacting with one another and their physical environment.
Embankment	A bank of earth or stone built to carry a road or railway over an area of low ground.
Effect	The result of change or changes on specific environmental resources or receptors.
Environmental Impact Assessment (EIA)	The process by which information about the environmental effects of a project is evaluated and mitigation measures are identified.
Environmental Impact Assessment Report (EIA Report)	Document provided by the Developer to the Competent Authority, containing environmental information required under Directive 2011/92/EU as amended by Directive 2014/52/EU.
Estuary/Estuarine	A partially enclosed coastal body of brackish water with one or more rivers or streams flowing into it, and with a free connection to the open sea.
Geomorphology	The branch of geology concerned with the structure, origin and development of topographical features of the earth's crust.

Glacial Till	Glacial till is that part of glacial drift which was deposited directly by the glacier. It may vary from clays to mixtures of clay, sand, gravel and boulders.	Mean High Water Springs (MWS)	The height of Mean High Water Springs (MHWS) is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest (Spring tides).
Greenhouse gas (GHG)	A gaseous compound that absorbs infrared radiation and traps heat in the atmosphere.	Migration/Migratory	The movement (of an animal) from one habitat to another according to the seasons.
Ground Investigation	Exploratory investigation to determine the structure and characteristics of the ground. The collected information is used to establish or predict ground and groundwater behaviour during, and subsequent to, construction.	Mineral	A solid, naturally occurring inorganic substance.
Groundwater	Water below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.	Mitigation	Measure to avoid, reduce or offset potential adverse impacts.
Habitat	Term most accurately meaning the place in which a species lives, but also used to describe plant communities or agglomerations of plant communities.	Mudflat	A stretch of muddy land left uncovered at low tide.
Habitat Regulations Appraisal (HRA)	The process by which certain plans or projects are assessed which could affect the integrity of European sites. The report is used to inform an Appropriate Assessment (AA) under the requirements of the Habitats Directive.	National Vegetation Classification (NVC)	A system to describe British vegetation types, whereby each vegetation type has a different 'code'.
Holt	Deep underground otter shelter.	Offsetting	The process of compensating for something with something else.
Hydrodynamics	The motion of fluids and the forces acting on solid bodies immersed in fluids and in motion relative to them.	Parapet	A low protective wall along the edge of a roof, bridge, or balcony. Often referred to as 'guardrail'.
Hydrogeology	Branch of geology dealing with occurrence, distribution, and effect of groundwater.	Peat	Brown to black organic material formed by the partial decomposition of vegetable matter in the wet acidic conditions of bog and fens.
Impact	Any changes attributable to the proposed scheme that have the potential to have environmental effects (i.e. the causes of the effects).	Pier	An upright support for a structure or superstructure such as an arch or a bridge.
Intertidal	The area that is above water level at low tide and underwater at high tide.	Pile/Piling	A heavy stake or post made out of timber, steel, reinforced concrete or pre-tensioned concrete, driven into the ground to support foundations.
Listed Building	Building included on the list of buildings of special architectural or historic interest and afforded statutory protection under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (as amended by the Historic Environment Scotland Act 2014) and other planning legislation. Classified categories A-C.	Potential Impact	The impact on an aspect of the environment that may occur in the absence of mitigation.
Made ground	Ground comprised of material deposited by man i.e. not natural.	Proposed scheme	The scheme design as reported in Chapter 3 of the EIA Report, and used as the basis for environmental assessment and reporting.
Marine	Relating to or found in the sea.	Ramsar sites	Internationally important wetland identified for conservation under the Ramsar Convention 1971.
		Receptor	In this context, an element that is susceptible to being affected (either directly or indirectly) by the proposed scheme. Examples include habitats, species, people, properties, landscape, archaeological remains etc.
		Residual Effects	Residual effect means the environmental effect after the provision of mitigation measures, if any.
		Salting	An area of coastal land that is regularly covered by the tide.

Saltmarsh	Coastal ecosystem in the upper coastal intertidal zone between land and open saltwater or brackish water that is regularly flooded by the tides.	Sustainable Drainage Systems (SuDS)	A sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.
Sedimentary rock	Rock that has formed through the deposition and solidification of sediment.	Terrestrial	The environment above the Mean High Water Springs.
Silt	Fine sand, clay, or other material carried by running water and deposited as a sediment, especially in a channel or harbour.	Threshold	The minimum intensity or value of a signal etc that will produce a response or specified effect.
Sites of Special Scientific Interest (SSSI)	Designated areas of national importance. The aim of the SSSI network is to maintain an adequate representation of all natural and semi-natural habitats and native species in the UK. The site network is protected under the Nature Conservation (Scotland) Act 2004.	Tidal creek	A small waterway, and part of a stream, that is affected by tides.
Soffit	The underside of an architectural structure such as an arch, a balcony, or overhanging eaves.	Varioguard®	A galvanised steel safety barrier designed for use at the roadside to absorb the energy of errant vehicles.
Special Area of Conservation (SAC)	An area designated under the EC Habitats Directive to ensure that rare, endangered or vulnerable habitats or species of community interest are either maintained at or restored to a favourable conservation status.	Viaduct	A bridge that carries a road, railroad etc. over a valley.
Special Protection Area (SPA)	Special Protection Areas (SPAs) are selected to protect one or more rare, threatened or vulnerable bird species listed in Annex I of the Birds Directive, and regularly occurring migratory species. These areas are designated under the Birds Directive (Directive 79/409/EEC).	Water Framework Directive (WFD)	European environmental legislation (2000/60/EC) relating to inland surface waters, estuarine and coastal waters and groundwater. Fundamental objective to maintain "high status" of waters where it exists, preventing any deterioration in the existing status of waters and achieving at least "good status" in relation to all waters by 2027.
Species	A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.	Water quality	The chemical and biological status of various parameters within the water column and their interactions, for example dissolved oxygen, indicator metals such as dissolved copper, or suspended solids (the movement of which is determined by hydrological process and forms geomorphological landforms).
Stakeholder	In this context, a person or group that has an interest in a project.	Wetland	Land or areas (such as marshes or swamps) that are covered often intermittently with shallow water or have soil saturated with moisture.
Substructure	An underlying or supporting structure.		
Subtidal	The area where the seabed is below the lowest tide.		
Superficial Deposits	Superficial deposits are the youngest of the geological formations (less than 2.6 million years old). They are largely unconsolidated and cover much of the bedrock of Britain. They generally include sediments deposited during the Pleistocene (Quaternary) glacial episodes, subsequent Holocene rivers and coastal systems; superficial deposits also include modern man-made deposits such as mining spoil and road embankments.		

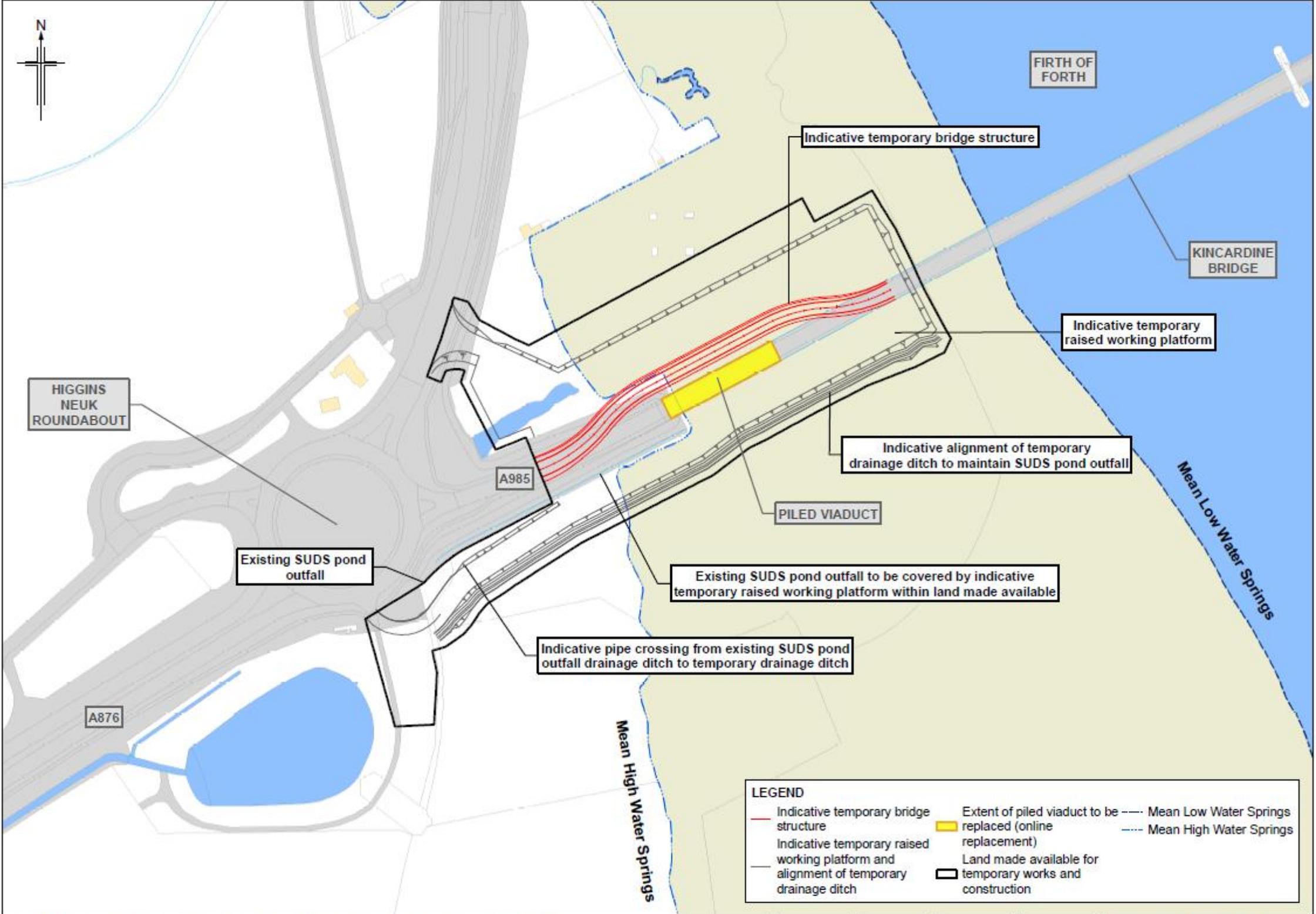


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LEGEND

 Indicative temporary bridge structure	 Extent of piled viaduct to be replaced (online replacement)	 Mean Low Water Springs
 Indicative temporary raised working platform and alignment of temporary drainage ditch	 Land made available for temporary works and construction	 Mean High Water Springs

LEGEND

-  Indicative temporary bridge structure
-  Indicative temporary raised working platform and alignment of temporary drainage ditch
-  Extent of piled viaduct to be replaced (online replacement)
-  Land made available for temporary works and construction
-  RSPB Skinflats Nature Reserve**
-  Special Protection Area (SPA)**
-  Wetlands of International Importance (Ramsar)**
-  Site of Special Scientific Interest (SSSI)**
-  Local Wildlife Site
-  Category A Listed Building*
-  Category B Listed Building*
-  Category C Listed Building*
-  Conservation Area*
-  Kincardine Ship Graveyard
-  Core path (Falkirk Council Core Paths: 010/110 Higgins Neuk to Clackmannanshire Bridge and 010/124 Cycleway to Higgins Neuk Roundabout)
-  Local path
-  Local cycle route
-  Rights of Way
-  National Cycle Network (NCN)
-  Mean Low Water Springs
-  Mean High Water Springs

Data source:

*Historic Environment Scotland (HES) - Data provided March 2018

**Scottish National Heritage (SNH) - Data provided March 2018

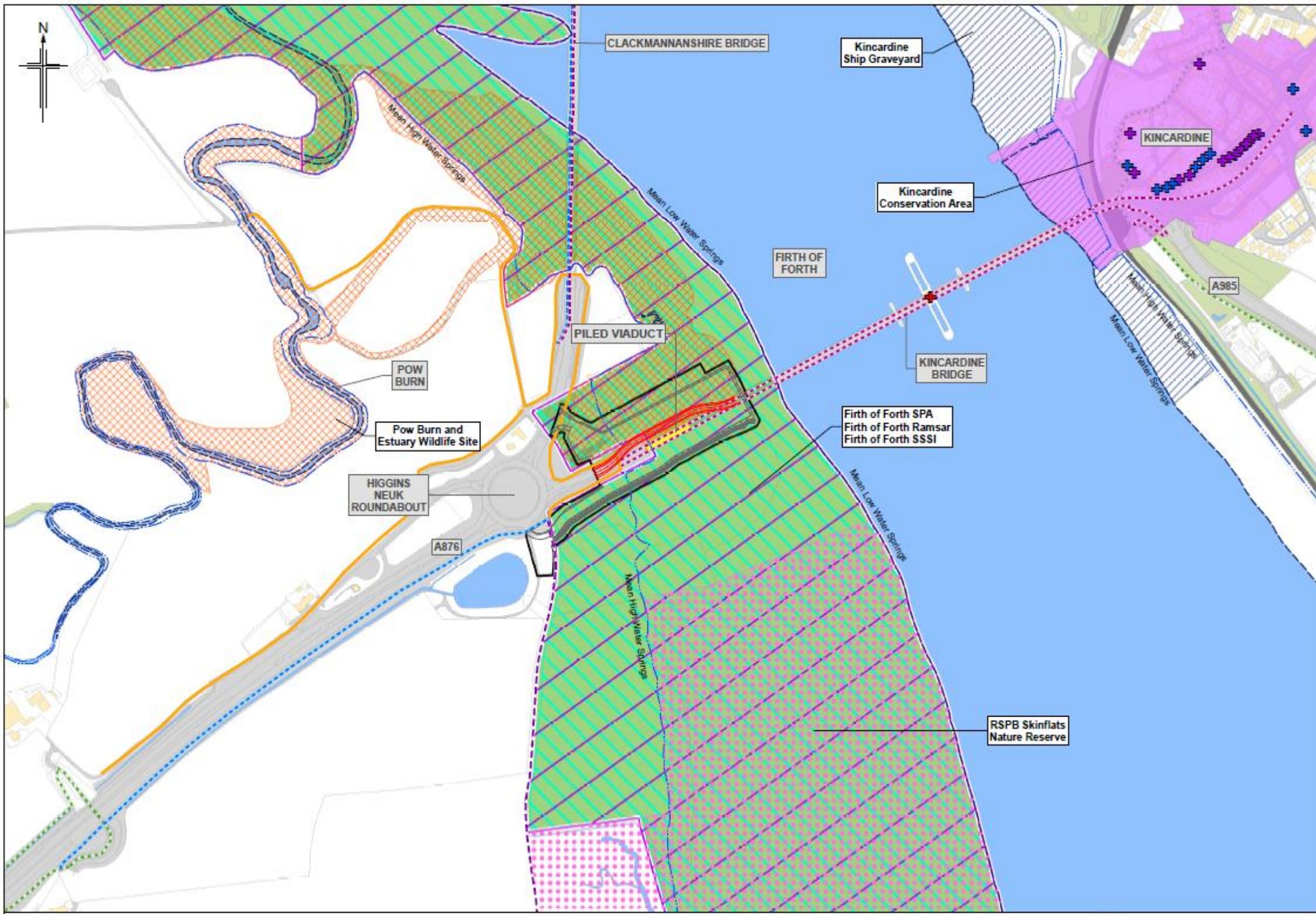


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