Fife Council

NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT

Habitats Regulations Appraisal

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CONFIDENTIAL

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List of Abbreviations

AA	Appropriate Assessment
BTO	British Trust for Ornithology
CEMP	Construction Environmental Management Plan
CMS	Construction Method Statement
ECoW	Ecological Clerk of Works
FC	Fife Council
FCCT	Fife Coast and Countryside Trust
HRA	Habitat Regulations Appraisal
LNR	Local Nature Reserve
LSE	Likely Significant Effect
PPG	Pollution Prevention Guidance
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TTTC	Through the Tide Counts
WeBS	Wetland Bird Survey

EXECUTIVE SUMMARY

WSP was commissioned by Fife Council (FC)l to provide support in respect of proposed major concrete repairs and installation of cathodic protection (the 'Proposed Development') to New Bridge, Guardbridge, Fife, (the 'Site').

This is a comprehensive report which has addressed the potential impacts on the qualifying features in detail. A further round of bird surveys will be undertaken before works commence, however based upon on the assessment findings and proposed mitigation measures these are not expected to adversely impact the findings and recommendations contained herein.

The Site is located within an area subject to legal protection under European legislation Directive 2009/147/EC on the conservation of wild birds (The 'Birds Directive') and Conservation of natural habitats and wild fauna and flora Directive (92/43/EEC) (The 'Habitats Directive'), namely the Firth of Tay and Eden Estuary Special Protection Area (SPA), Special Area for Conservation (SAC) and Ramsar site.

Under the requirements of The Habitats Directive and The Birds Directive it is necessary to consider whether the Proposed Development may have significant effects upon areas of nature conservation importance designated/classified under the Directives. This requirement is translated into Scottish law through the Conservation of Habitats and Species Regulations 2017 (in relation to reserved matters) and the Conservation (Natural Habitats. &c.) Regulations 1994 (collectively, 'The Habitats Regulations').

The Habitats Regulations place a duty upon 'Competent Authorities' (i.e. FC in this case) to consider the potential for effects upon sites of European importance prior to granting consent for projects or plans. Should 'Likely Significant Effects' (LSEs) be identified by the Screening Process it is necessary to further consider the LSEs by way of an 'Appropriate Assessment' (AA). This process of assessment is known as Habitats Regulations Appraisal (HRA). Ramsar sites are also included within the HRA process as required by The Habitats Regulations. Given the nature of the proposed development and the location of the Site, FC recognised the requirement for a HRA; this requirement was confirmed in consultation with Scottish Natural Heritage (SNH). The following LSEs (without mitigation) were identified:

Firth of Tay and Eden Estuary SPA and Ramsar site:

- Disturbance of the qualifying species redshank (noise and visual pathways, physical barrier to flight under bridge);
- Disturbance of the qualifying species black-tailed godwit (noise and visual pathways, physical barrier to flight under bridge);
- Disturbance of the qualifying species dunlin (noise and visual pathways, physical barrier to flight under bridge); and
- Disturbance of the wintering waterfowl assemblage (noise and visual pathways, physical barrier to flight under bridge).

Firth of Tay and Eden Estuary SAC:

- Deterioration of the qualifying habitats: Estuaries (land-take, water quality and pollutant pathways);
- Deterioration of the qualifying habitats Sandbanks which are slightly covered by sea water all the time (water quality/pollutant pathways); and
- Deterioration of the qualifying habitats: Mudflats and sandflats not covered by seawater at low tide (land-take, water quality/pollutant pathways).

Taking into account the desk study data, survey data and mitigation measures, the AA concluded no significant adverse effects on qualifying habitats and species of the Firth of Tay and Eden Estuary SAC, SPA or Ramsar site due to the Proposed Development if undertaken March-September. **This report will be updated upon completion of bird surveys in September/October 2018 in order to inform an assessment of Likely Significant Effects should works extend in to September and October.**

1 INTRODUCTION

1.1 BACKGROUND

1.1.1. WSP was commissioned by Fife Council (FC) to provide support in respect of proposed major concrete repairs and installation of cathodic protection[1] (hereafter the 'Proposed Development') to New Bridge, Guardbridge, Fife, (hereafter the 'Site', OS Grid Reference NO 45181 18857).

1.1.2. The Site is located within an area subject to legal protection under European legislation Directive 2009/147/EC on the conservation of wild birds (The 'Birds Directive') and Conservation of natural habitats and wild fauna and flora Directive (92/43/EEC) (The 'Habitats Directive'), namely the Firth of Tay and Eden Estuary Special Protection Area (SPA[2]), Special Area for Conservation (SAC[3]) and Ramsar site[4].

1.2 THE HABITATS DIRECTIVE

1.2.1. Under the requirements of The Habitats Directive and The Birds Directive it is necessary to consider whether the Proposed Development may have significant effects upon areas of nature conservation importance designated/classified under the Directives. This requirement is translated into Scottish law through the Conservation of Habitats and Species Regulations 2017 (in relation to reserved matters) and the Conservation (Natural Habitats. &c.) Regulations 1994 (collectively, 'The Habitats Regulations').

1.2.2. The Habitats Regulations place a duty upon 'Competent Authorities' (i.e. FC in this case) to consider the potential for effects upon sites of European importance prior to granting consent for projects or plans. Should 'Likely Significant Effects' (LSEs) be identified by the Screening Process it is necessary to further consider the LSEs by way of an 'Appropriate Assessment' (AA). This process of assessment, described in full in Section 1.3, is known as Habitats Regulations Appraisal (HRA). Ramsar sites are also included within the HRA process as required by The Habitats Regulations.

1.2.3. Given the nature of the proposed development and the location of the Site, FC recognised the requirement for a HRA; this requirement was confirmed in consultation with Scottish Natural Heritage (SNH).

1.3 HRA PROCESS

1.3.1. The HRA process used is usually summarised in four distinct stages of assessment:

- Stage 1 – Screening: the process which identifies whether effects upon a Natura 2000 site of a plan or project are possible, either alone or in combination with other plans or projects, and considers whether these effects are likely to be significant, i.e. they cannot be objectively ruled out[5]. Prior to recent 'People Over Wind' case law[6], mitigation was applied at this stage and LSEs then re-assessed in light of mitigation proposed. However, in this HRA, mitigation is only applied at Stage 2.
- Stage 2 – Appropriate Assessment (AA): the detailed consideration of the effect on the integrity of the Natura 2000 site of the plan or project, either alone or in combination with other plans or projects, with

[1] Cathodic protection is a technique used to control the corrosion of a metal surface.

[2] Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.

[3] Special Areas of Conservation (SACs) are strictly protected sites designated under the Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).

[4] Ramsar sites are wetlands of international importance designated under the Ramsar Convention, an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

[5] With reference to paragraph 45 of Court of Justice of the European Union Case C-127/02 dated 7th September 2004, 'the Waddenzee ruling'.

[6] With reference to Court of Justice of the European Union Case C-323/17 'People Over Wind v Coillte Teoranta' dated 12 April 2018: that the Habitats Directive "must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site".

respect to the site's conservation objectives and its structure and function. Mitigation measures are included at this stage.

- Stage 3 – Assessment of alternative solutions: the process which examines alternative ways of achieving the objectives of the plan or project that avoid adverse impacts on the integrity of the Natura 2000 site.
- Stage 4 – Assessment where no alternative solutions exist and where adverse impacts remain: an assessment of whether the development is necessary for Imperative Reasons of Overriding Public Interest (IROPI) and, if so, of the compensatory measures needed to maintain the overall coherence of the Natura 2000 network.

1.4 GUIDANCE

In undertaking this HRA, the following guidance and European Union Case Law was referred to:

- 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[7];
- Habitats Regulations Appraisal of Plans: Guidance for Plan-making Bodies in Scotland[8];
- Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC[9];
- Communication from the Commission on the Precautionary Principle10;
- Court of Justice of the European Union Case C-127/02 dated 7 September 2004, 'the Waddenzee ruling'; and
- Court of Justice of the European Union Case C-323/17 'People Over Wind v Coillte Teoranta' dated 12 April 2018.

[7] European Commission (2001). Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf

[8] David Tyldesley and Associates (2015). Habitats Regulations Appraisal of Plans: Guidance for Plan-making Bodies in Scotland. Version 3.0. January 2015. www.snh.gov.uk/docs/A1500925.pdf

[9] European Commission (2000a). Managing Natura 2000 Sites. The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg. http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

[10] European Commission (2000b). Communication from the Commission on the Precautionary Principle. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3Al32042

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

2.1.1. The New Bridge, Guardbridge, Fife, was constructed in the mid-1930s and is located approximately 6 km north-west of St. Andrews and is the main route to the town carrying the A91 across the Eden Estuary. The A91 is a single lane carriageway with pedestrian footpaths located either side of the road, with the bridge itself comprising five spans. Spans 1 and 5 are buried within the banks of the Eden Estuary channel, with spans 2, 3 and 4 located within the estuary channel, with exposed piers located within the estuary bed. **Appendix A** details the technical design drawings for the project and illustrates the bridge structure.

2.1.2. The bridge structure and piers are subject to repeated inundation, with the underside of the bridge arches subject to inundation by flood waters periodically. Because of the interaction with the tidal/marine environment the structure has deteriorated and resulted in insufficient cover to the embedded reinforcement within the bridge. Concrete cover has reduced to less than 25 mm in areas, and less than 10 mm in areas of extreme deterioration. Delamination and spalling of concrete has resulted in exposure and subsequent corrosion of rebar within the bridge.

2.1.3. Spans 2 and 3 are showing some of the most pronounced deterioration, with leaking expansion joints exacerbating deterioration of the structure by allowing de-icing salt contaminated water (from de-icing activities during winter periods) to penetrate through and flow around the arches below.

2.1.4. Phase 1 of reparatory works was completed in July 2014 comprising replacement of the bridgedeck waterproofing, the surfacing and asphaltic plug joints on the top-side of the bridge. Phase 2 of reparatory works (i.e. the Proposed Development) is proposed to comprise concrete repairs and the installation of long-term protection in the form of cathodic protection.

2.1.5. Detailed construction materials, methods and timings for Phase 2 will be determined by the Principal Contractor who will prepare a Construction Method Statement (CMS) (or equivalent document). The construction information used as the basis of this HRA is based on the assumed methods of working based on other similar developments. Where uncertainty exists, a precautionary approach is adopted.

2.2 CONSTRUCTION METHODS AND PROGRAMME

2.2.1. In the absence of detailed construction methods, to inform this HRA, the following elements of the Proposed Development are anticipated:

- Erection and encapsulation of scaffolding around the bridge;
- Hydroblasting to remove areas of defunct/damaged concrete from the underside of the bridge arches. This is a non-percussive method.
- Where hydroblasting is not possible, other proposed concrete removal methods will be employed, involving the use of pneumatic hand tools (i.e. percussive). Whilst this method creates similar noise disruption to hydroblasting, it would likely be slower and less efficient and as a result, increase the duration of noise disturbance associated with the works;
- Repairs and reinforcement to the bridge will be undertaken using sprayed gunite concrete; and
- Cathodic protection will be installed and will require excavation of areas of the estuary bed adjacent to bridge piers to install the anode system.

2.3 CONSTRUCTION PROGRAMME

2.3.1. It is anticipated that the Proposed Development will take place over the course of a single year – currently proposed to be 2019. The aspirational dates for completion span March-September inclusive, however, this is dependent on the outcome of this HRA, regarding potentially significant effects on the non-breeding qualifying avian receptors of the SPA and Ramsar. .

2.4 CONSTRUCTION HOURS OF WORK

2.4.1. The Principal Contractor will finalise the hours of work, however it is assumed that working hours will be during daylight hours from Monday to Saturday.

3 DESIGNATED SITES

3.1.1. **Appendix B** illustrates the extent of the Firth of Tay and Eden Estuary SPA, SAC and Ramsar and the location of the Site. The reasons for designation of these sites is summarised below with SPA and SAC site citations, Natura 2000 standard data forms, Ramsar information sheet and conservation objectives all provided in **Appendix B**.

3.1.2. Further to European and international designation status, the area is also designated as the Eden Estuary Site of Special Scientific Interest (SSSI[11]) and Local Nature Reserve (LNR[12]), recognising several features of conservation status at the national and local level. Information from work associated with the management of these sites is useful to inform this assessment and is provided in **Appendix C** of this report.

3.2 FIRTH OF TAY AND EDEN ESTUARY SPA

3.2.1. **Appendix B** provides information on the qualifying features and their relative conservation status.

3.2.2. This site qualifies under Article 4.1 of the Birds Directive by supporting populations of European importance of the following species listed on Annex I of the Directive:

- During the breeding season:
  - Little tern *Sterna albifrons*; and
  - Marsh harrier *Circus aeruginosus*.
- Over winter:
  - Bar-tailed Godwit *Limosa lapponica*.

3.2.3. This site also qualifies under Article 4.2 of the Birds Directive by supporting populations of European importance of the following migratory species:

- Over winter:
  - Pink-footed goose *Anser brachyrhynchus*; and
  - Redshank *Tringa totanus*.

3.2.4. The area qualifies under Article 4.2 of the Birds Directive by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports 34,074 individual waterfowl including: velvet scoter *Melanitta fusca*, pink-footed goose, greylag goose *Anser anser*, redshank, cormorant *Phalacrocorax carbo*, shelduck *Tadorna tadorna,* eider *Somateria mollissima*, bar-tailed godwit *Limosa lapponica*, common scoter *Melanitta nigra*, black-tailed godwit *Limosa limosa islandica*, goldeneye *Bucephala clangula*, red-breasted merganser *Mergus serrator*, goosander *Mergus merganser*, oystercatcher *Haematopus ostralegus*, grey plover *Pluvialis squatarola*, sanderling *Calidris alba*, dunlin and long-tailed duck *Clangula hyemalis*.

3.3 FIRTH OF TAY AND EDEN ESTUARY RAMSAR

3.3.1. **Appendix B** provides information on the qualifying features and their relative conservation status.

3.3.2. The Ramsar qualifying features list is as follows:

- Bar-tailed godwit: non-breeding;
- Greylag goose: non-breeding;
- Pink-footed goose: non-breeding;
- Redshank: non-breeding; and
- Waterfowl assemblage: non-breeding.

[11] Site of Special Scientific Interest (SSSI) is a statutory designation made by Scottish Natural Heritage under the Nature Conservation (Scotland) Act 2004.

[12] Local Nature Reserves (LNRs) are areas of natural heritage that are at least locally important. Local authorities select and designate LNRs under Section 21 of the National Parks and Access to the Countryside Act 1949 (as amended).

3.4 FIRTH OF TAY AND EDEN ESTUARY SAC

3.4.1. **Appendix B** provides information on the qualifying features and their relative conservation status. The Habitats Directive Annex I habitat that is a primary reason for selection of this site is:

- Estuaries.

3.4.2. The Habitats Directive Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site are:

- Sandbanks which are slightly covered by sea water all the time; and
- Mudflats and sandflats not covered by seawater at low tide.

3.4.3. The Habitats Directive Annex II species that is a primary reason for selection of this site is:

- Harbour seal *Phoca vitulina*.

3.5 CONSERVATION OBJECTIVES

3.5.1. The broad conservation objectives of the Firth of Tay and Eden Estuary SPA and SAC as defined by SNH[13] are:

- To avoid deterioration of the qualifying habitats thus ensuring the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status…and to ensure for the qualifying habitats that the following are maintained in the long term:
    - Extent of the habitat on site;
    - Distribution of the habitat within the site;
    - Structure and function of the habitat;
    - Processes supporting the habitat;
    - Distribution of typical species of the habitat; and
    - Viability of typical species as components of the habitat.
- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status…and to ensure for the qualifying species that the following are maintained in the long term:
    - Population of the species as a visible component of the site;
    - Distribution of the species within the site;
    - Distribution and extent of habitats supporting the species;
    - Structure, function and supporting processes of the habitats supporting the species; and
    - No significant disturbance of the species.

3.5.2. The Habitats Directive provides further interpretation of the meaning of 'favourable conservation status' within Article 1 parts (a), (e) and (i) as below:

- (a) conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status as defined in (e) and (i):
    - (e) conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2. The conservation status of a natural habitat will be taken as "favourable" when:
        - its natural range and areas it covers within that range are stable or increasing, and
        - the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and

[13] SAC and SPA and conservation objectives accessed 10.7.2018: http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8257 and http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8501.

- the conservation status of its typical species is favourable as defined in (i);

- (i) conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2. The conservation status will be taken as “favourable” when:
  - population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
  - the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
  - there is, and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

3.5.3. Specific conservation objectives for Ramsar sites are not available but for the purposes of the HRA are assumed to mirror those of the SPA.

4 SUPPORTING INFORMATION

4.1 INTRODUCTION

4.1.1. This section presents the methodology and findings of surveys and data gathering exercises undertaken to obtain the current baseline for areas within the SAC, SPA and Ramsar.

4.2 METHODOLOGY

4.2.1. The baseline was established through a combination of the following methods:

- Consultation and data review; and
- Migrating/wintering bird surveys.

CONSULTATION AND DATA REVIEW

4.2.2. Consultation and data gathering has been carried out with:

- Scottish Natural Heritage (SNH) (site visit December 2016, meeting and e-mail correspondence on several dates between 2016 and 2018);
- Royal Society for the Protection of Birds (RSPB) (data received December 2016)[14];
- Marine Scotland - Licensing Operations Team (contacted in November 2016 - no response received to date);
- British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) data;
- Fife Nature Records Centre (data received November 2016)[14]; and
- Ranald Strachan, Countryside Ranger, Fife Coast and Countryside Trust (FCCT) (various dates between 2016 and 2018).

4.2.3. The following document is referred to by permission for contextual information:

- Ecos Country Services LLP (December 2013). Guardbridge Energy Centre, Report to Inform Appropriate Assessment, commissioned by St. Andrews University.

WINTERING BIRD SURVEYS

4.2.4. Gavin Johnson, SNH Operations Officer – Fife, was consulted in November 2017 regarding the proposed timing of the Proposed Development and the feasibility of undertaking work between March and September inclusive, i.e. overlapping with the migratory bird season and it was advised that wintering bird surveys be undertaken. Wintering bird surveys enable an assessment of the effects of construction work, if undertaken during spring and autumn, on SPA and Ramsar qualifying bird species.

4.2.5. Wintering bird surveys, including Through the Tide Counts (TTTC) and Flight Activity Surveys were undertaken in spring 2018 (March and April) and are programmed to be undertaken again in autumn 2018 (September and October).

Through the Tide Counts

4.2.6. TTTC survey methodology follows an adapted version of that used during the British Trust for Ornithology's (BTO) Wetland Bird Surveys (WeBS) core and low tide counts (as described in Bibby et al., 2000).

4.2.7. A study area of approximately 1 km up and down stream of the Site was surveyed utilising several strategically located vantage points (VP) along the shoreline, thus enabling the entire shoreline within the survey area to be observed. The surveyors took 'snapshot' scans and recorded the number, location and behaviour of waterbirds (waders and wildfowl) on a large-scale survey map. Data were recorded on maps using standard BTO bird species codes with the number of each species recorded in superscript and the related behaviour indicated in subscript text (loafing, roosting, foraging or flying). The study area included the open water, intertidal area and adjacent terrestrial habitat within 200 m of the mean high tide springs. Consideration of adjacent terrestrial habitat e.g. arable farmland, grazing pasture was given to assess use by wildfowl and waders for high tide roosting and foraging.

[14] Data were received but not referred to specifically in the remainder of this HRA since more recent relevant data were available.

4.2.8. TTTC surveys were undertaken during periods of good visibility with the aid of binoculars and a x 60 zoom spotting telescope. To ensure adequate coverage of the study area at all tidal states a total of eight surveys of the study area were undertaken per month. Two surveys of the study area were completed sequentially during each survey visit with the surveys programmed to ensure that each survey was undertaken on a different tidal state e.g. low followed by mid tide or mid followed by high tide.

4.2.9. High tide counts were carried out over a three-hour period, 1.5 hours either side of high water (when minimal or no areas of intertidal flats were exposed), and low tide counts over four hours, two hours either side of low water (when maximum areas of inter-tidal flats were exposed).

4.2.10. Mid-tide counts were carried out up to 1.5 hours either side of the time half-way between high and low water (depending on the timing of tides on a particular day) on a falling or rising tide. Surveys were undertaken once a week (four surveys a month) during March and April 2018. Counts therefore covered a range of spring (tides when high water was above the average level and low water below the average level) and neap tide conditions (when tidal ranges are less extreme than average) in the Eden Estuary.

Flight Activity Surveys

4.2.11. The Site is in an area regularly used by waterbirds with regular flights between foraging and /or roosting areas expected to occur. As the proposed methods for the concrete works (involving scaffolding in particular) may obstruct flight paths under the bridge, further information was gathered with regards waterbird flight activity.

4.2.12. Flight activity surveys were undertaken from a VP located east of the Site that afforded views of flights that passed both under and over the bridge. The surveyor undertook two watches of one hour in duration before, after and/or between the TTTC surveys. Therefore, a total of four hours of survey effort were undertaken (two per week) for the months of March and April. The surveyor timed the surveys so that a variety of tidal states (high, low, falling and rising) were undertaken each month.

4.2.13. On each occasion a waterbird flight was observed over or under the bridge structure the surveyor recorded direction of flight, species, number of birds as well as whether the flight was under or over the bridge.

4.3 RESULTS

CONSULTATION AND DATA REVIEW

Fife Coast and Countryside Trust

4.3.1. Ranald Strachan (FCCT) provided the following contextual background information (email 09 November 2016):

- ‘Waders and wildfowl use estuarine area close to and around the bridge area for feeding, however 40 m either side less so. The main feeding area for waders is the mudflat at the bend in the River Eden [the Edenside mudflat]. The bridge area is of course a transition area and birds move frequently over and under the bridge’.
- ‘Pink footed geese use the Edenside mudflat for low tide night roosts in October-April, with max: 20,250, Usual: 1500, Minimum: 300 approx. Geese often fly up river to graze’.
- An annotated aerial photograph (Figure 1) was also provided with the following descriptions:
  - ‘Circle: Wader/waterbird feeding areas (godwits, redshanks, dunlin, greenshank, little egret, heron, shelduck etc). Used when available according to tidal state.
  - Square: High tide roosts and loafing. Used at high tide however on highest tides birds will move to outer estuary due to coastal squeeze and saltmarsh inundation’.

Figure 1 – Anecdotal Information on Wader / Waterbird Feeding / Roosting Areas (Ranald, Strachan, Pers. Comm)

4.3.2. This anecdotal information indicates that the closest location to the bridge that is recognised as preferred foraging habitat is 150 m south (on west side of the River Eden) and closest for high tide roosting and loafing is the Edenside saltmarsh over 350 m to the northwest. The habitats in these areas appear to be more suitable for foraging and roosting (with reference to aerials and site visit observations) than the area surrounding the bridge.

Ecos Countryside Services LLP (2013)

4.3.3. Ecos Countryside Services LLP (2013) reported that the estuary and estuarine resource has been studied by St. Andrew's University for many years, including the mapping of invertebrate food sources for birds. It states that recent changes to sedimentary processes have altered the distribution of prey items and some bird species are showing a marked response as a result, e.g. black-tailed godwit are foraging more regularly upstream of the bridge[15].

4.3.4. The Ecos Countryside Services LLP (2013) report also collated baseline data made available by FCCT and created a 'preliminary key sensitivity map' relating to key sensitivities of areas within the SPA and Ramsar, presented as Figure 2 below.

[15] No further information on this pattern of behaviour is available within the Ecos report.

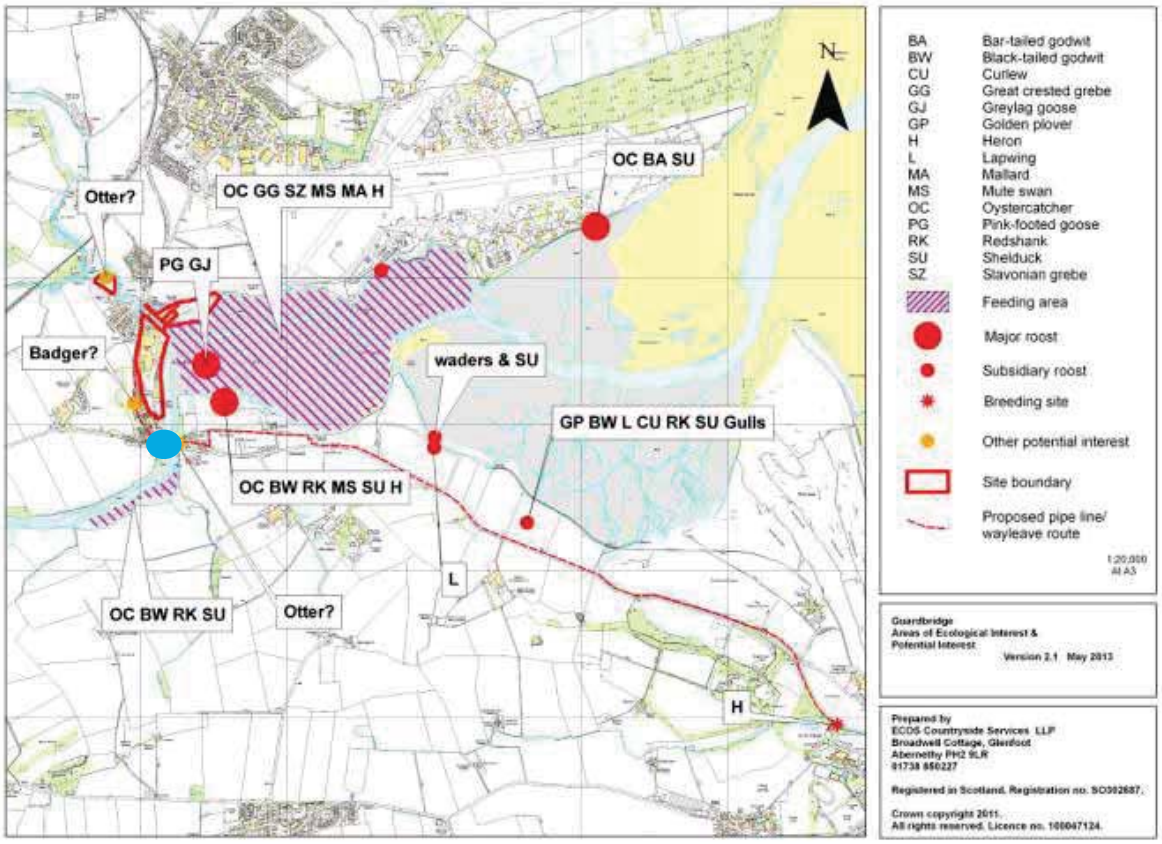


Figure 2 – Ecos Countryside Services LLP (2013) 'Preliminary Key Sensitivity Map' (Bridge location shown as a blue dot).

4.3.5. Figure 2 correlates with Figure 1, indicating that major roosts are assessed as being over 350 m north of the bridge and the most expansive feeding site is a similar distance away within the estuary itself. A preferred feeding area is also identified upstream of the bridge, on the right bankside, which is favoured by oystercatcher, black-tailed godwit redshank and shelduck.

4.3.6. Low tide species distribution maps for the 2008/09 WeBS survey were available from BTO for 18 key species, summarised in Ecos Countryside Services LLP (2013), and of these only six species made more than just occasional use of habitat within approximately 500 m of the bridge: black-tailed godwit, curlew *Numenius arquata*, dunlin, lapwing *Vanellus vanellus*, oystercatcher and redshank.

4.3.7. To supplement anecdotal information and the 2008/09 WeBS data, TTTC surveys were undertaken on the biggest spring tides in August and September 2013 and results provided in Annex A of Ecos Countryside Services LLP (2013). Surveys were not conducted upstream of the bridge. Low tide results of 'Sector A' covered the area immediately downstream of the bridge and are of relevance to this report. The highest (5 or above) peak counts from August-September 2013 were as follows: mute swan (9), mallard (25), teal (22), oystercatcher (6), lapwing (39), black-tailed godwit (7), curlew (13), redshank (29) and grey heron *Ardea cinerea* (6).

WeBS Data

4.3.8. An important area for black-tailed godwit and redshank during Low Tide Counts (LTCs) is a section referred to as 'BE014' while for the WeBS core counts it's the webstation known as 'Edenside'. Section BE014 and Edenside essentially comprises the outer part of the WSP study area from Eden Estuary Centre east to Sand Ford Head. This area has been identified as having high densities of these two species and other waders and wildfowl during WSP surveys, with declining numbers to the west in the direction of the bridge.

4.3.9. A summary of LTC data for black-tailed godwit and redshank follows:

- December 2017: Black-tailed godwit, 9 of a total of 99 birds counted in BE014. Redshank, 122 of 628 birds counted in BE014, 153 birds in total in area relevant to WSP study. The remaining 485 birds were beyond the WSP study area.
- January 2018: Black-tailed godwit, 94 of 94 birds counted BEO14. Redshank, 265 birds of 455 birds counted were in area relevant to WSP study area with 234 in BE014.
- February 2018: Black-tailed godwit, 112 of 115 birds counted in BEO14. Redshank, 608 of 701 birds counted in area relevant to WSP study area with 568 in BEO14.

4.3.10. A summary of WeBS Core Count data for black-tailed godwit and redshank follows:

- January 2018: Black-tailed godwit, 80 of a total of 80 birds counted were from the Edenside WeBS station (incorporating WSP Study area). Redshank: RK-121of 251 birds counted were from Edenside WeBS station (incorporating WSP Study area)
- February 2018: Black-tailed godwit, 69 of 74 birds counted were from Edenside WeBS station (incorporating WSP Study area). Redshank, 30 of 948 birds counted were from Edenside WeBS station (incorporating WSP Study area). A large proportion, 718 were beyond the WSP study area to the East).
- March 2018: Black-tailed godwit, 62 of 62 birds counted were from Edenside WeBS station (incorporating WSP Study area). Redshank, 220 of 557 birds counted were from Edenside WeBS station (incorporating WSP Study area). A further 337 birds were to east of the WSP study area.

WINTERING BIRD SURVEYS

Through the Tide Counts

4.3.11. **Appendix D** sets out the details of the TTTC survey data (weather conditions, results and figures). **Appendix D:** Figure D1.1 shows the survey area (red line) and grid squares which are 50 m x 50 m within approximately 200 m of mean high-water springs and 100 m x 100 m beyond this (to reflect the reduced surveyor accuracy beyond this distance).

4.3.12. The results figures **Appendix D**: (D2.1-D2.14 display the peak bird numbers recorded during any one individual survey in each grid square for all species combined for all behaviours except flying or perched (i.e. only foraging (F), loafing (L) and roosting (R)). These are presented in one combined figure for all SPA species and are also separated out into separate behaviours and individual species where required to interrogate the data more clearly. Each figure also displays a 200 m 'disturbance buffer' from the bridge. This disturbance buffer is discussed in detail in Section 6.5 and it is interpreted as the Zone of Influence of the noise/visual impacts of the Proposed Development on SPA/Ramsar species.

4.3.13. Table 1 shows the peak counts of SPA/Ramsar species within 200 m of bridge as a percentage of total peak counts within the survey area (F, L and R behaviours combined).

Table 1 – Peak Counts within 200m of Bridge as a Percentage of Total Peak Counts within Survey Area A9 (F, L and R behaviours combined)

Species/Assemblage	Total Peak Counts in Survey Area	Total Peak Counts within 200 m of Bridge	Percentage within 200 m of Bridge
Oystercatcher	583	23	3.9
Cormorant	5	1	20
Redshank	3971	582	14.7
Dunlin	1482	0	0
Black-tailed godwit	1422	13	0.9
Eider	16	0	0
Goldeneye	63	7	11.1
Goosander	8	2	25
Greylag goose	5	0	0
Long-tailed duck	4	0	0

Species/Assemblage	Total Peak Counts in Survey Area	Total Peak Counts within 200 m of Bridge	Percentage within 200 m of Bridge
Pink-footed goose	1240	0	0
Red-breasted merganser	7	1	14.3
Shelduck	722	0	0
Total	9528	629	6.6

4.3.14. The following species were recorded in the survey area, but were absent from the 200 m zone surrounding the bridge: greylag goose, dunlin, eider, long-tailed duck, pink-footed goose and shelduck. For oystercatcher (3.9%), black-tailed godwit (0.9%) the presence within the 200 m zone of the bridge was a relatively minor proportion of the Survey Area, whilst for cormorant, redshank, goldeneye goosander and red-breasted merganser the proportions varied from 14-25%.

4.3.15. Table 2 provides similar information, but is limited to foraging behaviour only. Only oystercatcher, redshank, goldeneye, goosander and red-breasted merganser were recorded foraging within 200 m of the bridge.

Table 2 – Peak Counts within 200 m of Bridge as a Percentage of Total Peak Counts within Survey Area A9 (F behaviour only)

Species/Assemblage	Total Peak Counts in Survey Area - Foraging	Total Peak Counts within 200 m of Bridge - Foraging	Percentage within 200 m of Bridge - Foraging
Oystercatcher	329	7	2.1
Cormorant	4	0	0
Redshank	1801	229	12.7
Dunlin	1100	0	0
Black-tailed godwit	552	13	0.9
Eider	4	0	0
Goldeneye	62	7	11.3
Goosander	6	2	33.3
Long-tailed duck	4	0	0
Pink-footed goose	232	0	0
Red-breasted merganser	7	1	14.3
Shelduck	529	0	0

4.3.16. The only roosting behaviour within 200 m of the bridge related to two oystercatchers on two occasions at high tide. Table 3 provides similar information to Table 1 and 2, but is limited to loafing behaviour only. Only oystercatcher, redshank and cormorant were recorded loafing within 200 m of the bridge.

Table 3 – Peak Counts within 200m of Bridge as a Percentage of Total Peak Counts within Survey Area A9 (L behaviour only)

Species/Assemblage	Total Peak Counts in Survey Area - Loafing	Total Peak Counts within 200 m of Bridge - Loafing	Percentage within 200 m of Bridge - Loafing
Oystercatcher	83	12	14.5

Species/Assemblage	Total Peak Counts in Survey Area - Loafing	Total Peak Counts within 200 m of Bridge - Loafing	Percentage within 200 m of Bridge - Loafing
Cormorant	1	1	100
Redshank	1201	353	29.4
Dunlin	2	0	0
Black-tailed godwit	630	0	0
Eider	12	0	0
Goldeneye	1	0	0
Goosander	2	0	0
Greylag goose	5	0	0
Long-tailed duck	83	0	0
Pink-footed goose	338	0	0
Shelduck	143	0	0

Flight Activity Surveys

4.3.17. **Appendix E** sets out the details of the Flight Activity survey data (weather conditions and results) and these are summarised in Table 4.

Table 4 – Flight Activity Surveys Summary – March/April 2018

Date	Survey Times	Under Bridge	Species	Time	Direction
14.03.18	07:10-08:10	0			
14.03.18	14:20-15:20	0			
16.03.18	09:15-10:15	0			
16.03.18	12:50-13:50	0			
4.04.2018	07:20-08.20	0			
4.04.2018	14:00-15:00	0			
16.04.2018	06:30-07:30	0			
16.04.2018	13:50-14:50	0			
25.04.2018	09:00-10:00	1	Grey Heron	10:07	SW
25.04.2018	15:50-16:50	0			

4.3.18. Ten hour-long surveys were undertaken, four in March and six in April 2018, across the range of tidal states. Only one bird, a grey heron, was observed to fly underneath the bridge. All other bird species were recorded to fly over the bridge, from a total of 352 bird flight observations (**Appendix E**).

5 SCREENING THE PROPOSED DEVELOPMENT FOR LIKELY SIGNIFICANT EFFECTS

5.1 INTRODUCTION

5.1.1. The Project is not directly connected with, or necessary for, the management of the Firth of Tay and Eden Estuary SPA, SAC or Ramsar. It has not been conceived solely to further the conservation of these sites and nor is it essential to the management of these sites. Therefore, further consideration of the Project under the HRA process is required.

5.2 CONSIDERATION OF THE PROJECT IN ISOLATION

5.2.1. Utilising information included within Sections 2 -4 and Appendices A and B, Table 5 sets out the potential effect pathways have been identified and assessed as having LSE and as such are screened in for further assessment. Further detail and justification is provided in **Appendix F.**

Table 5 – Summary of HRA Screening Stage (Pre-Mitigation): LSEs

Screened In	Screened Out
FIRTH OF TAY AND EDEN ESTUARY SPA/RAMSAR	
▪ Disturbance of the qualifying species **redshank** (noise and visual pathways, physical barrier to flight under bridge); ▪ Disturbance of the qualifying species **black-tailed godwit** (noise and visual pathways, physical barrier to flight under bridge); ▪ Disturbance of the qualifying species **dunlin** (noise and visual pathways, physical barrier to flight under bridge); and ▪ Disturbance of the **wintering waterfowl assemblage** (noise and visual pathways, physical barrier to flight under bridge).	Disturbance of all other SPA/Ramsar qualifying bird species (noise and visual pathways): Firth of Tay and Eden Estuary SPA/Ramsar area is well-studied annually, therefore the movement and location of bird species utilising the estuary mean that species Screened In are those most commonly recorded foraging upstream from the estuary mouth and closest in proximity to the bridge location. Given the distance of the bridge from the estuary mouth and with reference to pertinent annual bird location records, it is therefore possible to screen out these species from further assessment: • Little tern; • Marsh harrier; • Pink-footed goose; • Velvet scoter; • Greylag goose; • Cormorant; • Shelduck; • Eider; • Bar-tailed godwit; • Common scoter; • Goldeneye; • Red-breasted merganser; • Goosander; • Oystercatcher; • Grey plover; • Sanderling; and • Long-tailed duck. These scoped out species are, however, considered in the waterfowl assemblage category.
FIRTH OF TAY AND EDEN ESTUARY SAC	

Screened In	Screened Out
▪ Deterioration of the qualifying habitats: **Estuaries** (land-take, water quality and pollutant pathways); ▪ Deterioration of the qualifying habitats **Sandbanks which are slightly covered by sea water all the time** (water quality/pollutant pathways); and ▪ Deterioration of the **qualifying habitats: Mudflats and sandflats not covered by seawater at low tide** (land-take, water quality/pollutant pathways).	Disturbance of the SAC qualifying species harbour seal: Harbour seal is scarcely recorded upstream of the estuary mouth area. The main haul-out areas are located at Tentsmuir Point (c. 10.9 km north of the bridge) and Balgove Bay (c. 3 km east of the bridge). It is considered that seals will only be present within the vicinity of the bridge when salmon/sea-trout are migrating up-river to spawn (generally around September to November). Given this limited period and likely low numbers of individuals, it is considered that the erection of scaffolding and hoarding will not have likely significant impacts on seal movement. Noise resulting from work operations will be restricted to low tide for the majority, given this is required for access to the underside of the bridge and therefore seals are highly unlikely to be present around the bridge at these times. It is therefore considered that there will be no LSE upon this species. Deterioration of the qualifying habitats via direct land-take effects: Sandbanks. The Proposed Development will not result in direct impacts (land-take) impacts upon sandbank habitat, with all proposed excavation works proposed immediately adjacent to the bridge piers outside of the sand bank habitats.

5.3 POTENTIAL IN-COMBINATION EFFECTS

5.3.1. Gavin Johnson, SNH Operations Officer – Fife advised (email: 22/11/2017) that repair works on the sea wall at the old Guardbridge Papermill should be taken account of in this HRA. Repair work started in June 2017 and is proposed to continue until 2022, commencing in June each year and finishing in early August, thereby avoiding the peak season qualifying features of the SPA and Ramsar. Mitigation measures are included in this development (to control adverse environmental effects such as air/water pollution). On this basis it is considered that there will be no likely significant in-combination effects since the Papermill repair works will not overlap with the time the qualifying species are at the Site.

6 APPROPRIATE ASSESSMENT

6.1 INTRODUCTION

6.1.1. This section first sets out the mitigation measures that will be incorporated into the Proposed Development. Taking these measures into account, the rest of this section subsequently considers the effects of the Proposed Development on site integrity in view of the SAC, SPA and Ramsar site conservation objectives, adopting the precautionary principle where necessary.

6.2 MITIGATION MEASURES

6.2.1. The following mitigation measures will be incorporated into the Proposed Development. These are standard construction measures, with a high degree of certainty of successful implementation and do not require any bespoke, high risk, new or untested solutions to be designed:

- A CMS (or equivalent document) will be prepared by the Principal Contractor and signed off, as required by FC, Scottish Environment Protection Agency (SEPA) and SNH (and other stakeholders if necessary). The CMS will detail exact timings, locations, methods and materials to be used in the Proposed Development;
- A project-specific Construction and Environmental Management Plan (CEMP) with associated Method Statements (MS) will be prepared by the Principal Contractor and signed off, as required by FC, SEPA and SNH (and other stakeholders if necessary);
- To avoid/reduce adverse impacts to over-wintering non-breeding qualifying species of the SPA and Ramsar, all works will take place from March-September/October (inclusive) (i.e. the late spring/summer/early autumn season). This would allow the works to be undertaken over one year, avoiding the core of the over-wintering bird period, whereas, limiting the works to April-August (thereby limiting overlap with overwintering bird species' presence) would require the works to extend into a second year. The following programme of works is anticipated:
    - March: site enabling, mobilisation and site preparatory works including erection of scaffolding etc;
    - April-August: repair works; and
    - September/October: site clearance works, removal of scaffolding, demobilisation etc: **subject to findings of autumn surveys**.
- An experienced and qualified Ecological or Environmental Clerk of Works (ECoW) will be appointed during the works with support from an ornithologist or hydrologist where required;
- The Proposed Development will be fully compliant with all relevant SEPA advice, guidance and regulations as well as best practice working methods for construction16;
- Standard best-practice mitigation measures will be implemented throughout the Proposed Development, and all construction personnel will be made aware of the risks associated with works and their potential effect on the environment, with appropriate provisions/methods/responses in place in the event an environmental incident occurs;
- An Emergency Response Plan will detail the procedure/response to be implemented in the event a spill/release of contaminated material from the works should enter the Eden water/surrounding environment;
- Scaffolding will be securely encapsulated to prevent spread of any of concrete/dust/sediments; Encapsulation will be impermeable to tidal waters to prevent works associated wastes (dust/waters) being washed into the Eden;
- Isolation measures will be utilised during any concrete removal/application works (e.g. use of a cowl), with materials removed easily and safely extracted from the Proposed Development area prior to high tide;
- In the event of hydro-blasting/demolition, suitable measures will be implemented and detailed within a MS, to prevent release of contaminated water to the river (bed or water) below the bridge; and
- Scaffolding hoarding will be of a neutral colour (similar in colour to that of the bridge) and be firmly affixed to scaffolding to avoid movement in the wind and being affected by high tide waters.

[16] https://www.sepa.org.uk/regulations/water/guidance/

6.2.2. Table 6 provides more detailed information on how potential environmental issues will be mitigated – these methods will be set out in a CMS, CEMP and various MSs.

Table 6 – Potential Environmental Issues and Related Technical Mitigation Considerations

Environmental Issues	Technical Mitigation
Noise /visual (disturbance)	▪ Any activities with increased noise (above baseline levels) will only be undertaken during daylight hours, ceasing at dusk (or pre-agreed time following consultation with FC/SNH). ▪ Encapsulation materials will comprise neutral, natural colours (brown), in keeping with existing colours of the bridge. ▪ No reflective materials will be used/placed on encapsulation material around scaffolding. ▪ Lighting will not be left on overnight and will be directional where required during working hours to illuminate working areas only. ▪ All hoarding will be securely fixed to scaffolding. ▪ Warning signs will be implemented to prevent the public from trying to cross the bridge during road closures. The Old Bridge runs parallel with the road bridge. This bridge will offer a safe alternative route and ensuring there is no increased footfall or human activity in environmentally sensitive areas.
Discharge of waste waters to water (i.e. discharge to the Eden Channel) (water quality and pollutant pathways)	▪ All wastewater will be captured, treated to an agreed standard then released to an agreed location. ▪ If hydrodemolition is used then a proprietary system to capture the water will be used – e.g. impermeable bund. ▪ Settlement, filtering, neutralising and pumping of water will be used to treat water prior to discharge/removal from site. ▪ As a minimum the concrete wash-out system will securely capture, contain and store the concrete solids and wash water in an impermeable bund. ▪ Wash water will be captured in an impermeable bund and treated on site before discharge or transported to a licenced waste water facility offsite.
Dust/Emissions to air (water quality and pollutant pathways)	▪ The number of vehicle journeys will be kept to a minimum to reduce emissions to air but also potential for noise / visual disturbance. ▪ Dust attenuation measures will be employed.
Waste (water quality and pollutant pathways)	▪ A Site Waste Management Plan will be produced, as part of the CEMP and will comply with SEPA requirements. ▪ All waste material will be collected and removed off-site. ▪ Any special wastes will be removed by an appropriately licensed contractor. ▪ Waste will also be transported off site and transported to a nearby waste facility.
Working near/within Designated Site – International/European, National Designated Sites (disturbance, water quality and pollutant pathways)	▪ Regular communication with SNH/ SEPA/FC for consents/approvals and to approve the CMS and CEMP (and associated MSs). ▪ Principal Contractor will ensure that any wildlife/geological features are kept safe and not impacted upon by works, under the instruction of a dedicated site ECoW and following site-specific MSs. ▪ Contractor and site ECoW will maintain open lines of communication with statutory bodies and conduct internal site environmental audits in addition to facilitating external audits as required.

Environmental Issues	Technical Mitigation
Encapsulation (disturbance, water quality and pollutant pathways)	Installing encapsulation sheeting around scaffolding to contain blast and residues presents a number of challenges, especially when working in a highly protected and sensitive tidal environment. The Principal Contractor will ensure the following: ■ The type of encapsulation/scaffold will be determined by the Principal Contractor in consultation with FC, SNH and SEPA as required. ■ Encapsulation will be supported from the bridge structure given the sensitivities surrounding the substrate of the river bed and the environmental designations. ■ The encapsulation sheeting will be designed not to detach from the scaffolding. If the sheeting is being used to encapsulate the working area becomes loose or detaches, work will be stopped whilst the repairs are made. ■ The encapsulation will be designed to remain intact in high wind speeds and gusts. ■ Any holes or gaps between sheets where blast residues can escape will be avoided as far as possible.
Working in a Tidal Environment (water quality and pollutant pathways)	■ Tides will dictate the working shifts so will change every day. The Principal Contractor will manage this via a detailed MS that will need to be reviewed by the FC, SEPA and SNH prior to commencement of any works. ■ Given the issues with tide levels, if the encapsulation is placed above high-water level it will not cover the whole soffit that requires work. ■ Consideration will be given to working on small areas at a time to work around tidal patterns. This will also be detailed and signed off in an MS.
Delivery and storage of materials on footways (water quality and pollutant pathways)	■ Principal Contractor will ensure that the bridge structure/footways can accommodate any increased loads from materials/equipment/stationary vehicles. ■ Materials will be covered/secured/stored appropriately so that they are not blown away and/or able to leak to ground/water. ■ The materials would need to be secured (separated by a fence) to protect the public and/or avoid vandalism. ■ Options to spread the load will also be examined with storage of materials/equipment away from the bridge (i.e. on land). ■ Production, storage, removal procedures associated with waste and special waste will be secured within the CEMP.

6.3 WATER QUALITY AND POLLUTANT PATHWAYS

6.3.1. With the incorporation of the package of mitigation measures set out in Section 6.2, it is considered that there is no (or de minimis) potential for significant effects on qualifying habitats of the SAC through water quality and pollutant pathways. Accordingly, these LSEs are not discussed further in the AA:

- Deterioration of the qualifying habitats: Estuaries (water quality and pollutant pathways);
- Deterioration of the qualifying habitats: Sandbanks which are slightly covered by sea water all the time (water quality/pollutant pathways); and
- Deterioration of the qualifying habitats: Mudflats and sandflats not covered by seawater at low tide (water quality/pollutant pathways).

6.4 PHYSICAL BARRIER TO FLIGHT UNDER BRIDGE

6.4.1. The remainder of the AA focusses on these LSEs:

- Disturbance of the qualifying species redshank (noise and visual pathways, physical barrier to flight under bridge);

- Disturbance of the qualifying species black-tailed godwit (noise and visual pathways, physical barrier to flight under bridge);
- Disturbance of the qualifying species dunlin (noise and visual pathways, physical barrier to flight under bridge);
- Disturbance of the wintering waterfowl assemblage (noise and visual pathways, physical barrier to flight under bridge);
- Deterioration of the qualifying habitats: Estuaries (land-take); and
- Deterioration of the qualifying habitats: Mudflats and sandflats not covered by seawater at low tide (land-take).

6.4.2. Scaffolding and hoarding to facilitate work on the bridge may act as a physical barrier to movement beneath the bridge and therefore has the potential to cause habitat fragmentation and/or collisions. This physical barrier effect may reasonably be expected to result in more birds flying over instead of under the bridge, however, there is limited research data regarding effects on flight path due to introduced barriers.

6.4.3. Flight activity surveys conducted during varying tidal states during March and April 2018 have indicated that the qualifying species of the SPA/Ramsar flew over and not under bridge. Accordingly, it is not expected that the erection of scaffolding and hoarding will have a significant effect on any of the SPA/Ramsar qualifying species during the March/April 2019 phase of the Proposed Development.

6.4.4. There is no reason to anticipate that flight activity behaviour of the qualifying species of the SPA/Ramsar will be different during the Autumn/September 2018 surveys; however, this will be corroborated following completion of bird surveys during September and October 2018.

6.5 NOISE AND VISUAL DISTURBANCE

6.5.1. The Proposed Development is on an active well-used road bridge, which is the main route to St. Andrews, Dundee and the west. Traffic movement across the bridge will have resulted in bird species (including SPA/Ramsar qualifying species) becoming habituated to a baseline level of noise and visual disturbance associated with traffic passage and movement of public walkers along the bridge. Modelling of existing traffic data (Fife Council, Sept. 2015) resulted in an estimated baseline range of 45-75 decibels (dB) associated with ambient bridge traffic movement (assumed 10% HGV traffic, see **Appendix G** – Noise Modelling Report).

6.5.2. The Proposed Development will result in increased noise levels associated with hydroblasting / pneumatic hand-tool operations, generator/plant noise and increased work affiliated traffic/presence along the bridge. Hydroblasting or pneumatic hand-tool concrete removal will increase the ambient level of noise beyond that of traffic movement along the bridge for a temporary period (6 months maximum) and whilst intermittent during working hours, operation of such equipment will result in noise levels generally above 85 dB (Hutt, 2004), i.e. 10 dB above that of the maximum baseline range.

6.5.3. A study by the Institute for Estuarine and Coastal Studies (IECS) during the construction of flood defence works at Saltend along the Humber Estuary found that a variety of waders opted to forage c. 200 m away from piling operations (Cutts et al., 2009). Whilst piling operations are expected to be significantly more noisy than the works associated with the Proposed Development, as a precautionary approach, 200 m is used as the disturbance zone for consideration in this HRA.

6.5.4. The implications of such a response for the Proposed Development are shown in Figure 3, illustrating the core foraging areas for the species either side of the bridge that may be abandoned (given the precautionary 200 m avoidance effect, assumed low tide) during the works and represents approximately 4.26 ha (1.86 ha north of bridge, 2.4 ha south).

Figure 3 – Potential 200m disturbance area (blue hatching) from the bridge (red line)

6.5.5. Not all species react in the same way to noise. Cutts et al. (2009) assessed the severity of disturbance to different wader species from irregular construction noise (noise above 70 dB) as high/moderate. These sensitivities are referred to in the following sections for each species separately.

6.5.6. In addition to noise, numerous studies on visual disturbance effects on estuarine waders have shown that waders elicit a disturbance response due to human presence. It is reported that birds tend to be more susceptible to human presence as a disturbance precursor than by noise from equipment (Hinkley Point C, 2011). The intertidal areas surrounding the Proposed Development are used for recreational activities such as dog-walking, cycling, wildfowling, birdwatching, meaning that birds that use these areas are habituated to some levels of human presence.

6.5.7. Construction workers will be shielded by the scaffolding and hoarding and as such, human presence may therefore be less visually intrusive. However, the hoarding itself may represent a visual disturbance stimulus and may also result in an avoidance response and abandonment of habitat near the bridge.

6.5.8. In addition to the main reparatory works on the bridge, anode installation will be undertaken directly underneath the bridge in an area that the birds have not been regularly recorded foraging in (Ranald Strachan pers. comm.). This will be a short-term localised construction activity either side of the piers within the riverbed with excavations undertaken by hand (due to ground conditions being unsuitable for machine loading) and would take place during periods of low tide (coinciding with the peak foraging period of birds). Since the birds are likely to be habituated to baseline noise/disturbance, and considering the working location will be restricted to the bridge piers, the birds are likely to move away from the bridge without abandoning the SPA/Ramsar area completely. The disturbance associated with anode installation will be of lower magnitude than other proposed works.

6.5.9. The implications in relation to the conservation objectives of the selected qualifying features of the SPA/Ramsar are discussed in the followings sections: redshank, black-tailed godwit, dunlin and waterfowl assemblage.

REDSHANK

Background

6.5.10. Redshank is a species of conservation concern in the UK and Europe and is currently categorised as an amber-listed species within the Birds of Conservation Concern (BoCC) population assessment, having shown a sustained decline in both breeding population and range and wintering population range (Eaton et al., 2015). The redshank population within the Firth of Tay and Eden Estuary SPA/Ramsar comprises birds which arrive

from Iceland in the autumn, departing in spring, however, also includes birds that are resident in the UK year-round and is additionally used as a staging area for migrant birds travelling to/from Scandinavia (Elkins & Lynch, 1997). The species feeds predominately on benthic invertebrates, obtained from foraging on exposed mudflats and sandbanks as exposed during tidal movements.

6.5.11. Redshank is well documented as being susceptible to disturbance, particularly during the winter period and harsh weather conditions, when foraging pressure to maintain favourable body state and fat reserves is paramount (Cutts et al., 2009; Burton et al., 2002; Wright I., 2010). Cutts et al. (2009) assessed redshank as having high sensitivity to irregular construction noise (noise above 70 dB), both in winter and spring passage. The programming of the Proposed Development outside of the core winter period will, therefore reduce the potential for a significant disturbance response.

6.5.12. Collop et al., (2016) reported that the initiation of a flight response in redshank to the presence of an approaching person ranged from a minimum of 28 m to 187 m (mean 79.83 m). The range is likely due to the fact that the initiation of a response to disturbance is influenced by an individual bird's physical condition and the energetic costs of foraging or abandoning an area in response to a stimulus (Burton et al., 2002; Wright et al., 2010), but also includes an assessment of starvation/predation risk trade-off (Quinn & Cresswell, 2005).

6.5.13. Redshank data gathered by WSP in March and April 2018 has indicated that peak counts of 3971 were recorded within the Survey Area, 14.7% of which were recorded within 200 m of the bridge (Table 1). 12.7% of the recorded foraging behaviour was within 200 m of the bridge compared to 29.4% of loafing behaviour. Roosting birds were not recorded within 200 m of the bridge. This pattern largely follows the documented historic patterns.

Implications for Site Conservation Objectives

- Population of the species as a visible component of the site

6.5.14. Most of the birds foraged, loafed and roosted (March/April 2018) in areas over 200 m from the Proposed Development (87.3%). It is not considered that alteration of birds' behaviour due to disturbance would result in a reduction in the redshank population, considering the temporary, localised nature of the works, outside the core over-wintering period, within an area that redshank is not recorded to use preferentially for foraging / roosting / loafing. It is, therefore, concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution of the species within the site

6.5.15. Most of the birds fed and roosted (March/April 2018) in areas over 200 m from the Proposed Development (85.3%). The Proposed Development will not alter the food resource and prey items available for redshank within the SPA/Ramsar, but may alter the accessibility of the feeding resource, due to disturbance or displacement effects. However, considering the temporary nature of the works, avoiding the core over-wintering period, and since only 14.7% of the redshank in the study area were recorded within 200 m of the bridge, it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution and extent of habitats supporting the species

6.5.16. There are no aspects of the Proposed Development that would alter the distribution and extent of habitats to support foraging, loafing or roosting redshank. Effects on the habitats will be limited to very minor areas associated with installation of cathode protection, within an area that redshank are not known to preferentially use. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Structure, function and supporting processes of the habitats supporting the species.

6.5.17. There are no aspects of the Proposed Development that would alter the structure, function and supporting habitats that support foraging, loafing or roosting redshank. Mitigation measures (Section 6.2) will ensure water quality and pollution prevention measures are adequate and successfully implemented thus preserving current habitat processes. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- No significant disturbance of the species

6.5.18. Implications of noise and visual disturbance to redshank vary dependent on the extent of the response that is elicited. A disturbance stimulus will normally evoke a vigilance response in the first instance (Wright et al.,

2010), with a bird ceasing to feed and assessing the perceived threat of a 'predator'; then secondarily walking away from an area (potentially continuing to feed whilst doing so). Depending on several factors, for example, the physical condition of the bird (e.g. body weight, fat reserves, energy uptake for that day, etc.), weather, and the availability of prey in an area or other potential feeding grounds nearby, this avoidance response may be sufficient. In more extreme cases disturbance may result in a flight response, either a short distance away from the source, or further away to a new area, utilizing energy reserves and reducing overall time available for foraging/loafing or roosting. However, migratory and wintering waterfowl will attempt to minimize time spent in flight to maximize time feeding, given flight requires considerably greater energy expenditure than any other activity other than egg-laying (Korschgen, 1992).

6.5.19. Redshank move further upstream with the incoming tide, to continue utilising exposed low-tide habitats, therefore disturbance effects from the Proposed Development may prevent birds from utilising habitat within the 200 m buffer as the tide rises. This may decrease the overall time and space available for foraging activity within 200 m of the bridge, i.e. 4.3 ha of potential habitat, which WSP found was used for foraging by 12.7% of redshanks within the Survey Area in March/April 2018.

6.5.20. The effect of not being able to meet daily energy uptake requirements during the winter period would ultimately result in decreased fitness of redshank. As over-wintering birds use this time to build fat reserves for migration at the end of winter or in preparation for breeding, the reduced fitness of birds may result in failed breeding attempts and/or increase the risk of mortality due to insufficient energy stores.

6.5.21. Redshank are known to forage extensively at night during non-breeding periods (Burton & Armitage, 2005) possibly to attain their daily energy requirements having not managed to fulfil them during daylight hours (Santiago-Quesada et al, 2014), switching to tactile feeding. Therefore, if redshank are displaced and are facing an energy deficit, research suggests they may make up this time by reducing time spent roosting at night, to exploit foraging habitats during non-working periods to supplement any diurnal energy uptake.

6.5.22. Whilst birds will likely make less overall use of the current foraging resource and whilst night-time feeding will likely supplement any diurnal energy uptake, the reduced time to accumulate their daily (diurnal) energy needs as a result of delayed arrival and early abandonment of foraging grounds would consequently impact negatively on birds' physical condition and may ultimately increase the risk of mortality.

6.5.23. However, putting this research and patterns of behaviours in the context of the Proposed Development, being undertaken in a single year, avoiding the core winter period, within an area that is not preferentially used for foraging, loafing or roosting, it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

BLACK-TAILED GODWIT

Background

6.5.24. Black-tailed godwit along the Firth of Tay and Eden estuary comprise migrating birds primarily those from Iceland (islandica subspecies) but also rare migrants from the European mainland (the limosa subspecies) over-wintering on British shores (Prater, 1975), with historic over-wintering sites in Ireland and in southern England. The Eden estuary is one of the most important sites in Scotland for supporting the species, with the majority maintaining their range within the inner estuary. Small numbers breed in southern England each year, with some instances also in the Shetland isles, but the largest influx of birds are those over-wintering from Iceland.

6.5.25. The global population has shown a marked decline throughout its range (IUCN, 2017), with the species currently categorised as near-threatened due to reduction in population and range. In the UK, the species is categorised as red-listed under the BoCC assessment, with a recognised historical decline in breeding populations and severe decline in its UK range (>50%) between breeding bird atlases (1998-91 and 2007-11) (Eaton et al., 2015). Factors affecting the species include habitat loss, both breeding habitat and over-wintering grounds, expansion of agricultural practices and effects from recreation e.g. dog walkers (Schekkerman & Beintema 2007).

6.5.26. Black-tailed godwit vary in their prey preferences dependent on the time of year and their location, and will prey on spiders, snails, beetles and their larvae to molluscs, polychaete worms, crustaceans but also berries, seeds and rice grains during migration and over-wintering (IUCN, 2017).

6.5.27. Black-tailed godwit data gathered by WSP in March and April 2018 has indicated that peak counts of 1422 were recorded within the Survey Area, 0.9% of which were recorded within 200 m of the bridge (Table 1), all of which were foraging. This pattern largely follows the documented historic patterns.

6.5.28. Cutts et al. (2009) report states that black-tailed godwit as having high sensitivity to irregular construction noise (noise above 70 dB), both in winter and spring passage (second to redshank). The programming of the Proposed Development outside of the core winter period should, therefore reduce the potential for a significant disturbance response.

Implications for Site Conservation Objectives

- Population of the species as a visible component of the site

6.5.29. Most of the birds foraged, loafed and roosted (March/April 2018) in areas over 200 m from the Proposed Development (99.1%). It is not considered that alteration of birds' behaviour due to disturbance would result in a reduction in the black-tailed godwit population, considering the temporary, localised nature of the works, outside the core over-wintering period, within an area that black-tailed godwit is not recorded to use preferentially for foraging / roosting / loafing. It is, therefore, concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution of the species within the site

6.5.30. Most of the birds foraged, loafed and roosted (March/April 2018) in areas over 200 m from the Proposed Development (99.1%). The Proposed Development will not alter the food resource and prey items available for black-tailed godwit within the SPA/Ramsar, but may alter the accessibility of the feeding resource, due to disturbance or displacement effects. However, considering the temporary nature of the works, avoiding the core over-wintering period, and since only 0.9% of the black-tailed godwit in the study area were recorded within 200 m of the bridge (all foraging), it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution and extent of habitats supporting the species

6.5.31. There are no aspects of the Proposed Development that would alter the distribution and extent of habitats to support foraging, loafing or roosting black-tailed godwit. Effects on the habitats will be limited to very minor areas associated with installation of cathode protection, within an area that black-tailed godwit are not known to preferentially use. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Structure, function and supporting processes of the habitats supporting the species.

6.5.32. There are no aspects of the Proposed Development that would alter the structure, function and supporting habitats that support foraging, loafing or roosting black-tailed godwit. Mitigation measures (Section 6.2) will ensure water quality and pollution prevention measures are adequate and successfully implemented thus preserving current habitat processes. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- No significant disturbance of the species

6.5.33. Although Cutts et al. (2009) report states that black-tailed godwit are second only to redshank in terms of sensitivity to disturbance during the winter period (October to March), the low usage of the 200 m area surrounding the bridge (Mar/April 2018) by the species, limits exposure of the species to disturbance.

6.5.34. Even if the species is disturbed, black-tailed godwit can undertake night-time foraging to supplement the energy intake requirements if they have not been able to meet them during the day (Santiago-Quesada et al, 2014).

6.5.35. Putting this research and patterns of behaviours in the context of the Proposed Development, being undertaken in a single year, avoiding the core winter period, within an area that is not preferentially used for foraging, loafing or roosting by black-tailed godwit, it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

DUNLIN

Background

6.5.36. Whilst dunlin breed in the UK (approximately 8,600-10,600 pairs annually) there is an influx of migrants during the winter period with numbers in the region of 360,000 birds (RSPB, 2017). Most dunlin wintering on UK shores are of the sub-species alpina (Goss-Custard & Moser, 1988) which breeds in Scandinavia and Russia, whilst other sub-species may also be present including schinzii, originating from Ireland, UK, Iceland and the Baltic states (JNCC, 2017).

6.5.37. The global population is understood to be slowly decreasing although current population estimates and range currently only warrant inclusion as 'Least Vulnerable' on the IUCN (2017). Within the UK, dunlin are classified as an amber-listed species under the BoCC as a result of a breeding range decline over 25%, but less than 50% (between 1968-71/2007-11) and a non-breeding population decline over 25%, but less than 50% beyond 25 years (Eaten et al., 2015).

6.5.38. Dunlin prey on a variety of food items including molluscs, crustaceans, polychaete worms, and amphipods (Santos et al., 2005) and showing differences in prey preference dependent on day or night foraging, most likely in response to availability of different prey (Mouritsen, 1994).

6.5.39. Cutts et al. (2009) assessed dunlin as having moderate sensitivity to irregular construction noise (noise above 70 dB), both in winter and spring passage. The programming of the Proposed Development outside of the core winter period should, therefore reduce the potential for a significant disturbance response. Dunlin show a great variability in terms of response to a visual disturbance, with Smit & Visser (1993) stating that in response to approach by people some dunlins didn't react until within 10-20 m, whilst others were disturbed and resulted in a flight response between 100 - 200 m away. Additionally, they found that birds that foraged close to a sea wall tolerated the presence of people on the tidal flats at shorter distances than those foraging further away from the sea wall (Smit & Visser, 1993).

6.5.40. Dunlin data gathered by WSP in March and April 2018 has indicated that peak counts of 1482 were recorded within the Survey Area, none of which were recorded within 200 m of the bridge (Table 1). This pattern largely follows the documented historic patterns.

6.5.41. Dunlin are known to exploit habitat as soon as tide allows, foraging as soon as habitat is exposed by the receding tide and foraging almost continuously until the advancing tide covers the highest areas (Goss-Custard & Moser, 1988).

Implications for Site Conservation Objectives

- Population of the species as a visible component of the site

6.5.42. All dunlins recorded foraged, loafed and roosted (March/April 2018) in areas over 200 m from the Proposed Development. It is not considered that alteration of birds' behaviour due to disturbance would result in a reduction in the dunlin population, considering the temporary, localised nature of the works, outside the core over-wintering period, within an area that dunlin is not recorded to use preferentially for foraging / roosting / loafing. It is, therefore, concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution of the species within the site

6.5.43. All dunlins recorded foraged, loafed and roosted (March/April 2018) in areas over 200 m from the Proposed Development. The Proposed Development will not alter the food resource and prey items available for dunlin within the SPA/Ramsar, but may alter the accessibility of the feeding resource, due to disturbance or displacement effects. However, considering the temporary nature of the works, avoiding the core over-wintering period, and since none of the dunlin in the study area were recorded within 200 m of the bridge it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution and extent of habitats supporting the species

6.5.44. There are no aspects of the Proposed Development that would alter the distribution and extent of habitats to support foraging, loafing or roosting dunlin. Effects on the habitats will be limited to very minor areas associated with installation of cathode protection, within an area that dunlin are not known to preferentially use. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Structure, function and supporting processes of the habitats supporting the species

6.5.45. There are no aspects of the Proposed Development that would alter the structure, function and supporting habitats that support foraging, loafing or roosting dunlin. Mitigation measures (Section 6.2) will ensure water quality and pollution prevention measures are adequate and successfully implemented thus preserving current habitat processes. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- No significant disturbance of the species

6.5.46. Dunlin show a greater flexibility in terms of their habitat/foraging utilisation, with an increased range across the estuary than that of redshank and black-tailed godwit. The species shows flexibility in its prey preference and will respond to available habitat with the movement of tidal waters (Goss-Custard & Moser, 1988). The species is recorded to undertake day and night feeding, opting for differing habitats during these periods, and additionally altering its method of foraging from pecking during the day to probing at night (Mouritsen, 1994) likely in to maintain fat reserves or supplement daily energy requirements.

6.5.47. Considering this research and pattern of behaviour in the context of the Proposed Development, being undertaken in a single year, avoiding the core winter period, within an area that is not preferentially used for foraging, loafing or roosting by dunlin (based on March/April 2018 data), it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

WATERFOWL ASSEMBLAGE

Background

6.5.48. The following SPA/Ramsar species were recorded in the survey area (refer to Table 1): oystercatcher, cormorant, redshank, dunlin, black-tailed godwit, eider, goldeneye, goosander, greylag goose, long-tailed duck, pink-footed goose, red-breasted merganser and shelduck. Of these, the following were absent from the 200 m zone surrounding the bridge: greylag goose, dunlin, eider, long-tailed duck, pink-footed goose and shelduck. For oystercatcher (3.9%), black-tailed godwit (0.9%) the presence within the 200 m zone of the bridge was a relatively minor proportion of the Survey Area, whilst for cormorant, redshank, goldeneye goosander and red-breasted merganser the proportions varied from 14-25%.

6.5.49. Mixed species flock responses to disturbance are incredibly variable and inter-species relationships aren't fully understood, however, vigilance and behaviour in response to a disturbance stimulus in one species is recorded to impact upon species within a mixed flock/assemblage. Foraging behaviour of species has shown to be influenced by the presence of differing species within a larger flock. For example, Metcalfe (1989) observed turnstones opting to forage closer to redshank and oystercatcher to gain anti-predator vigilance benefits.

6.5.50. The above assessments specifically reference potential disturbance effects of individual species in response to noise and visual stimuli, however, bird species present along the estuary are seldom recorded individually. A variety of species will utilise the habitat at the same time, occupying differing, sometimes overlapping, ecological macro-niches. Single-species flocks and mixed-species flocks may elicit differing responses to disturbance. In a mixed flock scenario, birds of one species may rely more prevalently on another and respond because of that other species' behaviour. Thompson & Barnard (1983) observed that in mixed flocks of lapwing, golden plover and black-headed gulls, lapwing and plover would respond sooner to a disturbance stimulus as the gulls acted as an early warning system; this also resulted in larger flight distances.

6.5.51. In the context of the species described above, it is likely that such inter-species flock relationships exist within the Eden estuary and that disturbance effects upon such species may have a cascade effect across the flock, i.e. the avoidance or flight response of a bird may elicit similar responses in other species present around that bird, which increases the overall chance of a flight response to disturbance occurring. As previously discussed, the disturbance response of a given bird is dependent upon a variety of factors (e.g. daily energy uptake at that point in time, body state, availability of further habitat, etc.) and therefore variances in individual bird responses to disturbance will occur and may impact upon flock response.

6.5.52. It is, therefore, plausible to assume that overall disturbance distances may extend beyond the 200 m threshold, with birds beyond this distance responding to behaviour by birds within 200 m of the bridge.

Implications for Site Conservation Objectives

- Population of the species as a visible component of the site

6.5.53. Most of the birds recorded foraged, loafed and roosted (March/April 2018) in areas over 200 m from the Proposed Development (93.4%). It is not considered that alteration of the assemblage/flock behaviour due to disturbance would result in a reduction in population, considering the temporary, localised nature of the works, outside the core over-wintering period, within an area that the assemblage is not recorded to use preferentially for foraging / roosting / loafing. It is, therefore, concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution of the species within the site

6.5.54. Most of the birds fed and roosted (March/April 2018) in areas over 200 m from the Proposed Development (93.4%). The Proposed Development will not alter the food resource and prey items available for the species assemblage within the SPA/Ramsar, but may alter the accessibility of the feeding resource, due to disturbance or displacement effects. However, considering the temporary nature of the works, avoiding the core over-wintering period, and since only 6.6% of the species assemblage in the study area was recorded within 200 m of the bridge, it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Distribution and extent of habitats supporting the species

6.5.55. There are no aspects of the Proposed Development that would alter the distribution and extent of habitats to support foraging, loafing or roosting features of the species assemblage. Effects on the habitats will be limited to very minor areas associated with installation of cathode protection, within an area that species assemblage is not known to preferentially use. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- Structure, function and supporting processes of the habitats supporting the species.

6.5.56. There are no aspects of the Proposed Development that would alter the structure, function and supporting habitats that support foraging, loafing or roosting features of the species assemblage. Mitigation measures (Section 6.2) will ensure water quality and pollution prevention measures are adequate and successfully implemented thus preserving current habitat processes. It is concluded that this conservation objective will continue to be met during and after the Proposed Development.

- No significant disturbance of the species

6.5.57. Even if features of the assemblage are disturbed, many of the species can undertake night-time foraging to supplement the energy intake requirements if they have not been able to meet them during the day. Considering the relatively low level of usage of habitats within 200 m of the bridge it is not considered that flock responses will cause certain species, or the assemblage to be significantly affected.

6.5.58. Putting the research and patterns of behaviours in the context of the Proposed Development, being undertaken in a single year, avoiding the core winter period, within an area that is not preferentially used for foraging, loafing or roosting by the species assemblage, it is concluded that this conservation objective will continue to be met during and after the Proposed Development.

6.6 DETERIORATION OF THE QUALIFYING HABITATS: ESTUARIES AND MUDFLATS AND SANDFLATS NOT COVERED BY SEAWATER AT LOW TIDE (LAND-TAKE)

BACKGROUND

6.6.1. Excavation of the estuary bed is required for the installation of anodes as part of the cathodic protection. This work is proposed to be completed manually as there is a risk an excavator or vehicle becoming stuck in the soft bed substrate. Given the excavations are small (option A totalling 0.52 m3 per small trench excavation or option B, 0.07 m3 per tubular anode installation), with four required to be installed at the bridge piers within the estuarine substrate, the total area of excavation represents substantially less than 0.1% of the entire SAC designated area. The excavation works can only be undertaken at low tide to prevent inundation of water within the excavations and will be temporary in nature, with the substrate reinstated as much as is practically possible once the works are complete.

IMPLICATIONS FOR SITE CONSERVATION OBJECTIVES

6.6.2. The implications for all site conservation objectives are discussed together:

- Extent of the habitat on site;
- Distribution of the habitat within the site;
- Structure and function of the habitat;
- Processes supporting the habitat;
- Distribution of typical species of the habitat; and
- Viability of typical species as components of the habitat.

6.6.3. Given the small-scale excavation works required (<0.1% of SAC) with excavated material to be place back within excavations as much as practically possible following installation of the anode, it is concluded that these conservation objectives will continue to be met during and after the Proposed Development.

7 CONCLUSION

Assuming the successful implementation of all mitigation outlined in Section 6.2, there will be no significant adverse effects on qualifying habitats and species of the Firth of Tay and Eden Estuary SAC, SPA or Ramsar site due to the Proposed Development if undertaken March-September. With the benefit of the FCCT/Ecos reports and work undertaken already, it should possible to make an informed assessment of likely impacts at this time, albeit further survey will confirm. **This report will be updated upon completion of bird surveys in September/October 2018 in order to inform an assessment of Likely Significant Effects should works extend in to September and October.**

8 BIBLIOGRAPHY

- ABP Marine Environmental Research Ltd (2014) Inner Thames Estuary Airport Option: Waders and Waterfowl. Inner Thames Estuary Feasibility Study, Transport for London.
- Beale, C. M. & Monaghan, P. (2004). Behavioural responses to human disturbance: a matter of choice? Animal Behaviour (68)5: 1065-1069.
- Bibby, C.J., Burgess, N.D., Hill, D.A & Mustoe, S (2000). Bird Census Techniques. Second Edition. Academic Press, London.
- Bird Life International (Bern Convention) (2013) Wind Farms and Birds: an updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment. Bern Convention Bureau Meeting, Strasbourg, 2013.
- BirdLife International. 2016. Calidris alpina. The IUCN Red List of Threatened Species 2016: e.T22693427A86616117. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22693427A86616117.en. [Accessed 30 January 2017].
- BirdLife International. (2016). Haematopus ostralegus. The IUCN Red List of Threatened Species 2016: e.T22733462A90098775. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22733462A90098775.en. [Accessed 30 January 2017].
- BirdLife International. 2016. Limosa limosa. The IUCN Red List of Threatened Species 2016: e.T22693150A90105356. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22693150A90105356.en. [Accessed 30 January 2017].
- BirdLife International. 2016. Numenius arquata. The IUCN Red List of Threatened Species 2016: e.T22693190A90101437. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22693190A90101437.en. [Accessed 30 January 2017].
- BirdLife International. 2016. Tringa totanus. The IUCN Red List of Threatened Species 2016: e.T22693211A86687799. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22693211A86687799.en. [Accessed 30 January 2017].
- BirdLife International. 2016. Vanellus vanellus. The IUCN Red List of Threatened Species 2016: e.T22693949A90100238. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22693949A90100238.en. [Accessed 30 January 2017].
- Boates, J. S., & Goss-Custard, J. D. (1992) Foraging behaviour of oystercatchers Haematopus ostralegus specialising on different species of prey. Can. J. Zool, 70, p. 2398-2404.
- Burton, N. H. K & Armitage, M. J. S. (2005). Differences in the diurnal and nocturnal use of intertidal feeding grounds by Redshank Tringa tetanus. Bird Study 52: 120-128.
- Burton, Niall; Armitage, Michael; Musgrove, Andrew; & Rehfisch, Mark. (2002) Impact of Man-Made Landscape Features on Number of Estuarine Waterbirds at Low Tide. Environmental Management, 30, p. 857-864.
- Burton, Niall; Rehfisch, Mark; & Clark, Nigel (2002) Impacts of disturbance from Construction Works on the densities and feeding behaviour of waterbirds using the intertidal mudflats of Cardiff Bay, UK. Environmental Management, 30, p. 865-871.
- Collop, Catherine; Stillman, Richard; Garbutt, Angus; Yates, Michael; Rispin, ED; & Yates, Tina (2016) Variability in the area, energy and time costs of wintering waders responding to disturbance. Ibis, 158, p. 711-725.
- Cutts, N & Allen, J (1999) Avifaunal Disturbance Assessment: Flood Defence Work, Saltend. Repot to Environment Agency.
- Cutts, N; Phelps, A; & Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impact and Guidance. Report to Humber INCA. The University of Hull.
- Dwyer, Ross (2010). Ecological and anthropogenic constraints on waterbirds of the Forth Estuary: population and behavioural responses to disturbance. The University of Exeter.
- Eaton, M., Nicholas, A., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D. & Gregory, R. (2015). Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108: 708-746.
- Ecos Country Services LLP (December 2013). Guardbridge Energy Centre, Report to Inform Appropriate Assessment, commissioned by St. Andrews University.
- Elkins, N. & Lynch, B. M. (1997). Waterfowl counts on the Tay estuary, 1985-1995. Scottish Birds, 19(1), 36-54.
- Ens, B.J & Goss-Custard, J.D (1984) Interference Among Oystercatchers, Haematopus ostralegus, Feeding on Mussels, Mytilus edulis on the Exe Estuary. Journal of Animal Ecology, 53, p. 217-231.

- Fitzpatrick, S & Bouchez, S (1998) Effects of recreational disturbance on the foraging behaviour of waders on a rocky beach. Bird Study, 45, p. 157-171.
- Gill, Jennifer A., Norris, Ken & Sutherland, William, J (2001) The effects of disturbance on habitat use by black-tailed godwits Limosa limosa. Journal of Applied Ecology issue 38, p 846-856.
- Gillings, Simon (2003) Plugging the gaps – winter studies of Eurasian Golden Plovers and Northern Lapwings. Wader study Group Bull 100, p. 25-29.
- Gillings, S., Austin, G. E., Fuller, R. J. & Sutherland, W. J. (2006). Distribution shifts in wintering Golden Plovers Pluvialis apricaria and Lapwing Vanellus vanellus in Britain. Bird Study 54: 274-284.
- Gillings, S. & Sutherland, W. (2007) Comparative diurnal and nocturnal diet and foraging in Eurasian Golden Plovers Pluvialis apricaria and Northern Lapwings Vanellus vanellus wintering on arable farmland. Ardea, 95, p. 243-257.
- Goss-Custard, J.D & Jones, R.E (1976). The diets of Redshank and Curlew. Bird Study 23:3, p. 233-243.
- Goss-Custard, J. D., & Moser, M. E. (1988). Rates of change in the numbers of Dunlin Calidris alpina, wintering in British estuaries in relation to the spread of Spartina anglica. Journal of Applied Ecology, 25, 95-110.
- Goss-Custard, J.D; Van bit Durell, S.E.A.Le; & Ens, B.J (1982) Individual differences in aggressive and food stealing among wintering oystercatchers, Haematopus ostralegus L. Animal Behaviour, 30, p. 917-928.
- Goss-Custard, J.D., Triplet, P., Sueur, F. & West, A.D (2006) Critical thresholds of disturbance by people and raptors in foraging wading birds. Biological Conservation issue 127, p 88-97.
- Grant, Murray; Orsman, Chris; Easton, Jon; Lodge, Chris; Smith, Malcolm; Thompson, Guy; Rodwell, Steven; & Moore, Niall. (1999) Breeding success and causes of breeding failure of curlew Numenius arquata in Northern Ireland. Journal of Applied Ecology, issue 36, p. 59-74.
- Greenwood, Julian (1984) Migration of dunlin calidris alpina: A worldwide overview. Ringing and Migration, 5, p. 35-39.
- Hanson, Nora; Thompson, Dave; Duck, Callan; Baxter, John; and Lonergan, Mike (2015) Harbour seal (Phoca vitulina) abundance within the Firth of Tay and Eden Estuary, Scotland: Recent trends and extrapolation to extinction. Aquatic conservation: marine and freshwater ecosystems, Wiley online Library.
- Hatton, Les & Millar, Shirley (undated) An analysis of Tay Ringing Group Redshank Recoveries.
- Henderson, I.G; Wilson, A.M; Steele, D; & Vickery, J.A (2010) Population estimates, trends and habitat associations of breeding Lapwing Vanellus vanellus, Curlew Numenius arquata and Snipe Gallinago gallinago in Northern Ireland in 1999. Bird Study, 49:1, p. 17-25.
- Hill, D (1992) The impact of noise and artificial light on waterfowl behaviour: a review and synthesis of available literature. British Trust for Ornithology, 1992.
- Hockin, D; Ounsted, M; Gorman, M; Hill, D; Keller, V; & Barker, M.A (1991) Examination of the Effects of Disturbance on Birds with Reference to its Importance in Ecological Assessment. Journal of Environmental Management, 36, p.253-286.
- Holloway, Steve (1997) Winter distribution and disturbance of wildfowl and waders on Findhorn Bay. British Trust for Ornithology.
- Hutt, R. (2004). Literature Review: Noise from High Pressure Water Jetting. Health and Safety Laboratory. [HSE Website - www.hse.gov.uk/research/hsl_pdf/2004/hsl0415.pdf]
- Jackson, Roger & Jackson, Jean (1980). A study of Lapwing breeding population changes in the New Forest, Hampshire. Bird Study, 27, p. 27-34.
- JNCC (2017) Outer Firth of Forth and St Andrews Bay Complex Proposed Special Protection Area (pSPA) SPA Site Selection Document: Summary of the scientific case or site selection.
- Johnson, C. (1985) Patterns of seasonal weight variation in waders on the wash. Ringing & Migration, 6, p. 19-32.
- Kirby, J. S (1997) Influence of environmental actors on the numbers and activity of wintering Lapwings and Golden Plovers. Bird Study, 44, p. 97-110.
- Korschgen, Carl & Dahlgren, Robert (1992) Human Disturbance of Waterfowl: Causes, Effects and Management. Waterfowl Management Handbook chapter 13.2.15.
- Liley, Durwyn & Fearnley, Helen (2011) Bird Disturbance Study: North Kent 2010/2011. Footprint Ecology.
- Madsen, Jasper; Tombre, Ingunn; & Eide, Nina (2009) Effects of disturbance on geese in Svalbard: implications for regulating increasing tourism. Polar Research, 28, p. 376-389.
- Marine Scotland (2014) Guidance on the Offence of Harassment at Seal Haul-out Sites. Marine Scotland.
- Mason, C.F & Macdonald, S.M (1999) Estuarine feeding by Lapwings Vanellus vanellus and Golden Plovers Pluvialis apricaria. Wildfowl, 50, p. 205-207.

- Meissner, Wlodziimierz & Strzalkowska, Malgorzata (2006). Autumn migration dynamics of the Dunlin (Calidris alpina) at the Reda Mouth (Southern Baltic). Ring 28, p.33-43.
- Metcalfe, N. B. (1989). Flocking Preferences in Relation to Vigilance Benefits and Aggression Costs in Mixed-Species Shorebird Flocks. Oikos (56), 1: 91-98.
- Mouritsen, K.N. (1994) Day and Night Feeding in Dunlins Calidris alpina: Choice of Habitat, Foraging Technique and Prey. Journal of Avian Biology, Vol. 25, p. 55-62.
- Musgrove, Andy & Burton, Niall (undated) Estuarine Waterbirds at Low Tide. Chapter 1, p. 1-38.
- Nehls, Georg & Tiedemann, Ralph (1993). What determines the densities of feeding birds on tidal flats? A case study on dunlin, Calidris alpina, in the Wadden Sea. Netherlands Journal of Sea Research, 31, p. 375-384.
- Prater, A. J. (1975). The Wintering Population of the Black-Tailed Godwit. Bird Study 22:3, p. 169-176.
- RSPB (2017). https://www.rspb.org.uk/birds-and-wildlife/bird-and-wildlife-guides/bird-a-z/d/dunlin/ [Accessed January, 2017].
- Ruddock, M & Whitfield, D.P (2007) A Review of Disturbance Distances in Selected Bird Species. Report from Natural Research (Projects) Ltd to Scottish Natural Heritage.
- Santiago-Quesada, Francisco, Masero, José A, Albano, Noelia, Villegas, Auxiliadora & Sánchez-Guzmán Juan M. (2008) Sex differences in digestive traits in sexually size-dimorphic birds: Insights from an assimilation efficiency experiment on Black-tailed Godwit. Comparative Biochemistry and Physiology, Part A, issue 152, p 565-568.
- Santiago-Quesada, Francisco, Estrella, Sora M., Guzman, Jose M. & Masero, Jose A. (2014) Why water birds forage at night: A test using black-tailed godwits Limosa limosa during migratory periods. Journal of Avian Biology issue 0, p 1-4.
- Santos, Carlos; Granadeiro, Jose; & Palmeirim, Jorge (2005) Feeding ecology of dunlin Calidris alpina in a southern European Estuary. Ardeola 52, p. 235-252.
- Schekkerman, H. & Beintema, A.J. (2007). Abundance of invertebrates and foraging success of Black-tailed Godwit Limosa limosa chicks in relation to agricultural grassland management. Ardea 95: 39–54
- Scottish Wildlife Trust (undated) Conservation and Management of Seals. Scottish Wildlife Trust Policy.
- Sheldon, Rob; Bolton, Mark; Gillings, Simon; & Wilson, Andy. (2004) Conservation management o Lapwing Vanellus vanellus on lowland arable farmland in the UK. Ibis, 146, p. 41-49.
- Smit, C & Visser, J.M (1993) Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta Area. Wader Study Group Bull. 68, p.6-19.
- Speakman, J.R (1987) Apparent Absorption Efficiencies for Redshank (Tringa tetanus L.) and Oystercatcher (Haematopus ostralegus L.): Implications for the Predictions of Optimal Foraging Models. The American Naturalist, 130, p. 677-691.
- Stillman, Richard & Goss-Custard, John (2002) Seasonal changes in the response of oystercatchers Haematopus ostralegus to human disturbance. Journal of Avian Biology, 33, p. 358-356.
- Stolen, Eric (2003) The effects of vehicle passage on Foraging Behaviour of Wading Birds. The International Journal of Waterbird Ecology, 26, p. 429-436.
- Strachan, Ranald (2013) Eden Estuary Annual Report 2012-2013. Eden Estuary Local Nature Reserve.
- Suffolk Coast and Heaths AONB; Natural England; & Wildside Ecology (2012) A simple method for assessing the risk of disturbance to birds at coastal sites.
- Thompson, D.B.A & Barnard, C.J (1983) Anti-Predator responses in mixed-species associations of lapwings, golden plovers and black-headed gulls. Animal Behaviour, 31, p. 585-593.
- Valkama, Jari & Currie, Dave. (1998) Low productivity of Curlews Numenius arquata on farmland in southern Finland: Causes and consequences. Ornis Fennica 76, p. 65-70.
- Van der Vliet, Roland & van Dijk, Jerry (2015) EU protection is inadequate for a declining flyway population of Black-tailed Godwit Limosa limosa: mismatch between future core breeding areas and existing Special Protection Areas. Bird Conservation International, 25, p.111-125.
- Verhulst, S; Oosterbeek, K; & Ens, B.J (2001) Experimental evidence for effects of human disturbance on foraging and parental care in oystercatchers. Biological Conservation, 101, p. 375-380.
- Wennerberg, Liv (2001) Breeding origin and migration pattern of dunlin (Calidris alpina) revealed by mitochondrial DNA analysis. Molecular Ecology 10, p. 1111-1120.
- Worrall, D.H (1984) Diet of the Dunlin *Calidris alpina* in the Severn Estuary. Bird Study, 31, p. 203-212.
- Wright, Mark; Goodman, Paul; & Cameron, Tom (2010) *Exploring behavioural responses of shorebirds to impulsive noise.* Wildfowl 60, p. 150-167.

Appendix A

TECHNICAL DESIGN DRAWINGS

A91 New Bridge, Guardbridge

Outline Methodology for access to the soffit of Guardbridge.

It is believed that the following bullet points outline the construction of temporary works for the installation of the CP System at New Bridge, Guardbridge. The following is indicative and for the purposes of liaising with statutory undertakers only. This proposal may not be the solution a successful contractor uses.

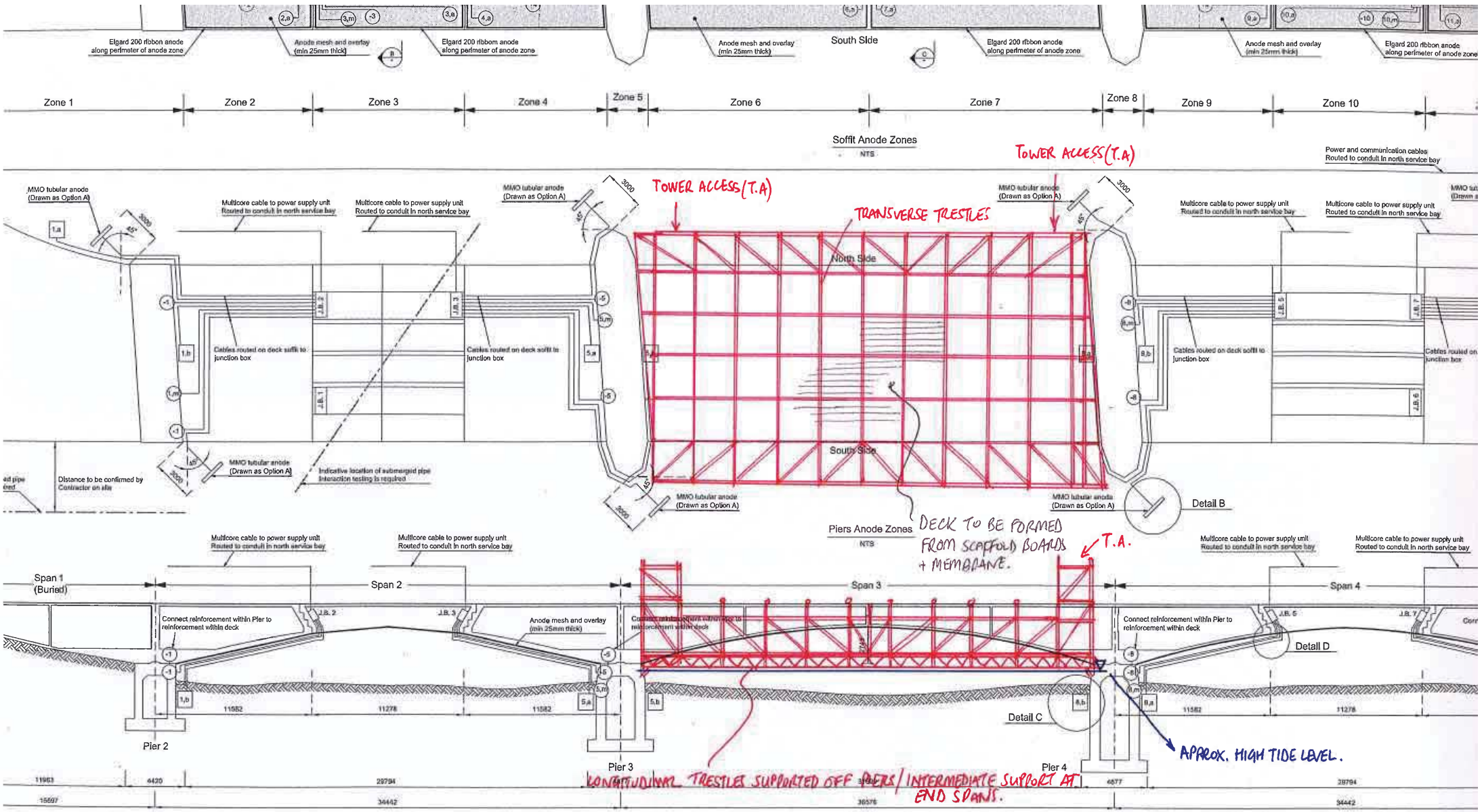
Installation of Scaffolding (assume that 1 span only at a time)

- Closure of the footways to pedestrians and re-routing to adjacent structure for duration of the works;
- Lane closures for delivery of materials (duration will be intermittent);
- Delivery of scaffolding
- Erection of scaffolding to elevations of structure including access towers to both elevations
- Installation of transverse members beneath the bridge soffit at a level to avoid high tide;
- Installation of supporting members off bridge piers or off discrete landings at abutments;
- Installation of scaffolding boards to deck level;
- Installation of membrane to deck, followed by a second layer of scaffold boards
- Full encapsulation of scaffolding system with heat sealing of membrane to main members (as per image opposite ©Scaftec)

The works shall then be undertaken using appropriate techniques

- All debris and waste is to be collected from the site and removed to a licenced tip as necessary
- No water shall be permitted to enter the River Eden and measures must be in place to ensure this, positive drainage or pumping, should water be used.

Once the works are completed the scaffolding shall be taken down and moved to an adjacent span or removed from site.



Cabling: Zones 1 to 5

Junction Box	Single Core Cables in from Structure	Cable Labels	Cables in as Multicore From Adjacent Junction Box	Cores out as Multicore	Notes
J.B. 1	Ref 3,a Ref 3,b 2 No. DC positives from zone 3 2 No. DC negatives from zone 3 1 No. Monitoring from zone 3	Ref 3,a Ref 3,b +3 -3 3,m	None	Ref 3,a Ref 3,b 1 No. DC positive from zone 3 1 No. DC negative from zone 3 1 No. Monitoring from zone 3	DC positives to zone commoned DC negatives to zone commoned
J.B. 2	Ref 1,a Ref 1,b 2 No. DC positives from zone 1 2 No. DC negatives from zone 1 Monitoring from zone 1 Ref 2,a Ref 2,b Ref 2,c Ref 2,d 2 No. DC positives from zone 2 2 No. DC negatives from zone 2 1 No. Monitoring from zone 2 Ref 3,c Ref 3,d 2 No. DC positives from zone 3 2 No. DC negatives from zone 3 1 No. Monitoring from zone 3	Ref 1,a Ref 1,b +1 -1 1,m Ref 2,a Ref 2,b Ref 2,c Ref 2,d +2 -2 2,m Ref 3,c Ref 3,d +3 -3 3,m	1 No. DC positive from zone 3 1 No. DC negative from zone 3 1 No. Monitoring from zone 3 Ref 3,a Ref 3,b	Ref 1,a Ref 1,b 2 No. DC positives from zone 1 2 No. DC negatives from zone 1 Monitoring from zone 1 Ref 2,a Ref 2,b Ref 2,c Ref 2,d 1 No. DC positive from zone 2 1 No. DC negative from zone 2 1 No. Monitoring from zone 2 Ref 3,c Ref 3,d 1 No. DC positive from zone 3 1 No. DC negative from zone 3 1 No. Monitoring from zone 3 Ref 3,a Ref 3,b	DC positives to zone commoned DC negatives to zone commoned DC positives to zone commoned DC negatives to zone commoned


TUFCOAT
SCAFFOLD SHRINK-WRAP
BRIDGE CONTAINMENT

Appendix B

FIRTH OF TAY AND EDEN ESTUARY

SPA, SAC AND RAMSAR SITE INFORMATION

Table B1 - Firth of Tay and Eden Estuary SPA/Ramsar: qualifying features for designation and current conservation condition

Site Name	Site Description	Summary of Reasons for Designation	Current Condition (Component SSSI Units)
Firth of Tay and Eden Estuary SPA	The Site comprises a complex of estuarine and coastal habitats in eastern Scotland stretching from the mouth of the River Earn in the inner Furth of Tay east to Barry Sands on the Angus coast and St Andrews on the Fife Coast. The site includes extensive invertebrate-rich intertidal flats and areas of reedbed, saltmarsh and sand dune. The SPA is contained within the following SSSIs: Inner Tay Estuary, Monifieth Bay, Barry Links, Tayport-Tentsmuir Coast and Eden Estuary.	Article 4.1 Qualification (79/409/EEC) Breeding: ▪ Marsh harrier Circus aeruginosus, 4 females representing 3% of British population (mean number of females between 1992-96) ▪ Little tern Sterna albifrons, 25 pairs representing 1% of British population (mean number of pairs between 1993-97) Over winter: ▪ Bar-tailed godwit Limosa lapponica, 2,400 individuals representing 5% of UK and 2% of Western European population Article 4.2 Qualification (79/409/EEC) Over winter: ▪ Redshank Tringa totanus, 1,800 individuals representing 2% of UK and 1% of northwest European populations Article 4.2 Qualification (79/409/EEC) Assemblage Qualification Regularly supports over 20,000 waterfowl with a 1990/91-94/95 winter peak mean of 48,000 waterfowl, comprising 28,000 wildfowl and 20,000 waders. This assemblage includes the internationally important wintering populations of the following: ▪ Pink-footed goose Anser brachyrhynchus, 2,800 individuals representing 1% of UK and Icelandic populations (1990/91-94/95 winter peak means) ▪ Greylag goose Anser anser, 1,200; 1% of UK and Icelandic populations. ▪ Cormorant Phalacrocorax carbo, 230; 2% of UK ▪ Shelduck Tadorna tadorna, 1,200; 2% of UK	▪ Waterfowl assemblage: Favourable – Maintained ▪ Bar-tailed godwit: Favourable – Recovered ▪ Black-tailed godwit: Favourable – Maintained ▪ Common scoter: Favourable – Declining ▪ Eider: Favourable – Maintained ▪ Grey Plover: Favourable – Maintained ▪ Greylag Goose: Favourable – Maintained ▪ Oystercatcher: Favourable – Recovered ▪ Redshank: Favourable – Maintained ▪ Red-breasted merganser: Favourable - Maintained ▪ Shelduck: Unfavourable – Declining ▪ Velvet Scoter: Unfavourable – Declining ▪ Cormorant: Favourable – Maintained ▪ Dunlin: Unfavourable – No Change ▪ Goldeneye: Favourable – Maintained ▪ Goosander: Favourable – Maintained ▪ Little Tern: Unfavourable – No change ▪ Long-tailed duck: Favourable – Maintained ▪ Marsh Harrier: Favourable – Maintained ▪ Pink-footed goose: Unfavourable – No change ▪ Sanderling: Unfavourable – No change

		▪ Eider Somateria mollissima, 13,800; 18% of UK ▪ Long-tailed duck Clangula hyemalis, 560; 2% of UK ▪ Common scoter Melanitta nigra, 3,100; 9% of UK ▪ Velvet scoter Melanitta fusca, 730; 24% of UK ▪ Goldeneye Bucephela clangula, 230; 1% of UK ▪ Red-breasted merganser Mergus serrator, 470; 5% of UK ▪ Goosander Mergus merganser, 22; 2% of UK ▪ Oystercatcher Haematopus ostralegus, 5,100; 1% of UK ▪ Grey plover Pluvialis squatarola, 920; 2% of UK ▪ Sanderling Calidris alba, 220; 1% of UK ▪ Dunlin Calidris alpina, 5,200; 1% of UK ▪ Black-tailed godwit Limosa limosa,150; 2% of UK	
Firth of Tay and Eden Estuary Ramsar	The Firth of Tay and Eden Estuary is a complex of estuarine and coastal habitats in eastern Scotland. The site includes extensive invertebrate-rich intertidal mudflats and sandflats created by the massive sediment load deposited by the River Taw. Also present are large areas of reedbed and sand-dune and a small amount of saltmarsh. The site supports an internationally important assemblage of wintering waterfowl including internationally important populations of several species. Fourteen species of bird breed in nationally important numbers. Abertay Sands are also important as a major haul-out site for both grey seals Halichoerus grypus and breeding common seals Phoca vitulina.	Ramsar Criterion 5 – Assemblages of International Importance Species with peak counts in winter: ▪ 27,028 waterfowl (of year peak mean 1998/99-2002/03) Ramsar Criterion 6 – Species/Populations occurring at levels of international importance Species with peak counts in spring/autumn ▪ Redshank - 2,145 individuals, representing a mean of 1.8% of UK population (5 year peak mean 1998/9-2002/3) ▪ Species with peak counts in winter ▪ Pink-footed goose - 6,315 individuals, representing a mean of 2.6% of the UK, Iceland/Greenland population (5 year peak mean 1997/8-2001/2) ▪ Greylag goose – 1,883 individuals, representing a mean of 2.1% of the Iceland/UK, Ireland population (5 year peak mean 1996/7-2000/1) ▪ Bar-tailed godwit – 1,809 individuals, representing a mean of 1.5% of the West Palearctic population (5 year peak mean 1998/9-2002/3)	

Firth of Forth and St Andrews Bay Complex pSPA	Public consultation recently closed on the proposed Special Protection Area that would stretch from Arbroath to St Abb's Head, encompassing the Firth of Forth, the outer Firth of Tay and St Andrews Bay. The area hosts one of the largest and most diverse concentrations of marine sea birds in Scotland – over 21,000 eiders and over 500 velvet scoter, representing a third of the GB wintering population. Additionally, 61,000 puffin Fratercula arctica, 12,000 kittiwake, 28,000 guillemot and the largest populations of little gull, black-headed gull and common tern use the waters for foraging during the breeding season.	Proposed Breeding Interests: ▪ Arctic tern Sterna paradisaea ▪ Atlantic puffin Fratercula arctica ▪ Guillemot Uria aalge ▪ Common tern Sterna hirundo ▪ European shag Phalacrocorax aristotelis ▪ Herring gull Larus argentatus ▪ Kittiwake Rissa tridactyla ▪ Manx shearwater Puffinus puffinus ▪ Northern gannet Morus bassanus ▪ Proposed Non-breeding interests: ▪ Black-headed gull ▪ Eider ▪ Goldeneye ▪ Guillemot ▪ Common gull Larus canus ▪ Common scoter ▪ European shag ▪ Herring gull ▪ Kittiwake ▪ Little gull Hydrocoloeus minutus ▪ Long-tailed duck ▪ Razorbill Alca torda ▪ Red-breasted merganser ▪ Red-throated diver Gavia stellata ▪ Slavonian grebe Podiceps auritus ▪ Velvet scoter	

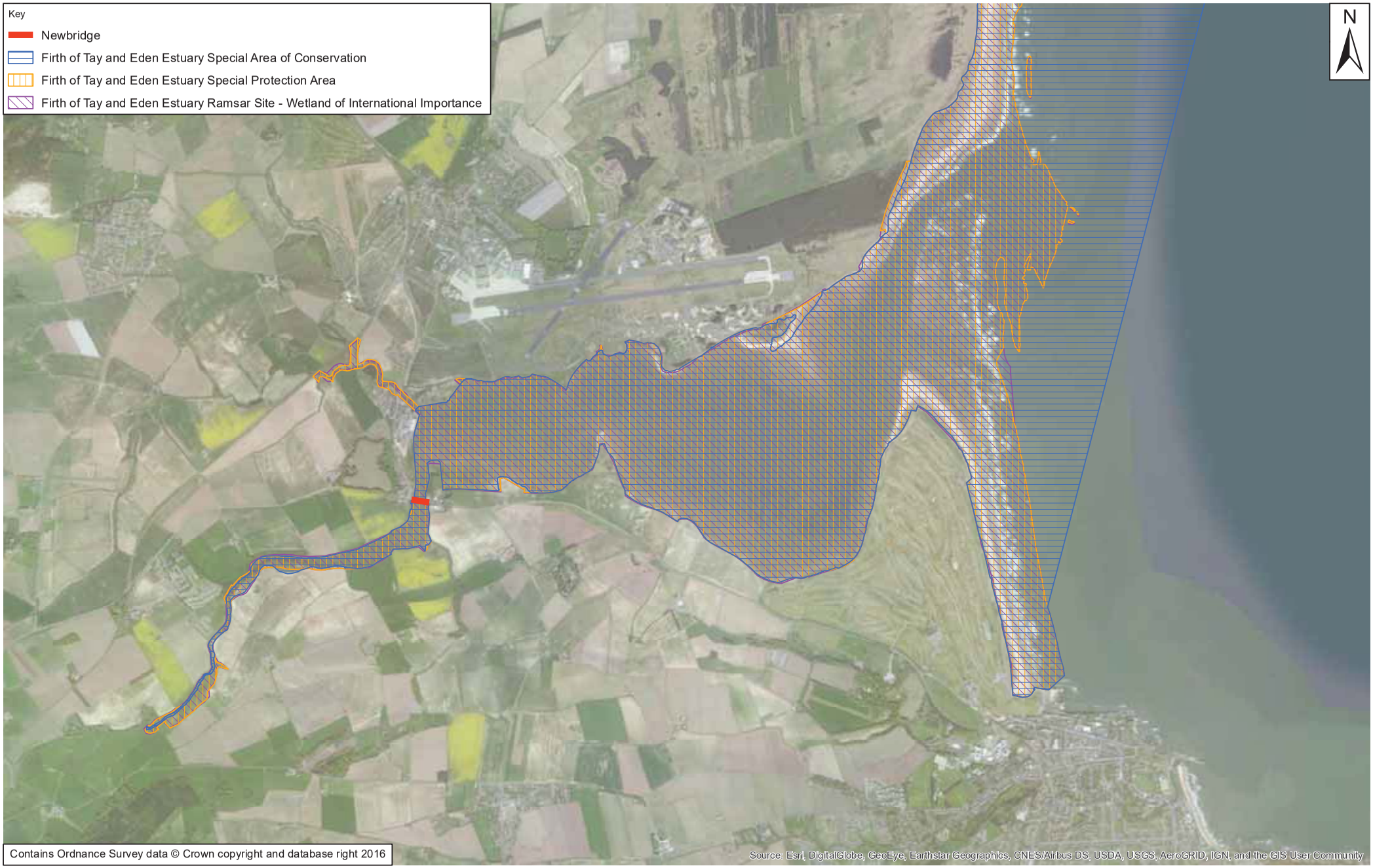
Table B2 - Firth of Tay and Eden Estuary SAC: qualifying features for designation and current conservation condition

Site Name	Site Description	Summary of Reasons for Designation	Current Condition (Component SSSI Units)
Firth of Tay and Eden Estuary SAC	The Firth of Tay and the Eden estuary are two high-quality estuarine areas. The two estuaries have been proposed within a single site because they are integral components of a large, geomorphologically complex area that incorporates a mosaic of estuarine and coastal habitats. The Tay is the least-modified of the large east coast estuaries in Scotland while the Eden estuary represents a smaller 'pocket' estuary. The inner parts of the estuaries are largely sheltered from wave action, while outer areas, particularly of the Tay, are exposed to strong tidal streams, giving rise to a complex pattern of erosion and	Annex I – Habitats of primary reason for selection of site (92/43/EEC) Estuaries (1130) Annex II – Habitats present as qualifying feature, but not primary reason for selection (92/43/EEC) Sandbanks which are slightly covered by sea water all the time (1110)	Estuaries: No Previous Assessment Sub-tidal sandbanks: Favourable - Maintained Mudflats and Sandflats: Favourable - Maintained Harbour Seal: Favourable - Maintained

	deposition of the sandbank feature at the firths' mouth. The sediments within the site support biotopes that reflect the gradients of exposure and salinity, and are typical of estuaries on the east coast of the UK. The abundance, distribution and composition of the associated plant and animal communities are ecologically representative of northern North Sea estuaries.	Mudflats and sandflats not covered by seawater at low tide (1140) Annex II – Species of primary reason for selection of site (92/43/EEC) Harbour Seal Phoca vitulina (1365)	

Appendix C

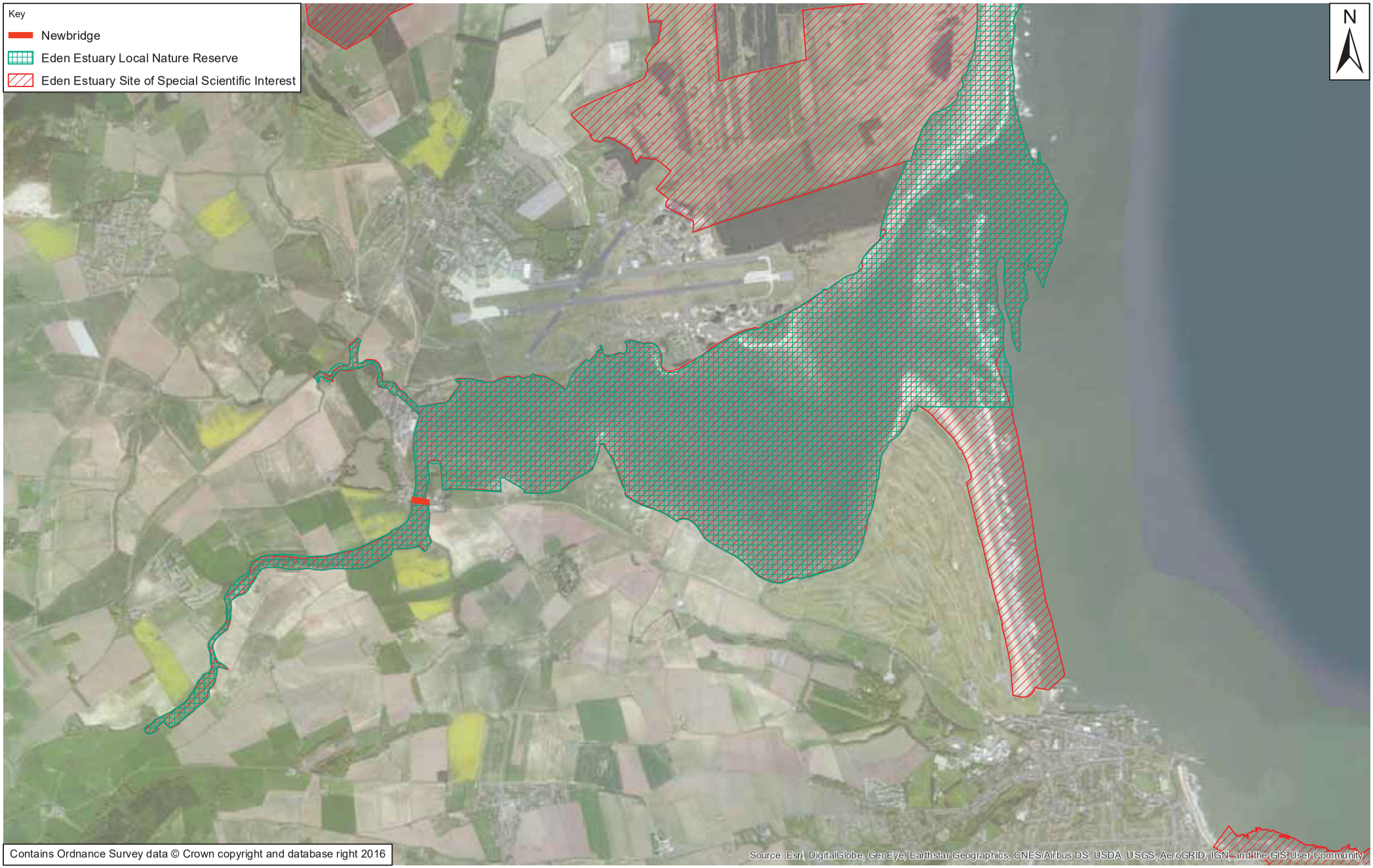
NATIONAL AND LOCALLY DESIGNATED SITE INFORMATION



PROJECT: Newbrdige, Guardbridge Bridge Refurbishment
PROJECT No: 70027582
Client: Fife Council

Drawn: AJ
Checked: DC
Approved: JS
Revision: A
Date: January 2017

WSP | PARSONS BRINCKERHOFF



PROJECT: Newbrdige, Guardbridge Bridge Refurbishment
PROJECT No: 70027582
Client: Fife Council

Drawn: DC
Checked: JS
Approved: JS
Revision: A
Date: March 2017

WSP | PARSONS BRINCKERHOFF

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough
Cambridgeshire PE1 1JY
UK
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948
Email: RIS@JNCC.gov.uk

2. Date this sheet was completed/updated:

Designated: 02 February 2000

3. Country:

UK (Scotland)

4. Name of the Ramsar site:

Firth of Tay & Eden Estuary

5. Designation of new Ramsar site or update of existing site:

This RIS is for: Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area:

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site included:

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* □;
ii**) an electronic format** (e.g. a JPEG or ArcView image) Yes
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* □;

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

8. Geographical coordinates (latitude/longitude):

56 24 30 N 03 05 00 W

9. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

On the east coast of Scotland, immediately adjacent to Dundee, Broughty Ferry, St Andrews and 10 km east of Perth.

Administrative region: Angus; City of Dundee; Fife; Perth & Kinross

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 6918.42

Min. -2
Max. 5
Mean 0

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Firth of Tay and Eden Estuary is a complex of estuarine and coastal habitats in eastern Scotland. The site includes extensive invertebrate-rich intertidal mudflats and sandflats created by the massive sediment load deposited by the River Tay. Also present are large areas of reedbed and sand-dune and a small amount of saltmarsh. The site supports an internationally important assemblage of wintering waterfowl including internationally important populations of several species. Fourteen species of bird breed in nationally important numbers. Abertay Sands are also important as a major haul-out site for both grey seals *Halichoerus grypus* and breeding common seals *Phoca vitulina*.

13. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

5, 6

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:
27028 waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

Common redshank , *Tringa totanus totanus*,	2145 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

Pink-footed goose , *Anser brachyrhynchus*, Greenland, Iceland/UK	6315 individuals, representing an average of 2.6% of the population (5 year peak mean 1997/8-2001/2)
Greylag goose , *Anser anser anser*, Iceland/UK, Ireland	1883 individuals, representing an average of 2.1% of the population (5 year peak mean for 1996/7-2000/01)
Bar-tailed godwit , *Limosa lapponica lapponica*, W Palearctic	1809 individuals, representing an average of 1.5% of the population (5 year peak mean 1998/9-2002/3)

Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Species with peak counts in spring/autumn:

Goosander , *Mergus merganser merganser*, NW & C Europe	258 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.
Details of bird species occuring at levels of National importance are given in Section 22

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:
Atlantic

b) biogeographic regionalisation scheme (include reference citation):
Council Directive 92/43/EEC

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	mud, alluvium, igneous, basalt, sandstone, sedimentary, peat, sand, shingle, biogenic reef
Geomorphology and landscape	lowland, coastal, subtidal sediments (including sandbank/mudbank), intertidal sediments (including sandflat/mudflat), open coast (including bay), estuary, lagoon, intertidal rock
Nutrient status	eutrophic, mesotrophic
pH	no information
Salinity	saline / euhaline
Soil	mainly mineral
Water permanence	usually permanent
Summary of main climatic features	Annual averages (Leuchars, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/leuchars.html) Max. daily temperature: 12.2° C Min. daily temperature: 4.9° C Days of air frost: 59.7 Rainfall: 653.9 mm Hrs. of sunshine: 1523.2

General description of the Physical Features:

The two estuaries are integral components of a large, geomorphologically complex area that incorporates a mosaic of estuarine and coastal habitats. The Tay is the least-modified of the large east coast estuaries in Scotland, while the Eden estuary represents a smaller 'pocket' estuary. The inner parts of the estuaries are largely sheltered from wave action, while outer areas, particularly of the Tay, are exposed to strong tidal streams, giving rise to a complex pattern of erosion and deposition of the sandbank feature at the firths' mouth. The sediments within the site support biotopes that reflect the gradients of exposure and salinity, and are typical of estuaries on the east coast of the UK.

The site stretches for some 35 km along the Tay estuary from near Newburgh to the estuary mouth. For much of its length the main channel of the estuary lies close to the southern shore and the most extensive intertidal flats are on the north side, west of Dundee. In Monifieth Bay, to the east of Dundee, the substrate becomes sandier and there are also mussel *Mytilus edulis* beds. The south shore consists of fairly steeply-shelving mud and shingle. The Inner Tay Estuary is particularly noted for the continuous dense stands of common reed *Phragmites australis* along its northern shore. These reedbeds, inundated during high tides, are amongst the largest in Britain. Eastwards, as conditions become more saline, there are areas of saltmarsh, a relatively scarce habitat in eastern Scotland.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

The River Tay is the longest river in Scotland, draining much of the southern Highlands. The catchment of the Tay system covers an area of 4970 km2, and average annual flow of the River Tay at Perth is about 170 m3/s. Below Perth the Tay becomes tidal and the River Earn flows into the estuary. The largest city on the river, Dundee, lies on the north bank of the Firth of Tay.
The River Eden drains some 400 km2 of north Fife, a predominantly low-lying catchment of which approximately 76% is prime agricultural land.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

No special values known

19. Wetland types:

Marine/coastal wetland

Code	Name	% Area
G	Tidal flats	48
E	Sand / shingle shores (including dune systems)	25
F	Estuarine waters	19
Sp	Saline / brackish marshes: permanent	6
H	Salt marshes	1.2
M	Rivers / streams / creeks: permanent	0.8

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Invertebrate-rich mudflats comprise the majority of the sites. These include important areas of eelgrass *Zostera* spp. in Tayport Bay. Small areas of saltmarsh can be found in Tayport Bay, Eden Estuary and the Inner Tay Estuary. These are dominated by *Juncus gerardii*, *Scirpus* spp. and *Schoenoplectus* spp. on the Inner Tay and *Puccinellia/Festuca* on the Eden Estuary. Successional sand-dune communities are to be found on Tentsmuir Point which is one of the most extensive dune systems in Scotland. In total 14 NVC communities are found there. The *Phragmites australis* reedbeds (S4 swamp) are the some of the most important in the UK and include the largest continuous stand of reed in the UK.

Ecosystem services

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Habitat of National Importance:

Phragmites australis reedbed

Nationally importance species:

Higher Plants:
Oak-leaved goosefoot *Chenopodium glaucum* (nationally scarce).
Baltic rush *Juncus balticus* (nationally scarce),
Seaside centaury *Centaurium littorale* (nationally scarce),
Coral-root orchid *Corallorhiza trifida* (nationally scarce),
Dense-flowered fumitory *Fumaria densiflora* (nationally scarce),
Eelgrass *Zostera marina* (nationally scarce),
Narrow-leaved eelgrass *Zostera angustifolia* (nationally scarce),
Dwarf eelgrass *Zostera noltei* (nationally scarce)

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Birds

Species currently occurring at levels of national importance:

Species with peak counts in spring/autumn:

Ringed plover , *Charadrius hiaticula*, Europe/Northwest Africa	428 individuals, representing an average of 1.3% of the GB population (5 year peak mean 1998/9-2002/3 - spring peak)
Common greenshank , *Tringa nebularia*, Europe/W Africa	13 individuals, representing an average of 2.1% of the GB population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

Common eider , *Somateria mollissima mollissima*, NW Europe	2359 individuals, representing an average of 3.2% of the GB population (5 year peak mean 1998/9-2002/3)
Black (common) scoter , *Melanitta nigra nigra*,	3100 individuals, representing an average of 6.2% of the GB population (5 year peak mean for 1990/91 to 1994/95)
Velvet scoter , *Melanitta fusca fusca*, Baltic/W Europe	730 individuals, representing an average of 24.3% of the GB population (5 year peak mean for 1990/91 to 1994/95)
Eurasian oystercatcher , *Haematopus ostralegus ostralegus*, Europe & NW Africa -wintering	3653 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Grey plover , *Pluvialis squatarola*, E Atlantic/W Africa -wintering	874 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)

Species Information

Internationally important species:

Mammals:
Common seal *Phoca vitulina*

Nationally important species:

Invertebrates:
fly *Dialineura anilis* (nationally rare),
fly *Eutropha fulvifrons* (nationally scarce),
Moths:
Cousin German moth *Paradiarsia sobrina* (nationally rare)
Lyme grass *Photedes elymi* (nationally scarce),
Pretty pinion *Perizoma blandiata* (nationally scarce),
Satin lutestring *Tetheella fluctuosa* (nationally scarce),
Regal mantle *Catarhoe cuculata* (nationally scarce),
Lunar yellow underwing *Noctua orbona* (nationally scarce),
Coast dart *Euxoa cursoria* (nationally scarce),
Sand dart *Agrotis ripae* (nationally scarce),
White colon *Sideridis albicolon* (nationally scarce),
Portland moth *Actebia praecox* (nationally scarce)

Mammals:

Grey seal *Halichoerus grypus*

23. Social and cultural values:

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

Aesthetic
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation
Non-consumptive recreation
Scientific research
Sport fishing
Sport hunting
Tourism
Transportation/navigation

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? No

If Yes, describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

Ownership category	On-site	Off-site
Local authority, municipality etc.	+	+
National/Crown Estate	+	+
Private	+	+
Public/communal	+	+
Other	+	+

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	+
Commercial forestry		+

Cutting of vegetation (small-scale/subsistence)	+	
Fishing: commercial	+	+
Fishing: recreational/sport	+	+
Bait collection	+	+
Arable agriculture (unspecified)		+
Permanent arable agriculture		+
Rough or shifting grazing	+	
Permanent pastoral agriculture		+
Hunting: recreational/sport	+	+
Industrial water supply	+	+
Industry	+	+
Sewage treatment/disposal	+	+
Harbour/port		+
Transport route	+	+
Urban development		+
Non-urbanised settlements		+
Military activities	+	+

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
No factors reported	NA				

For category 2 factors only. What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Is the site subject to adverse ecological change? NO

27. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site

Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	+
National Nature Reserve (NNR)	+	
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	
Management agreement	+	+
Site management statement/plan implemented	+	+
Other	+	
Special Area of Conservation (SAC)	+	+

b) Describe any other current management practices:
The management of Ramsar sites in the UK is determined by either a formal management plan or through other management planning processes, and is overseen by the relevant statutory conservation agency. Details of the precise management practises are given in these documents.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

29. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

EE= Eden Estuary, TP= Tentsmuir Point, IT= Inner Tay Estuary

Birds
Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.

· Disturbance and feeding (Eden Estuary)
· Distribution due to disturbance (Eden Estuary)
· Feeding strategies (Eden Estuary)
· Effect of algal mats and feeding (Eden Estuary)
· Reedbed breeding birds monitoring (Inner Tay Estuary)
· Long-term ringing studies

Seals
· Seal movement (Eden Estuary)
· Haulout behaviour and dietary habits (Eden Estuary)
· Underwater recordings of grey seal (Tentsmuir Point)
· Population and breeding monitoring (Tentsmuir Point)

Fish
· Sea trout behaviour and physiology (Eden Estuary)
· Fish population survey (Eden Estuary)

Invertebrates
· Biology of lugworm and ragworm (Eden Estuary)
· Mollusc parasitology (Eden Estuary)
· Butterfly surveys (Tentsmuir Point)

Plants
· Coral-root orchid studies (Tentsmuir Point)

· Vegetation succession (Tentsmuir Point)

Estuarine and geomorphological
· Estuarine energetics (Eden Estuary)
· Recovery of estuary after Effluent Treatment Plant built (Eden Estuary)
· Coastal protection (Eden Estuary)
· Sediment change (Eden Estuary)
· Use of *Scirpus* and *Phragmites* for coastal defence (Eden Estuary)
· Nutrient heterogeneity from shore to forest (Tentsmuir Point)

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Students from many universities conduct research on the site. In particular the University of St Andrews has strong links with both the Eden Estuary and Tentsmuir Point NNR where many students carry out fieldwork for undergraduate and postgraduate degrees. Students from Elmwood College in Cupar and Dundee University also visit the site.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The site is used all year round by local people for recreational activities such as walking and birdwatching. Low-level tourist use also occurs.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Scottish Executive, Environment and Rural Affairs Department

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Scottish Natural Heritage, 2 Anderson Place, Edinburgh, EH6 5NP

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see **15** above), list full reference citation for the scheme.

Site-relevant references

Adams, JA & Grierson, RJ (1974) *The Eden estuary*. Unpublished, Department of Agriculture and Fisheries for Scotland, Aberdeen (Marine Laboratory Internal Report, New Series, No. 4)

Ahmad, WA (1990) *Assessment of some remote sensing techniques for recognition of sediment distributions in Montrose Basin and the Eden estuary, Scotland*. Unpublished PhD thesis, University of Dundee

Alexander, WB (1932) The natural history of the Firth of Tay. *Transactions of the Perthshire Society of Natural Science*, **9**, 35-41

Anon. (ed.) (1972) *The Forth–Tay estuaries (an environmental assessment). Proceedings of the Royal Society of Edinburgh*, **71B**(2/4)

Anon. (ed.) (1975) *Physical and biological aspects of the Tay estuary. Proceedings of the Royal Society of Edinburgh*, **75B**(1/2)

Anon. (ed.) (1980) *Tay estuary symposium. Proceedings of the Royal Society of Edinburgh. Series B: Biological Sciences*, **78B**(3/4)

Anon. (1995) *Biodiversity: The UK Steering Group Report. Volume 1: Meeting the Rio Challenge*. HMSO, London

Anon. (1995) *Biodiversity: The UK Steering Group Report. Volume 2: Action plans*. HMSO, London

Atkins, SM, Jones, AM & Garwood, PR (1987) The ecology and reproductive cycle of a population of *Marenzelleria viridis* (Annelida; Polychaeta; Spionidae) in the Tay estuary. In: *The environment of the Tay estuary*, ed. by J McManus, 311-322. *Proceedings of the Royal Society of Edinburgh*, **92B**(3/4)

Atkinson, P (1989) *Determination of the physical and chemical status of the River Eden and Eden estuary, with regard to water quality*. Unpublished MSc dissertation, Heriot-Watt University, International Centre for Island Technology, Stromness

Barclay, AM, Ingram, HAP, Lynch, BM, Sprent JI & McMillan, RL (1976) *The performance of reeds in the Firth of Tay, 1975*. (Contractor: University of Dundee, Department of Biological Sciences) Unpublished report to Nature Conservancy Council, Edinburgh

Barne, JH, Robson, CF, Kaznowska, SS, Doody, JP, Davidson, NC & Buck, AL (eds.) (1997) *Coasts and Seas of the United Kingdom. Region 4. South-east Scotland: Montrose to Eyemouth*. Joint Nature Conservation Committee, Peterborough (Coastal Directories Series)

Bates, CR, Moore, CG, Malthus, T, Mair, JM & Kapouzli, E (2004) Broad scale mapping of habitats in the Firth of Tay and Eden estuary, Scotland. *Scottish Natural Heritage Commissioned Report*, No. **007** (ROAME No. F01AA401D)

Batten, LA, Bibby, CJ, Elliott, GD & Porter, RF (eds.) (1990) *Red Data birds in Britain: action for rare, threatened and important species*. Poyser, London

Bell, P (1979) *The biology of the Eden estuary*. Unpublished BSc dissertation, University of St Andrews

Bennett, TL & McLeod, CR (1998) Chapter 4. East Scotland (Duncansby Head to Dunbar) (MNCR Sector 4). In: *Benthic marine ecosystems of Great Britain and the north-east Atlantic*, ed. by K. Hiscock, 123-154. Joint Nature Conservation Committee, Peterborough. (Coasts and Seas of the United Kingdom. MNCR series)

Bentley, M (1998) The shore, the estuaries and the sea. In: *The nature of Fife. Wildlife and ecology*, ed. by GB Corbet, 52-69. Scottish Cultural Press, Edinburgh, for Scottish Wildlife Trust (Fife & Kinross Branch)

Boase, H (1961) *Birds of north and east Perth*. Unpublished typescript

Boase, H (1964) *Birds of north Fife*. Unpublished typescript

Booth, A (1991) *Tayport – Tentsmuir Site of Special Scientific Interest management plan*. Unpublished report to Scottish Natural Heritage

Booth, A, *et al*. (1996) *A study of vegetation change at Tentsmuir Point since the establishment of the NNR* ??

Bratton, JH (ed.) (1991) *British Red Data Books: 3. Invertebrates other than insects*. Joint Nature Conservation Committee, Peterborough

Browne, MAE (2000) Balmerino to Wormit. In: *Caledonian igneous rocks of Scotland*, ed. by D Stephenson, RE Bevins, D Millward, AJ Highton, I Parsons, P Stone & WJ Wadsworth, 531-534. Joint Nature Conservation Committee, Peterborough (Geological Conservation Review Series, No. 17)

Buck, AL (ed.) (1993) *An inventory of UK estuaries. Volume 4. North and east Scotland*. Joint Nature Conservation Committee, Peterborough

Buller, AT, McManus, J, Jones, AM, Jones, YM & Stewart, WDP (1972) Brief review of estuarine studies in the Tay, Scotland. *Bulletin of the Estuarine and Brackish Water Sciences Association*, **1**, 2-4

Burd, F (1989) *The saltmarsh survey of Great Britain. An inventory of British saltmarshes.* Nature Conservancy Council, Peterborough (Research & Survey in Nature Conservation, No. 17)

Campbell, JK (1982) The true bugs (Heteroptera) of Tentsmuir Point, Fife. *Forth Naturalist and Historian*, **5** (1980), 72-85

Campbell, JK (1983) The true bugs (Heteroptera) of Tentsmuir Point, Fife – postscript. *Forth Naturalist and Historian*, **6** (1981), 62

Caudwell, C & Jones, AM (1994) *Survey of green algal mats on the Eden Estuary Local Nature Reserve, September 1994*. (Contractor: University of Dundee, Environmental Advisory Unit). Unpublished report to Scottish Natural Heritage

Central Environmental Surveys (2003) Habitat survey inner Tay estuary 2002. *Scottish Natural Heritage Commissioned Report*, No. **003** (ROAME No. F01LH04B)

Chilvers, RN (1998) *Changes in the abundance and distribution of the shelduck (*Tadorna tadorna*) on the Eden estuary, N.E. Fife, Scotland*. Unpublished M.Phil. thesis, University of St Andrews

Clelland, BE (1997) The Eden estuary: a review of its ecological and conservation interest, with particular reference to water quality. In: *The estuaries of central Scotland. A volume based on a local meeting of the Estuarine and Coastal Sciences Association, Edinburgh, UK, April 1995*, ed. by DS McLusky, 189-194. *Coastal Zone Topics: Process Ecology & Management*, **3**

Coupar, AM, Glover, JG, Ingram, HAP & Sprent, JI (1979) *The performance of reeds in the Firth of Tay, 1978*. (Contractor: University of Dundee, Department of Biological Sciences, Dundee.) Unpublished report to Nature Conservancy Council, South-east (Scotland) Region, Edinburgh

Covey, R, Fortune, F, Nichols, DM & Thorpe, K (1998) *Marine Nature Conservation Review Sectors 3, 4, 13 & 15. Lagoons in mainland Scotland and the Inner Hebrides: area summaries*. Joint Nature Conservation Committee, Peterborough (Coasts and seas of the United Kingdom. MNCR series)

Cranswick, PA, Waters, RJ, Musgrove, AJ & Pollitt, MS (1997) *The Wetland Bird Survey 1995–96: wildfowl and wader counts*. British Trust for Ornithology, Wildfowl and Wetlands Trust, Royal Society for the Protection of Birds & Joint Nature Conservation Committee, Slimbridge

Crawford, RMM (1998) The landward coast: dunes, saltmarsh, and cliffs. In: *The nature of Fife. Wildlife and ecology*, ed. by GB Corbet, 40-51. Scottish Cultural Press, Edinburgh, for Scottish Wildlife Trust (Fife & Kinross Branch)

Cunningham, T (2004) *Bibliography for Tentsmuir Point and Morton Lochs National Nature Reserve*. Scottish Natural Heritage (unpublished bibliography)

Dargie, T (1994) *Earlshall/Tentsmuir airphoto interpretation*. Unpublished report to Scottish Natural Heritage, Edinburgh

Dargie, T (2001) Sand dune vegetation survey of Scotland: East coast. Volume 2: Site reports. *Scottish Natural Heritage Research, Survey and Monitoring Report*, No. **179**

Dargie, TCD (1993) *Sand dune vegetation survey of Great Britain: a national inventory. Part II: Scotland*. Joint Nature Conservation Committee, Peterborough

Dargie, TCD (2000) Sand dune vegetation survey of Scotland: national report. *Scottish Natural Heritage, Commissioned Report*, No. F97AA401. www.snh.org.uk/pdfs/strategy/commreports/F97AA401.pdf

Dean, BJ, Webb, A, McSorley, CA & Reid, JB (2003) Aerial surveys of UK inshore areas for wintering seaduck, divers and grebes: 2000/01 and 2001/02. *JNCC Report*, No. **333**. www.jncc.gov.uk/page-2346

Dean, BJ, Webb, A, McSorley, CA, Schofield, RA & Reid, JB (2004) Surveillance of wintering seaducks, divers and grebes in UK inshore areas: aerial surveys and shore-based counts 2003/04. *JNCC Report*, No. **357**

Department for Environment, Food and Rural Affairs (2002) *National Report submitted to the 8th Meeting of the Conference of the Parties, Valencia, Spain, 2002*. Joint Nature Conservation Committee, Peterborough. www.jncc.gov.uk/idt/ramsar/cop8/Default.htm

Dodd, C (1978) *A report on the beetles on Tentsmuir NNR, summer 1978*. Unpublished report to Nature Conservancy Council

Doody, JP, Johnston, C & Smith, B (1993) *Directory of the North Sea coastal margin*. Joint Nature Conservation Committee, Peterborough

Duffey, E (1968) A survey of the sand-dune spider fauna at Tentsmuir N.N.R., Fife, June 16-22, 1966. *Bulletin of the British Spider Study Group*, **37**, 1-3

Duffey, E (1968) An ecological analysis of the spider fauna of sand dunes. *Journal of Animal Ecology*, **37**, 641-674

Ecos Countryside Services (1992) *Tay estuary study. Part 1*. (Contractor: Ecos Countryside Services, Abernethy) Unpublished report to Perth & Kinross District Council / City of Dundee District Council / Nature Conservancy Council for Scotland

Ecos Countryside Services (1996) *A review of the natural heritage of the Firth of Tay*. (Contractor: Ecos Countryside Services, Abernethy) Unpublished report to Scottish Natural Heritage, South East Region

Eden Wildfowlers' Association (1987) *Eden Estuary Local Nature Reserve*. Eden Wildfowlers' Association (leaflet)

Eleftheriou, A & Robertson, MR (1988) *The intertidal fauna of sandy beaches – a survey of the east Scottish coast*. Department of Agriculture and Fisheries for Scotland, Aberdeen (Scottish Fisheries Research Report, No. 38)

Elkins, N & Lynch, BM (1997) Waterfowl counts on the Tay estuary, 1985–1995. *Scottish Birds*, **19**(1), 36-54

Elkins, N, Reid, JB, Brown, AW, Robertson, DG & Smout, A-M (2003) *The Fife bird atlas*. Fife Ornithological Atlas Group

Everett, N (2001) *Tayport – Tentsmuir Coast Site of Special Scientific Interest. Tentsmuir GCR site*. Scottish Natural Heritage, Perth (Earth Science Management Brief)

Fife Ranger Service (n.d. [1997]) *The Eden Estuary Local Nature Reserve*. Fife Council Ranger Service, St Andrews (leaflet)

Forsyth, IH & Chisolm, JI (1977) *The geology of east Fife (explanation of the Fife portion of One-inch Geological Sheet 41 and part of Sheet 49)*. HMSO, Edinburgh (Memoirs of the geological survey of Great Britain, Scotland)

Fullerton, L (1954) Flowers of Tentsmuir. *Scottish Field*, June 1954, 28-29

Gimingham, CH (1964) Maritime and sub-maritime communities. In: *The vegetation of Scotland*, ed. by JH Burnett, 67-142. Oliver & Boyd, Edinburgh

Goodenough, K (1998) *Balmerino to Wormit Shore Site of Special Scientific Interest*. Scottish Natural Heritage, Perth (Earth Science Management Brief)

Grierson, J (1962) A check-list of the birds of Tentsmuir, Fife. *Scottish Birds*, **2**, 113-164

Guardbridge Primary School (nd [~1991]) *Mud glorious mud. A guide to the Eden estuary*. [Wemyss Environmental Education Centre, East Wemyss]

Harvie-Brown, JA (1906) *A fauna of the Tay Basin and Strathmore*. David Douglas, Edinburgh

Hogarth, B. (1989) *Habitat survey of the Eden estuary SSSI*. Nature Conservancy Council, Cupar

Huxley, T (1996) The management plans of Tentsmuir Point National Nature Reserve. In: *Fragile environments: the use and management of Tentsmuir National Nature Reserve, Fife*, ed. by G Whittington, 53-64. Scottish Cultural Press, Edinburgh

Hydrographic Office (1981) *Scotland – east coast. River Tay. Admiralty chart 1481* UK Hydrographic Office, Taunton

Ingram, HAP (1968) Vegetation and flora. In: *Dundee and district*, ed. by SJ Jones, 82-93. British Association for the Advancement of Science, Dundee

Ingram, HAP, Barclay, AM, Coupar, AM, Glover, JG, Lynch, BM & Sprent, JI (1980) *Phragmites* performance in reed beds in the Tay estuary. In: *Tay estuary symposium*, s89-s107. *Proceedings of the Royal Society of Edinburgh*, **78B**(3/4)

Institute of Terrestrial Ecology (1979) *Report to the Nature Conservancy Council on the invertebrate fauna of dune and machair sites in Scotland. Vol. II Part (4). The east coast. Site dossiers*. Natural Environment Research Council, Institute of Terrestrial Ecology, Huntingdon

Jackson, DJ (1973) The influence of flight capacity on the distribution of aquatic Coleoptera in Fife and Kinross-shire. *Entomologist's Gazette*, **24**(3), 247-293

Jarvis, J & Riley, C (1987) Sediment transport in the mouth of the Eden estuary. *Estuarine, Coastal and Shelf Science*, **24**(4), 463-481

Jarvis, J (1989) Sediment transport in St Andrews Bay and the mouth of the Eden estuary. In: *Developments in estuarine and coastal study techniques. EBSA 17 Symposium, University of Dundee, 14-18 September 1987*, ed. by J. McManus & M. Elliott, 85-90. Olsen & Olsen, Fredensborg (International Symposium Series)

Johnston, J (1994) *Coral-root orchid research.***

Johnston, JP, Bell, P & Cobb, JLS (1978) *The invertebrate fauna of the Eden estuary, June – September 1978*. (Contractor: University of St Andrews, Gatty Marine Laboratory) Unpublished report to Nature Conservancy Council, South-east (Scotland) Region. (Internal report, No. NC 239I)

Johnston, JP, Cobb, JLS & Bell, P (1979) *Survey of shorebird feeding distribution and movements on the Eden estuary NE Fife, including a study of the invertebrate food source November 1978 – February 1979 (Eden estuary survey Winter 1978/79)*. (Contractor: University of St Andrews, Gatty Marine Laboratory, St Andrews) Unpublished report to Nature Conservancy Council, South East (Scotland) Region, Edinburgh (Internal report, No. NC 199A)

Jones, AM & Caudwell, CM (1994) *Survey of green algal mats on the Eden Estuary Local Nature Reserve: September 1994.* (Contractor: University of Dundee, Environmental Advisory Unit). Unpublished report to Scottish Natural Heritage

Jones, AM, Atkins, SM & Caudwell, CM (1992) *Environmental Impact Assessment for proposed extension to Riverside Landfill, Dundee, containing: marine biological field survey with desk studies of existing ornithological, metal contamination and hydrographical information.* (Contractor: University of Dundee, Environmental Advisory Unit) Unpublished report to City of Dundee District Council

Jones, AM, Herbert, RA & McManus, J (1989) *Environmental investigations in the Tay estuary, July, 1989*. (Contractor: University of Dundee, Environmental Advisory Unit). Unpublished report to Tayside Regional Council, Water Services Department, Dundee (Report, No. 7/12/239)

Jones, AM, Herbert, RA & McManus, J (1990) *Environmental investigations in the Tay estuary, July 1990*. (Contractor: University of Dundee, Environmental Advisory Unit). Unpublished report to Tayside Regional Council, Water Services Department, Dundee (Report, No. NW7/12/270)

Jones, AM, McManus, J & Herbert, RA (1986) *A re-investigation of the pollution status of the Invergowrie Bay area with specific reference to the impact of the Invergowrie sewage outfall*. University of Dundee, Centre for Industrial Research and Consultancy

Khayrallah, NH & Jones, AM (1975) A survey of the benthos of the Tay estuary. In: *Physical and biological aspects of the Tay estuary*, 113-135. *Proceedings of the Royal Society of Edinburgh*, **75B**(1/2)

Kinnear, PK (1979) Butterflies in north Fife 1978. *Scottish Wildlife Trust, Fife & Kinross Branch Bulletin*, **9**, 4-6

Laing, SA & Taylor, NW (1991) The status of autumn passage and winter wader populations on the inner Tay estuary, 1971 to 1989. *Journal of the Perthshire Society of Natural Science*, **16**, 14-29

Laverlack, MS & Blackler, M (eds.) (1974) *Fauna and flora of St Andrews Bay*. Scottish Academic Press, Edinburgh

Leach, SJ & Phillipson, PH (1983) *The coastal vegetation of the Fife peninsula*. Nature Conservancy Council, Edinburgh **

Leach, SJ & Phillipson, PH (1985) The saltmarsh and brackish swamp vegetation of the Fife peninsula. *Transactions of the Botanical Society of Edinburgh*, **44**, 357-373

Lynch, B (1984) Wader movements on the inner Tay estuary. *Scottish Ornithologists' Club Dundee Branch Newsletter*, November 1984, 1-4

Lynch, BM, Ingram, HAP, Barclay, AM & Sprent, JI (1977) *The performance of reeds in the Firth of Tay, 1976. A further investigation into the influences of commercial harvesting (with a fuller description of the flora of the study area)*. (Contractor: University of Dundee, Department of Biological Sciences) Unpublished report to Nature Conservancy Council, Edinburgh (Internal Report, No. NC 155 I)

MacGregor, AR (1968) *Fife and Angus geology. An excursion guide*. Scottish Academic Press, Edinburgh, for University of St Andrews

Mackie, DW (1968) Harvestmen (opilones) from Tentsmuir dunes, Fife. *Bulletin of the British Spider Study Group*, **38**, 13

Mackie, DW (1968) Spiders from traps at Tentsmuir fore-dunes, Fife, Scotland. *Bulletin of the British Spider Study Group*, **40**, 1-4

Mackie, DW (1971) Notes on some linyphiid spiders from Tentsmuir, Fifeshire. *Bulletin of the British Arachnological Society*, **2**(3), 33-37

MacTaggart, F (1997) *Barry Links SSSI*. Scottish Natural Heritage, Perth (Earth Science Site Documentation Series)

Maguire, EJ (nd [1973]) *Wader observations in south-east Perthshire*. Privately published, Dundee

May, VJ & Hansom, JD (eds.) (2003) *Coastal geomorphology of Great Britain*. Joint Nature Conservation Committee, Peterborough (Geological Conservation Review Series, No. 28)

McCurley, B (1997) *A check list of the birds of Barry Buddon*. Privately published, Dundee

McGlashan, DJ (1997) *The evolution, environmental effects of coastal protection, and suggested strategies for the future of the Eden estuary, Fife, Scotland*. Unpublished MSc dissertation, University of Strathclyde, Glasgow

McLeod, CR (2006 in press) Barry Buddon – a major Scottish sand dune system. *Scottish Naturalist*, **117**

McLeod, CR, Yeo, M, Brown, AE, Burn, AJ, Hopkins, JJ & Way, SF (eds.) (2004) *The Habitats Directive: selection of Special Areas of Conservation in the UK*. 2nd edn. Joint Nature Conservation Committee, Peterborough. www.jncc.gov.uk/SACselection

McLusky, DS (ed.) (1997) *The estuaries of central Scotland. A volume based on a local meeting of the Estuarine and Coastal Sciences Association, Edinburgh, UK, April 1995. Coastal Zone Topics: Process, Ecology & Management*, **3**

McManus, J & Green, CD (1977) *Report on Pilmour Links beaches and the eastern part of the Eden estuary*. (Contractor: University of Dundee). Unpublished report to Fife Regional Council, Glenrothes

McManus, J & Wal, A (1996) Sediment accumulation mechanisms on the Tentsmuir coast. In: *Fragile environments: the use and management of Tentsmuir National Nature Reserve, Fife*, ed. by G Whittington, 1-15. Scottish Cultural Press, Edinburgh

McManus, J (1999a) Ballast and the Tay eider duck populations. *Environment and History*, **5**, 237-244

McManus, J (ed.) (1982) *Sedimentological, hydrological and biological papers. Blicharski memorial volume*. University of Dundee, Newport-on-Tay (Tay Estuary Research Centre Report, No. 7.)

McManus, J (ed.) (1987) *The environment of the Tay estuary. Proceedings of the Royal Society of Edinburgh. Series B: Biological Sciences*, **92**(3/4)

McManus, J, Jones, AM, Herbert, RA & Charlton, JA (1985) *Tayside sewage sludge disposal investigation. Invergowrie and Dighty outfalls*. Unpublished, University of Dundee

McMillan, RL (1976) *Ornithological survey of the* Phragmites *beds on the north bank of the Tay estuary, 1976*. (*A preliminary investigation into the breeding species of the area with particular reference to the effects of commercial harvesting of the reeds)*. Unpublished report to Nature Conservancy Council, Edinburgh (Internal Report, No. NC 155 K)

Mitchell, AL (1988) Last man from Mugdrum. *Scots Magazine*, **130**(1) (Oct. 1988), 46-50

Moser, ME (1983) *An assessment of the importance of the Eden estuary and the Firth of Tay for non-breeding populations of waders*. (Contractor: British Trust for Ornithology, Tring). Unpublished report to Nature Conservancy Council, Huntingdon

Moyes, SB (1990) *The effects of reedbed management on the breeding birds of the Tay reedbeds 1989*. (Contractor: Tay Ringing Group). Unpublished report to Nature Conservancy Council, South East Region Scotland (Internal Report, No. NC 239 L)

Musgrove, AJ, Langston, RHW, Baker, H & Ward, RM (eds.) (2003) *Estuarine waterbirds at low tide. The WeBS Low Tide Counts 1992–93 to 1998–99*. WSG/BTO/WWT/RSPB/JNCC, Thetford (International Wader Studies, No. 16)

Musgrove, AJ, Pollitt, MS, Hall, C, Hearn, RD, Holloway, SJ, Marshall, PE, Robinson, JA & Cranswick, PA (2001) *The Wetland Bird Survey 1999–2000: wildfowl and wader counts*. British Trust for Ornithology, Wildfowl and Wetlands Trust, Royal Society for the Protection of Birds & Joint Nature Conservation Committee, Slimbridge. www.wwt.org.uk/publications/default.asp?PubID=14

Nature Conservancy Council (1985) *Inner Tay Estuary SSSI*. SSSI citation, May 1985

Nature Conservancy Council (1990) *Eden Estuary SSSI*. SSSI citation, February 1990

North East Fife District Council (nd [1987]) *Eden Estuary Local Nature Reserve management plan 1987–1992* . North East Fife District Council [Cupar]

Owens, NJP & Stewart, WDP (1983) *Enteromorpha* and the cycling of nitrogen in a small estuary. *Estuarine, Coastal and Shelf Science* **17**, 287-296

Peach, WJ (2001) Minimum breeding population of bearded tits on the Tay reedbeds in 2000: an analysis of Tay Ringing Group mark-recapture data. *Tay Ringing Group Report* 1998–2000, 24-28

Poores, MED (1954) *Plant list for Tentsmuir Point*. Nature Conservancy Council, Cupar [unpublished species list]

Posford Duvivier Scotland (2000) *Feasibility study for foreshore recharge on the Eden estuary*. (Contractor: Posford Duvivier Scotland) Unpublished report to Scottish Natural Heritage

Pounder, B (1971) Wintering eiders in the Tay estuary. *Scottish Birds*, **6**(8), 407-419

Preston, CD, Pearman, DA & Dines, TD (2002) *New atlas of the British and Irish flora. An atlas of the vascular plants of Britain, Ireland, the Isle of Man and the Channel Islands*. Oxford University Press, Oxford

Pritchard, DE, Housden, SD, Mudge, GP, Galbraith, CA & Pienkowski, MW (eds.) (1992) *Important Bird Areas in the United Kingdom including the Channel Islands and the Isle of Man*. Royal Society for the Protection of Birds, Sandy

Ramsay, DL & Brampton, AH (2000) Coastal cells in Scotland: Cell 2 – Fife Ness to Cairnbulg Point, *Scottish Natural Heritage Research Survey and Monitoring Report*, No. **144**

Ranwell, DS (ed.) (1972) *The management of sea buckthorn (*Hippophaë rhamnoides *L.) on selected sites in Great Britain. Report of the* Hippophaë *Study Group*. Nature Conservancy, Norwich

Ratcliffe, DA (ed.) (1977) *A Nature Conservation Review. The selection of biological sites of national importance to nature conservation in Britain*. Cambridge University Press (for the Natural Environment Research Council and the Nature Conservancy Council), Cambridge (2 vols.)

Ritchie, W (1979) *The beaches of Fife*. University of Aberdeen, Department of Geography, Aberdeen (for the Countryside Commission for Scotland, Perth)

Robertson, IA (1998) *The Tay salmon fisheries since the eighteenth century*. Cruithene Press, Glasgow

Robertson, J (1993) *Tay estuary study (S. side)*. Unpublished, Fife Regional Council, Glenrothes (Phase 1 Habitat Surveys Technical Report)

Robertson, JS (1988) *A vegetation survey of Tentsmuir and the adjoining coastal areas*. Nature Conservancy Council, South East Scotland Region, Edinburgh (unpublished report)

Rodwell, JS (ed.) (1995) *British plant communities. Volume 4. Aquatic communities, swamps and tall-herb fens*. Cambridge University Press, Cambridge

Rodwell, JS (ed.) (2000) *British plant communities. Volume 5. Maritime communities and vegetation of open habitats*. Cambridge University Press, Cambridge

Rose, PM & Scott, DA (1997) *Waterfowl population estimates*. 2nd edn. Wetlands International, Wageningen (Wetlands International Publication, No. 44) www.wetlands.org/IWC/wpe2/WPE2-toc.htm

Sage, J (1979) *Carolina Port Power Station, Dundee. Entrained fish survey, 10 January 1979 – 5 April 1979*. Unpublished, Dundee City Museums & Art Galleries (Natural History Section)

Scottish Natural Heritage (1999) *Tayport – Tentsmuir Coast SSSI*. SSSI citation, August 1999

Scottish Natural Heritage (2002) *Tentsmuir Point National Nature Reserve. 'Faster than most'*. Scottish Natural Heritage, Tayport (leaflet). www.nnr-scotland.org.uk/publications_detail.asp?pubID=3

Shaw, MW, Hewett, DG & Pizzey, JM (1983) Scottish Coastal Survey. A report on selected soft coast sites in Scotland . (Contractor: Institute of Terrestrial Ecology, Bangor) *Nature Conservancy Council, CSD Report*, No. **487**

Shirt, DB (ed.) (1987) *British Red Data Books: 2. Insects*. Nature Conservancy Council, Peterborough

Small, G (1984) The winter harvest. *Scots Magazine*, **122**(3) (Dec. 1984), 253-257

Smith, M (1971a) *A provisional list of Coleoptera from Tentsmuir Point NNR, collected by M. Smith (1963-67)*. Nature Conservancy Council, Cupar (Unpublished file note, ref. 13A/R)

Smith, R & Shepherd, M (1998) *Firth of Tay & Eden Estuary proposed Special Protection Area and Ramsar site (412A). Departmental brief*. Scottish Natural Heritage, Edinburgh (International Sites Series)

Smout, A-M & Kinnear, PK (1993) *The butterflies of Fife. A provisional atlas*. Fife Nature, Glenrothes

Smout, A-M (1986) *The birds of Fife. An outline of their status and distribution*. John Donald, Edinburgh

Smout, A-M (1996) Birds of Tentsmuir, 1880-1990: an ecological catastrophe? In: *Fragile environments: the use and management of Tentsmuir National Nature Reserve, Fife*, ed. by G Whittington, 40-53. Scottish Cultural Press, Edinburgh

Steers, JA (1973) *The coastline of Scotland*. Cambridge University Press, Cambridge

Stewart, A, Pearman, DA & Preston, CD (eds.) (1994) *Scarce plants in Britain*. Joint Nature Conservation Committee, Peterborough

Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds.) (2001) *The UK SPA network: its scope and content. Volume 3: Site accounts*. Joint Nature Conservation Committee, Peterborough www.jncc.gov.uk/UKSPA/default.htm

Stroud, DA, Mudge, GP & Pienkowski, MW (eds.) (1990) *Protecting internationally important bird sites: a review of the EEC Special Protection Area Network in Great Britain*. Nature Conservancy Council, Peterborough

Summers, RW & Bakx, A (1980) Wader populations on the Eden estuary, Fife, 1970-74. *Tay Ringing Group Report*, 1978-79, 26-39

Summers, RW (1974) *The birds of Tentsmuir Point NNR 1967–1972*. Privately published, Dundee

Tay Estuary Forum (nd) *The Tay Estuary Coastal References Database*. Tay Estuary Forum, Dundee www.dundee.ac.uk/crsem/TEF/review.htm#Literature

Tay River Purification Board (1989) *Biological survey of the inner Eden estuary 1989*. Tay River Purification Board, Perth (Unpublished report)

Watt, KR, Hancock, EG, Horsfield, D & MacGowan, I (1997) Rare and local Diptera from the Tay reed beds in Scotland. *Dipterists Digest*, **4**(1), 30-34

Welch, RC (1989) Invertebrates of Scottish sand dunes. In: *Coastal sand dunes*, ed. by CH Gimingham, W Ritchie, BB Willetts & AJ Willis, 267-287. *Proceedings of the Royal Society of Edinburgh*, **96B**

Wemyss Environmental Education Centre (1983) *Fife coastal walk. Guardbridge to St Andrews*. Wemyss Environmental Education Centre, East Wemyss (Walk 12)

Wemyss Environmental Education Centre (1984) *Fife coastal walk. Balmerino to the Tay Road Bridge*. Wemyss Environmental Education Centre, East Wemyss (Walk 13)

Wemyss Environmental Education Centre (1984) *Fife coastal walk. Flisk to Balmerino*. Wemyss Environmental Education Centre, East Wemyss (Walk 14)

Wemyss Environmental Education Centre (1984) *Fife coastal walk. Newburgh to Flisk*. Wemyss Environmental Education Centre, East Wemyss (Walk 15)

Wemyss Environmental Education Centre (1984) *Fife coastal walk. Tay Road Bridge to Kinshaldy*. Wemyss Environmental Education Centre, East Wemyss (Walk 4 (formerly Walk 11))

White, I (1983) Review of invertebrate sites in Scotland. Review of Tayside Region. *Nature Conservancy Council, CSD Report*, No. **429** (Invertebrate Site Register Report, No. 17)

Whittington, G (ed.) (1996) *Fragile environments: The use and management of Tentsmuir National Nature Reserve, Fife*. Scottish Cultural Press, Dalkeith

Wiggington, M (1999) *British Red Data Books. 1. Vascular plants*. 3rd edn. Joint Nature Conservation Committee, Peterborough

Wright, R (1981) *The beaches of Tayside*. University of Aberdeen, Department of Geography, Aberdeen (for the Countryside Commission for Scotland, Perth) [reprinted by Scottish Natural Heritage, 2001]

Zenetos, A (1980) *Molluscan populations of the Eden estuary, Fife, and the use of numerical taxonomy methods to determine their distribution patterns*. Unpublished MSc dissertation, University of St Andrews

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EC Directive 79/409 on the Conservation of Wild Birds

SPECIAL PROTECTION AREA (SPA) CITATION
FOR PUBLIC ISSUE

FIRTH OF TAY & EDEN ESTUARY (UK9004121)

Site description:

The Firth of Tay & Eden Estuary SPA is a complex of estuarine and coastal habitats in eastern Scotland stretching from the mouth of the River Earn in the inner Firth of Tay east to Barry Sands on the Angus coast and St Andrews on the Fife Coast. The site includes extensive invertebrate-rich intertidal flats and areas of reedbed, saltmarsh and sand dune. The SPA is contained within the following SSSIs: Inner Tay Estuary, Monifieth Bay, Barry Links, Tayport-Tentsmuir Coast and Eden Estuary.

Qualifying interest:

The Firth of Tay & Eden Estuary SPA qualifies under **Article 4.1** of the Birds Directive by regularly supporting nationally important breeding populations of the Annex I species marsh harrier *Circus aeruginosus* (average of 4 females in 1992-96, 3% of British population) and little tern *Sterna albifrons* (average of 25 pairs between 1993 and 1997, 1% of British); and an internationally important wintering population of the Annex I species bar-tailed godwit *Limosa lapponica* (2,400, 5% of GB and 2% of Western European).

The SPA qualifies under **Article 4.2** by regularly supporting an internationally important wintering population of redshank *Tringa totanus* (1,800 individuals; 2% of GB and 1% of northwest European populations).

The SPA qualifies under **Article 4.2** by regularly supporting in winter over 20,000 waterfowl with a 1990/91-94/95 winter peak mean of 48,000 waterfowl, comprising 28,000 wildfowl and 20,000 waders. This assemblage includes internationally important wintering populations (1990/91-94/95 winter peak means) of pink-footed goose *Anser brachyrhynchus* (2,800; 1% of GB and Icelandic/Greenlandic populations) and greylag goose *A. anser* (1,200; 1% of GB and Icelandic populations) and nationally important wintering populations of cormorant *Phalacrocorax carbo* (230, 2% of GB), shelduck *Tadorna tadorna* (1,200, 2% of GB), eider *Somateria mollissima* (13,800, 18% of GB), long-tailed duck *Clangula hyemalis* (560, 2% of GB), common scoter *Melanitta nigra* (3,100; 9% of GB), velvet scoter *Melanitta fusca* (730, 24% of GB), goldeneye *Bucephala clangula* (230, 1% of GB), red-breasted merganser *Mergus serrator* (470, 5% of GB), goosander *Mergus merganser* (220, 2% of GB), oystercatcher *Haematopus ostralegus* (5,100, 1% of GB), grey plover *Pluvialis squatarola* (920, 2% of GB), sanderling *Calidris alba* (220, 1% of GB), dunlin *Calidris alpina* (5,200, 1% of GB) and black-tailed godwit *Limosa limosa* (150, 2% of GB).

Area: 6923.29 ha
National grid references: NO 280220, NO 485313, NO 548317, NO 500283, NO 475195
OS 1:50,000 sheet - 54, 58 & 59

Scottish Natural Heritage
2 February 2000

Conservation Objectives for
Firth of Tay & Eden Estuary Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) 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**
- **No significant disturbance of the species**

Qualifying species:

- Bar-tailed godwit (*Limosa lapponica*)
- Black-tailed godwit (*Limosa limosa islandica)**
- Common scoter (*Melanitta nigra*)*
- Cormorant (*Phalacrocorax carbo*)*
- Dunlin (*Calidris alpina alpina)**
- Eider *(Somateria mollissima)**
- Goldeneye (*Bucephala clangula)**
- Goosander (*Mergus merganser*)*
- Grey plover (*Pluvialis squatarola*)*
- Greylag goose (*Anser anser*)
- Little tern (*Sterna albifrons*)
- Long-tailed duck (*Clangula hyemalis*)*
- Marsh harrier (*Circus aeruginosus*)
- Oystercatcher (*Haematopus ostralegus*)*
- Pink-footed goose (*Anser brachyrhynchus*)
- Red-breasted merganser (*Mergus serrator*)*
- Redshank (*Tringa totanus*)
- Sanderling (*Calidris alba*)*
- Shelduck (*Tadorna tadorna*)*
- Velvet scoter (*Melanitta fusca*)*

- Waterfowl assemblage

*Indicates assemblage qualifier only

This site overlaps with Barry Links Special Area of Conservation and Firth of Tay & Eden Estuary Special Area of Conservation

Conservation Objectives for
Firth of Tay & Eden Estuary Special Area of Conservation

To avoid deterioration of the qualifying habitats (listed below) 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 habitats that the following are maintained in the long term:

- **Extent of the habitat on site**
- **Distribution of the habitat within site**
- **Structure and function of the habitat**
- **Processes supporting the habitat**
- **Distribution of typical species of the habitat**
- **Viability of typical species as components of the habitat**
- **No significant disturbance of typical species of the habitat**

Qualifying Habitats:

- Estuaries
- Intertidal mudflats and sandflats
- Subtidal sandbanks

NB The conservation objectives for the qualifying species are on the next page

Conservation Objectives for
Firth of Tay & Eden Estuary Special Area of Conservation

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Common seal

The site overlaps with Firth of Tay & Eden Estuary Special Protection Area

NATURA 2000 – STANDARD DATA FORM

Special Areas of Conservation under the EC Habitats Directive (includes candidate SACs, Sites of Community Importance and designated SACs).

Each Natura 2000 site in the United Kingdom has its own Standard Data Form containing site-specific information. The data form for this site has been generated from the Natura 2000 Database submitted to the European Commission on the following date:

22/12/2015

The information provided here, follows the officially agreed site information format for Natura 2000 sites, as set out in the Official Journal of the European Union recording the Commission Implementing Decision of 11 July 2011 (2011/484/EU).

The Standard Data Forms are generated automatically for all of the UK's Natura 2000 sites using the European Environment Agency's Natura 2000 software. The structure and format of these forms is exactly as produced by the EEA's Natura 2000 software (except for the addition of this coversheet and the end notes). The content matches exactly the data submitted to the European Commission.

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

Further technical documentation may be found here
http://bd.eionet.europa.eu/activities/Natura_2000/reference_portal

As part of the December 2015 submission, several sections of the UK's previously published Standard Data Forms have been updated. For details of the approach taken by the UK in this submission please refer to the following document:
http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

More general information on Special Areas of Conservation (SACs) in the United Kingdom is available from the SAC home page on the JNCC website. This webpage also provides links to Standard Data Forms for all SACs in the UK.

Date form generated by the Joint Nature Conservation Committee
25 January 2016.

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK0030311**

SITENAME **Firth of Tay and Eden Estuary**

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1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
B	UK0030311

1.3 Site name

Firth of Tay and Eden Estuary

1.4 First Compilation date	1.5 Update date
2002-05	2015-12

1.6 Respondent:

Name/Organisation: Joint Nature Conservation Committee

Address: Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY

Email:

Date site proposed as SCI:	2002-05
Date site confirmed as SCI:	2004-12
Date site designated as SAC:	2005-03
National legal reference of SAC designation:	Regulations 8 and 11-15 of The Conservation (Natural Habitats, &c) Regulations 1994 (http://www.legislation.gov.uk/uksi/1994/2716/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
-2.95	56.36666667

2.2 Area [ha]:

15441.63

2.3 Marine area [%]

98.1

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKZZ	Extra-Regio
UKM2	Eastern Scotland

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.1 Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
1110			7612.72		G	B	C	B	C
1130			14978.38		G	B	B	B	B
1140			6717.11		G	C	B	C	C
1310			3.09		G	D			
1330			154.42		M	D			
2140	X					D			

- **PF:** for the habitat types that can have a non-priority as well as a priority form (6210, 7130, 9430) enter "X" in the column PF to indicate the priority form.
- **NP:** in case that a habitat type no longer exists in the site enter: x (optional)
- **Cover:** decimal values can be entered

- **Caves:** for habitat types 8310, 8330 (caves) enter the number of caves if estimated surface is not available.
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation)

3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
M	1364	Halichoerus grypus			p				C	DD	D			
M	1365	Phoca vitulina			p				C	DD	B	B	C	B
M	1351	Phocoena phocoena			p				P	DD	D			
M	1349	Tursiops truncatus			p				P	DD	D			

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N05	2.0
N03	1.2
N04	8.0
N01	55.1
N02	27.7
N06	6.0
Total Habitat Cover	100.00000000000001

Other Site Characteristics

1 Terrestrial: Soil & Geology: basalt,sandstone,sand 2 Terrestrial: Geomorphology and landscape: lowland,coastal 3 Marine: Geology: biogenic reef,mud,sand 4 Marine: Geomorphology: intertidal

rock,open coast (including bay),lagoon,subtidal sediments (including sandbank/mudbank),intertidal sediments (including sandflat/mudflat),estuary

4.2 Quality and importance

Sandbanks which are slightly covered by sea water all the time for which the area is considered to support a significant presence. Estuaries for which this is considered to be one of the best areas in the United Kingdom. Mudflats and sandflats not covered by seawater at low tide for which the area is considered to support a significant presence. Phoca vitulina for which this is considered to be one of the best areas in the United Kingdom.

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	F01		B
M	E03		B
M	K01		I
L	G01		I
M	E01		O
M	J02		B
L	G02		B
L	M01		B
H	F02		I
M	K04		I
H	G05		I
M	E02		O
H	H03		B
L	C01		B
M	H01		B
M	K03		I
M	H06		O
M	K02		I
L	G04		B
L	D02		B
H	I01		B
L	M02		B
M	D03		B
M	I03		O
M	C02		O

Positive Impacts			
Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
M	G01		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,

T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions

i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Scottish Natural Heritage 'site link' below provides access to the Conservation Objectives for this site. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): http://gateway.snh.gov.uk/sitelink/documentview.jsp?p_pa_code=8257&p_Doc_Type_ID=29

http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

5. SITE PROTECTION STATUS (optional)

Back to top

5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK04	100.0	UK01	4.6		

6. SITE MANAGEMENT

Back to top

6.1 Body(ies) responsible for the site management:

Organisation:	Scottish Natural Heritage
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

- [ ] Yes
- [ ] No, but in preparation
- [X] No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE NATURA 2000 STANDARD DATA FORMS

The codes in the table below are also explained in the official European Union guidelines for the Standard Data Form. The relevant page is shown in the table below.

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	Designated Special Protection Area	53
B	SAC (includes candidates Special Areas of Conservation, Sites of Community Importance and designated SAC)	53
C	SAC area the same as SPA. Note in the UK Natura 2000 submission this is only used for Gibraltar	53

3.1 Habitat representativity

CODE	DESCRIPTION	PAGE NO
A	Excellent	57
B	Good	57
C	Significant	57
D	Non-significant presence	57

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha□ rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	15%-100%	58
B	2%-15%	58
C	< 2%	58

3.1 Conservation status habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global grade habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	15%-100%	62
B	2%-15%	62
C	< 2%	62
D	Non-significant population	62

3.2 Conservation status species (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' Or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Assemblages types

CODE	DESCRIPTION	PAGE NO
WATR	Non breeding waterfowl assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code
BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

CODE	DESCRIPTION	PAGE NO
E03	Discharges	65
E04	Structures, buildings in the landscape	65
E06	Other urbanisation, industrial and similar activities	65
F01	Marine and Freshwater Aquaculture	65
F02	Fishing and harvesting aquatic ressources	65
F03	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)	65
F04	Taking / Removal of terrestrial plants, general	65
F05	Illegal taking/ removal of marine fauna	65
F06	Hunting, fishing or collecting activities not referred to above	65
G01	Outdoor sports and leisure activities, recreational activities	65
G02	Sport and leisure structures	65
G03	Interpretative centres	65
G04	Military use and civil unrest	65
G05	Other human intrusions and disturbances	65
H01	Pollution to surface waters (limnic & terrestrial, marine & brackish)	65
H02	Pollution to groundwater (point sources and diffuse sources)	65
H03	Marine water pollution	65
H04	Air pollution, air-borne pollutants	65
H05	Soil pollution and solid waste (excluding discharges)	65
H06	Excess energy	65
H07	Other forms of pollution	65
I01	Invasive non-native species	65
I02	Problematic native species	65
I03	Introduced genetic material, GMO	65
J01	Fire and fire suppression	65
J02	Human induced changes in hydraulic conditions	65
J03	Other ecosystem modifications	65
K01	Abiotic (slow) natural processes	65
K02	Biocenotic evolution, succession	65
K03	Interspecific faunal relations	65
K04	Interspecific floral relations	65
K05	Reduced fecundity/ genetic depression	65
L05	Collapse of terrain, landslide	65
L07	Storm, cyclone	65
L08	Inundation (natural processes)	65
L10	Other natural catastrophes	65
M01	Changes in abiotic conditions	65
M02	Changes in biotic conditions	65
U	Unknown threat or pressure	65
XO	Threats and pressures from outside the Member State	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK02	Marine Nature Reserve	67
UK04	Site of Special Scientific Interest (UK)	67

CITATION

EDEN ESTUARY
SITE OF SPECIAL SCIENTIFIC INTEREST
Fife

Site code: 596

NATIONAL GRID REFERENCE: NO 478193

OS 1:50,000 SHEET NO: Landranger Series 59
1:25,000 SHEET NO: Explorer Series 371, 380

AREA: 1097.88 hectares

NOTIFIED NATURAL FEATURES

Biological: Intertidal marine habitats: Mudflats
Coastlands: Saltmarsh
Coastands: Sand dunes
Woodlands: Scrub

Birds: Oystercatcher (*Haematopus ostralegus*), non-breeding
Birds: Black-tailed godwit (*Limosa limosa*), non-breeding
Birds: Bar-tailed godwit (*Limosa lapponica*), non-breeding
Birds: Grey plover (*Pluvialis squatarola*), non-breeding
Birds: Redshank (*Tringa totanus*), non-breeding
Birds: Ringed plover (*Charadrius hiaticula*), non-breeding
Birds: Shelduck (*Tadorna tadorna*), non-breeding
Birds: Red-breasted merganser (*Mergus serrator*), non-breeding
Birds: Common scoter (*Melanitta nigra*), non-breeding
Birds: Velvet scoter (*Melanitta fusca*), non-breeding
Birds: Scaup (*Aythya marila*), non-breeding
Birds: Eider (*Somateria mollissima*), non-breeding
Birds: Greylag goose (*Anser anser*), non-breeding

DESCRIPTION

The Eden Estuary Site of Special Scientific Interest (SSSI) lies between St Andrews and the Firth of Tay and contains extensive intertidal flats of mud and sand with a rich invertebrate fauna. Nationally or internationally important populations of 13 species of waders and waterfowl occur in winter or on passage. A wide diversity of estuarine and coastal vegetation types are represented, including the largest extent of saltmarsh in Fife.

The extensive mudflats are very varied, with beds of mussels, brown algae and eelgrass. Two nationally scarce species of eelgrass *Zostera angustifolia* and *Z. noltei* are present. The large areas of saltmarsh show good representation of saltmarsh types, from pioneer communities with glasswort *Salicornia europaea* to upper marsh communities with saltmarsh rush *Juncus gerardii* and, locally, saltmarsh flat-sedge *Blysmus rufus* or slender spike-rush *Eleocharis uniglumis*. Fringing the mudflats are locally extensive areas of brackish swamp of sea club-rush

Bolboschoenus maritimus and other reedswamp types. In places, these brackish swamps are transitional to freshwater swamp or fen with characteristic species such as hemlock water-dropwort *Oenanthe crocata* and gipsywort *Lycopus europaeus*.

The outer parts of the estuary, including the West Sands, are largely fringed by sand dunes. Several dune and drift line plant communities are well represented, with several species of plants and insects which are scarce in Fife, such as blue fleabane *Erigeron acer*, oak-leaved goosefoot *Chenopodium glaucum* and the grayling butterfly *Hipparchia semele*.

The uppermost section of the estuary is riverine in character with associated woodland and scrub. The river terrace supports alder-willow swamp woodland with a characteristic ground flora including common nettle *Urtica dioica* and ramsons *Allium ursinum*. This woodland type is scarce and declining in the area. Mixed scrub is abundant on the south side of the valley, with an abundance of the locally rare wood stitchwort *Stellaria nemorum*. Areas of ash-alder flush woodland and freshwater marsh add to the habitat diversity of the site.

Nationally important wintering populations of oystercatcher, black-tailed and bar-tailed godwits, grey plover and redshank use the estuary for feeding and roosting. Many other waders visit the site on passage in spring or autumn, including nationally important numbers of ringed plover. The estuary is of international importance for shelduck in winter and for red-breasted merganser in autumn. Nationally important wintering flocks of common and velvet scoter, scaup and eider occur, principally in St Andrews Bay and near the Eden Mouth. The estuary is also used by nationally important numbers of greylag geese as a nocturnal roost.

The estuary is of regional significance for several other species of waterfowl and waders in winter, including pink-footed geese, wigeon, teal, dunlin and curlew. It is of importance in Fife as a feeding area for young shelduck. A small but diverse population of breeding birds occurs within the site.

NOTIFICATION HISTORY

First notified under the 1949 Act: 1971
Re-notified under the 1981 Act: 16 February 1990 with a 460.7 ha increase in area
Notification reviewed under the 2004 Act: 24 March 2011

REMARKS

Measured area of site corrected (from 1160 ha).

The Eden Estuary SSSI adjoins Earlshall Muir SSSI and Tayport to Tentsmuir Coast SSSI.

The Eden Estuary SSSI is designated as part of the Firth of Tay and Eden Estuary special area of conservation (SAC) for the European habitats and species listed below and as part of the Firth of Tay and Eden Estuary special protection area (SPA) for the birds listed below.

Habitats: Estuaries
Intertidal mudflats and sandflats
Subtidal sandbanks

Species: Common seal (*Phoca vitulina*)

Birds: Bar-tailed godwit (*Limosa lapponica*), non-breeding
Common scoter (*Melanitta nigra*), non-breeding
Cormorant *(Phalacrocorax carbo)*, non-breeding
Dunlin (*Calidris alpina alpina*), non-breeding
Eider (*Somateria mollissima*), non-breeding
Goldeneye *(Bucephala clangula)*, non-breeding
Goosander *(Mergus merganser)*, non-breeding
Grey plover (*Pluvialis squatarola*), non-breeding
Greylag goose (*Anser anser*), non-breeding
Icelandic Black-tailed godwit (*Limosa limosa islandica*), non-breeding
Little tern *(Sternula albifrons),* breeding
Long-tailed duck *(Clangula hyemalis)*, non-breeding
Marsh harrier *(Circus aeruginosus),* breeding
Oystercatcher (*Haematopus ostralegus*), non-breeding
Pink-footed goose *(Anser brachyrhynchus)*, non-breeding
Red-breasted merganser (*Mergus serrator*), non-breeding
Redshank (*Tringa totanus*), non-breeding
Sanderling (*Calidris alba*), non-breeding
Shelduck (*Tadorna tadorna*), non-breeding
Velvet scoter (*Melanitta fusca*), non-breeding
Waterfowl assemblage, non-breeding

24 March 2011

EDEN ESTUARY SITE OF SPECIAL SCIENTIFIC INTEREST

OPERATIONS REQUIRING CONSENT FROM SCOTTISH NATURAL HERITAGE

If you propose to carry out, or permit to be carried out, any of the operations listed below, you must first obtain consent from SNH unless a local authority has granted you planning permission (under Part III of the Town and Country Planning (Scotland) Act 1997) or a designated regulatory authority has given you written permission (under s.15 of the Nature Conservation (Scotland) Act 2004). If you have such a permission you may proceed without obtaining consent from SNH for the same operation.

Standard Ref. No.	*Type of Operation*
1	Cultivation, including ploughing, rotovating, harrowing and re-seeding.
2	Grazing and changes to grazing management (including the introduction, re-introduction, changes to stock numbers, types and dates, or cessation).
3	Stock feeding and changes to stock feeding practices (including the introduction, re-introduction and changes to the type and location).
4	The introduction of mowing or cutting (including hay-making to silage and cessation).
5	Application of manure, fertilisers and lime.
6	Application of herbicides (weedkillers).
7	Dumping, spreading or discharge of any materials.
8	Burning of vegetation.
9	The release into the site of any wild, feral or domestic animal[1], plant[2] or seed.
10	The killing or removal of any wild animal[1] (except bird species covered by the General License (Scottish Government Rural Directorate); Wildlife & Countryside Act (as amended); other species under a specific license issued by Scottish Government Rural Directorate).
11	The destruction, displacement, removal or cutting of any plant[2] or plant[2] remains.
12	Tree and/or woodland management[3]. The introduction of tree and/or woodland management[3] and changes in tree and/or woodland management[3].

Standard Ref. No.	*Type of Operation*
13a	Drainage (including the use of mole, tile, tunnel or other artificial drains).
13b	Modification of the structure of water courses (rivers, burns, springs, ditches, drains), including their banks and beds, as by re-alignment, regrading and dredging.
13c	Management of aquatic and bank vegetation for drainage purposes.
14	The changing of water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes).
15	Infilling of ditches, drains, marshes or pits.
16a	Freshwater fishery production and/or management[4]. The introduction of freshwater fishery production and/or management[4] and changes in freshwater fishery production and/or management[4].
16b	Coastal fishing or fisheries management and seafood or marine life collection[5]. The introduction of coastal fishing and changes in coastal fishing practice or fisheries management and seafood or marine life collection[5].
17	Reclamation of land from sea, estuary or marsh.
18	Commercial bait digging in intertidal areas.
19	Erection of sea defences or coast protection works, including cliff or landslip drainage or stabilisation measures.
20	Extraction of minerals including shingle, sand and gravel, topsoil, subsoil, shells and spoil.
21	Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
22	Storage of materials.
23	Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
26	Use of vehicles or craft which would damage or disturb coastland or woodland flora and fauna.
27	Recreational activities (other than those carried out responsibly in keeping with the Scottish Outdoor Access Code), research, educational or other activities which would damage coastland or woodland flora and fauna.

Standard Ref. No.	*Type of Operation*
28	Game and waterfowl management and hunting practices. The introduction of game or waterfowl management and hunting practice and changes in game and waterfowl management and hunting practice.

Notes

1 "animal" includes any mammal, reptile, amphibian, bird, fish or invertebrate.

2 “plant” includes any flowering plant, fern, alga, fungus, lichen or moss.

3 ”Woodland management” includes planting, selective felling, thinning, coppicing, modification of the stand or underwood, changes in species composition, cessation of management.

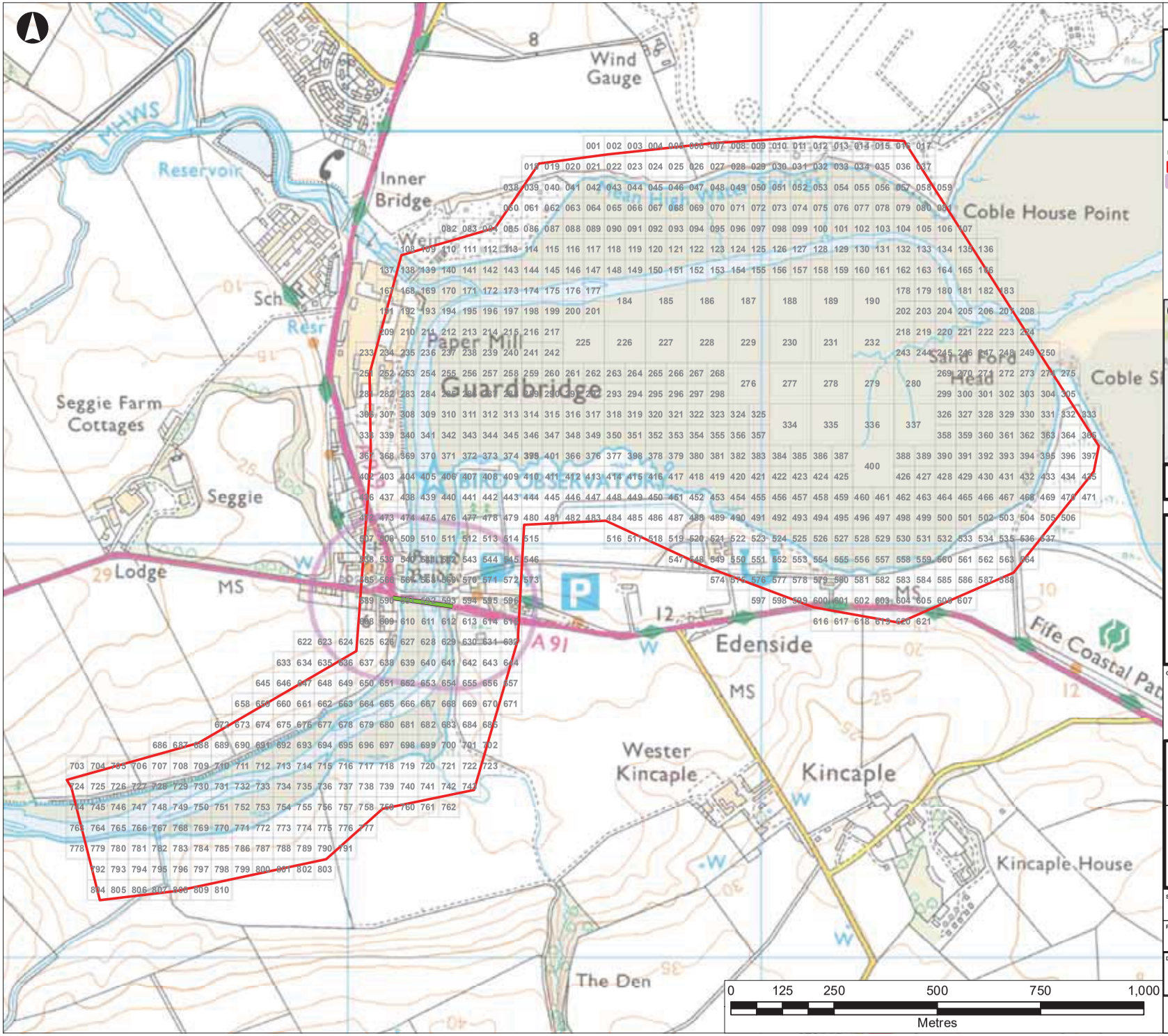
4 Includes sporting fishing and angling.

5 Includes the use of traps and fish cages.

Appendix D

THROUGH THE TIDE COUNT

SURVEY RESULTS



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

DRAWING STATUS: SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
T +44 (0) 151 242 5900
wsp.com

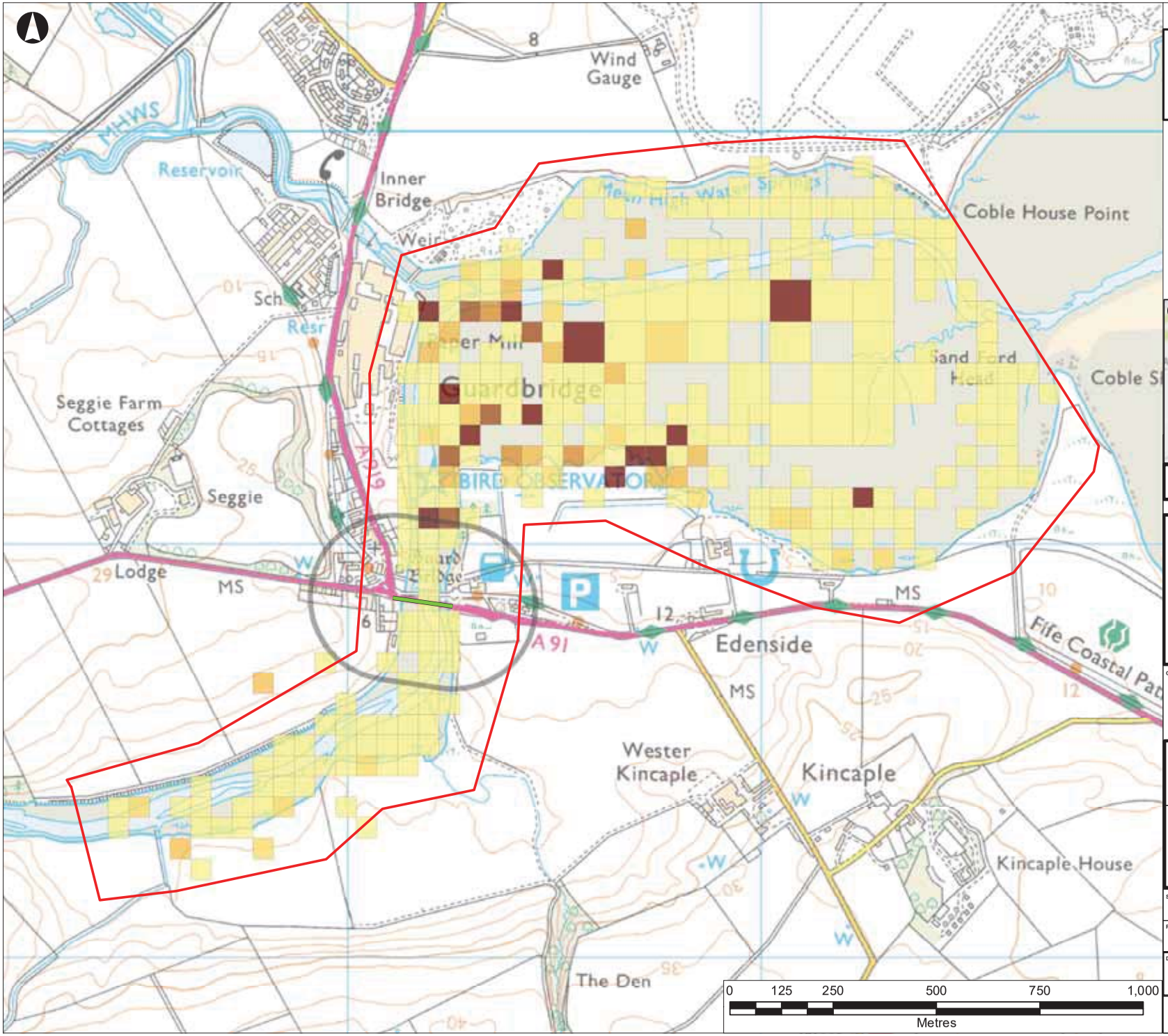
CLIENT: FIFE COUNCIL

PROJECT: NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE: SURVEY LOCATIONS

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 25/07/2018

DRAWING No:	REV:
FIGURE D1.1	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Count

- 1 - 30
- 31 - 60
- 61 -90
- 91 - 120
- 121 - 150
- 151 - 600

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
T +44 (0) 151 242 5900
wsp.com

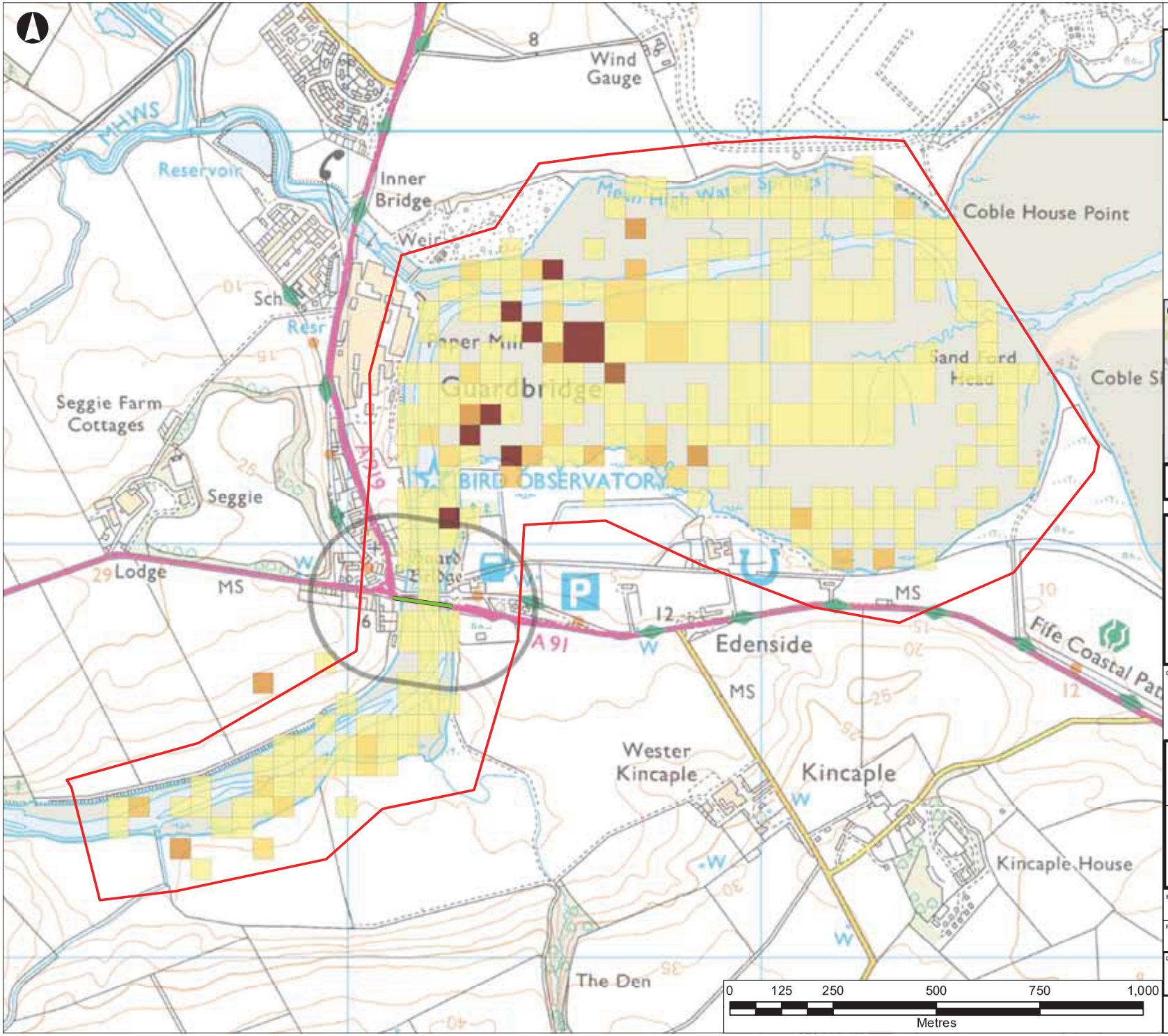
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
PEAK SPA QUALIFYING SPECIES COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.1	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Count

- 1 - 20
- 21- 40
- 41 - 60
- 61 - 80
- 81 - 100
- 101 - 420

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
T +44 (0) 151 242 5900
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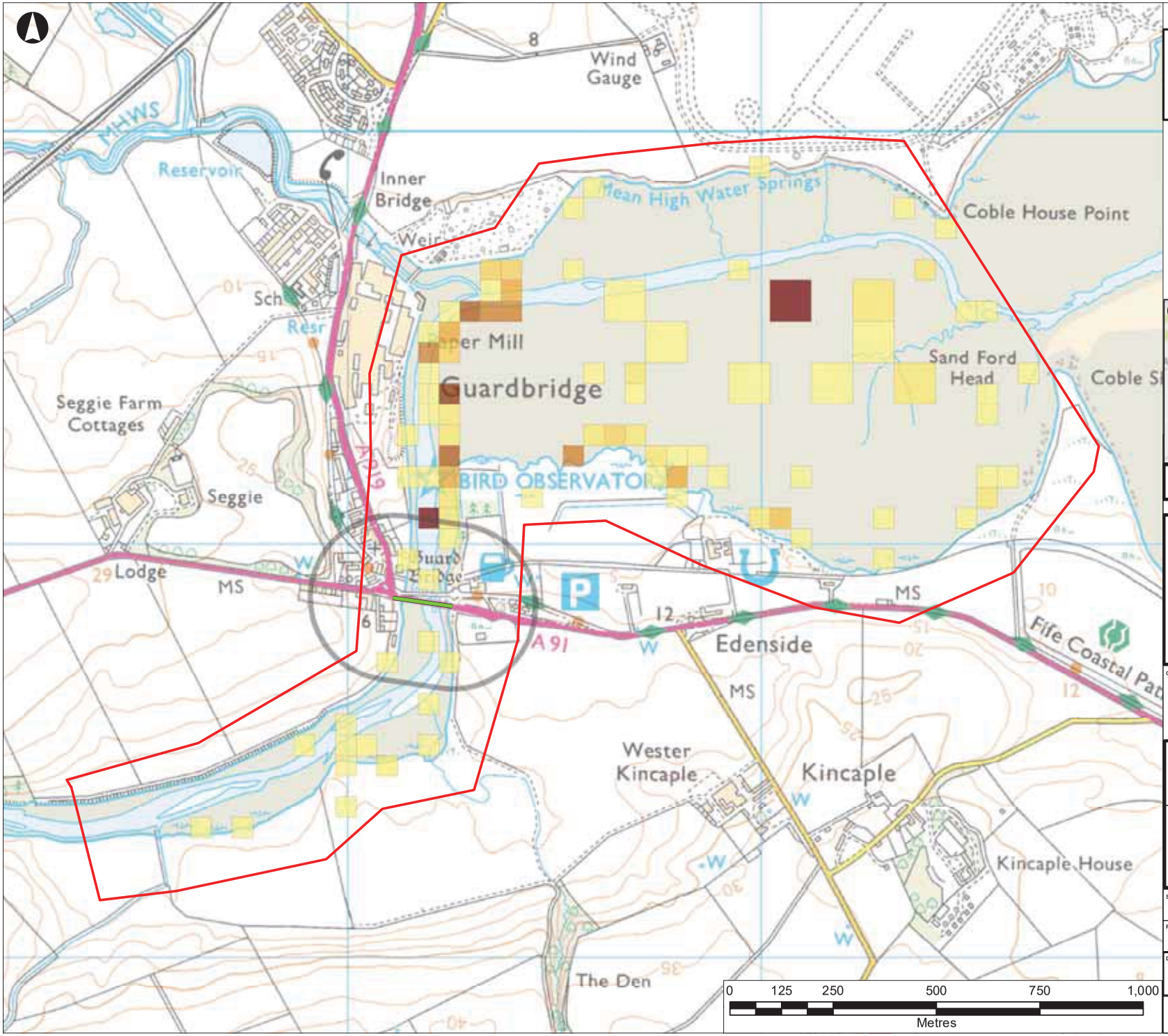
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
PEAK SPA QUALIFYING SPECIES COUNTS RECORDED
MARCH 2018 - APRIL 2018
FORAGING

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.2	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Count

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 80
- 81 - 120
- 121 - 160
- 161 - 200
- 201 - 350

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

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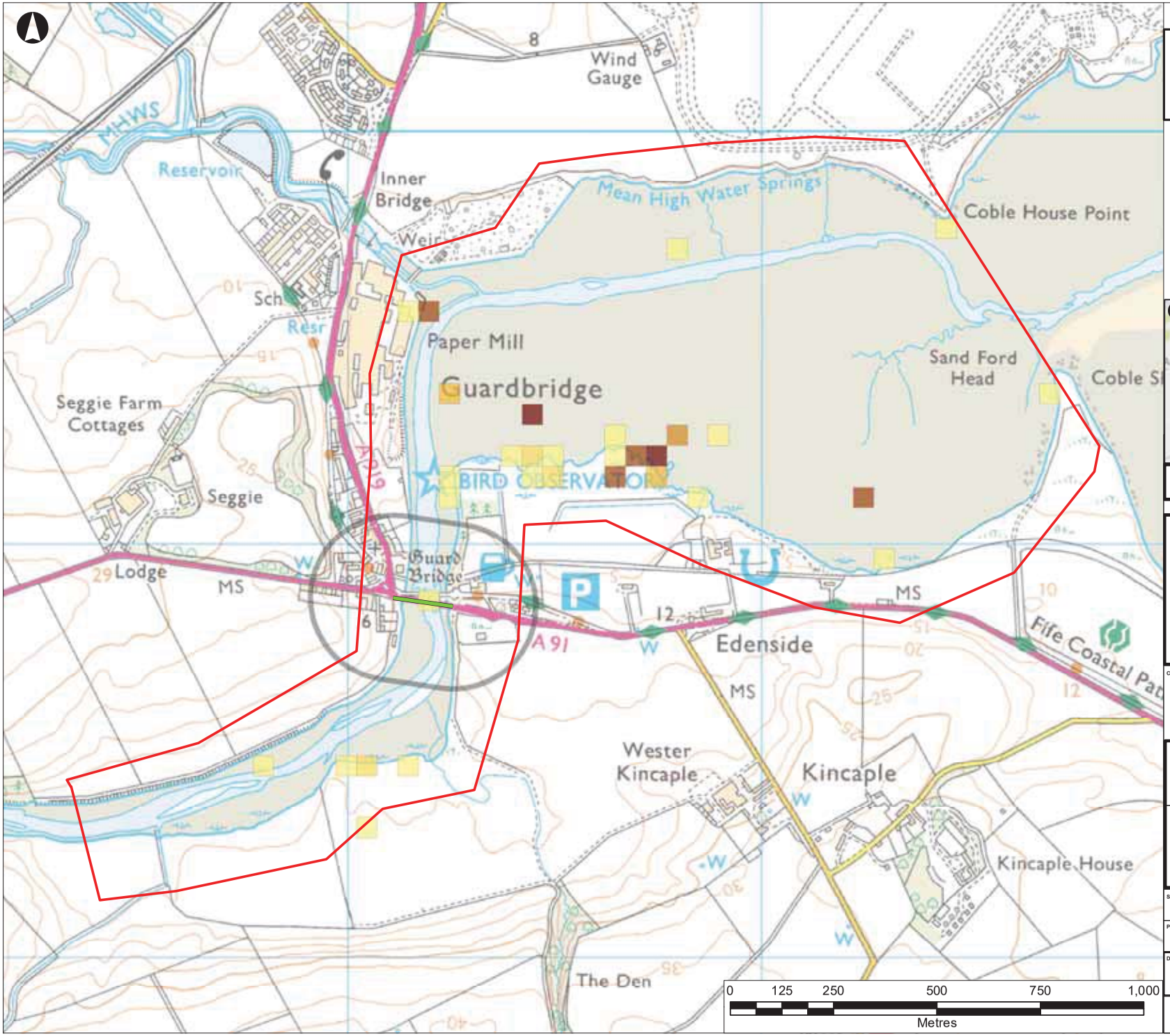
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
PEAK SPA QUALIFYING SPECIES COUNTS RECORDED
MARCH 2018 - APRIL 2018
LOAFING

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.3	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Count

- 1 - 20
- 21 - 60
- 61 - 120
- 121 - 200
- 201 - 300
- 301 - 600

DRAWING STATUS: SUITABLE FOR INTERNAL REVIEW & COMMENT

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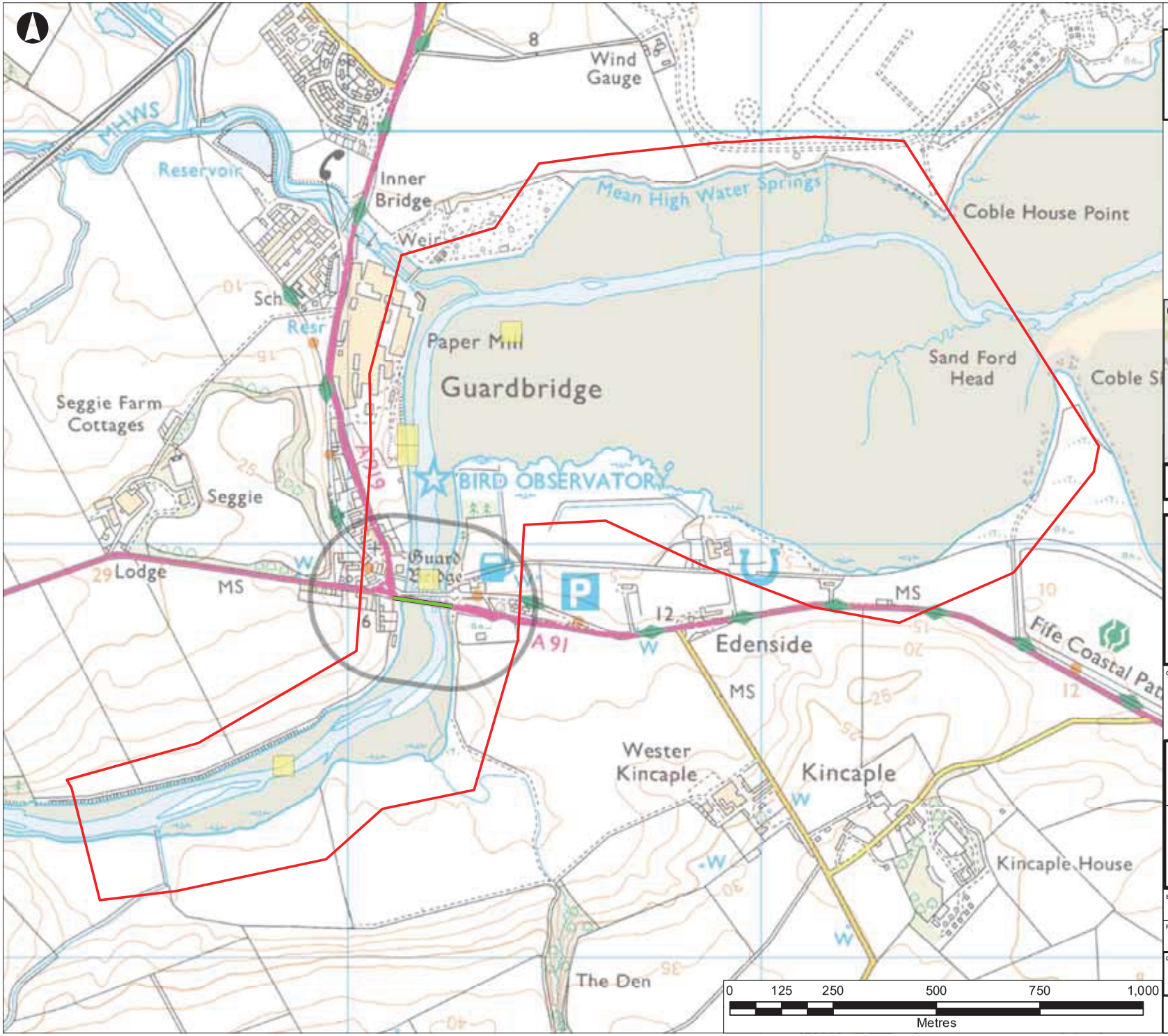
CLIENT: FIFE COUNCIL

PROJECT: NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE: PEAK SPA QUALIFYING SPECIES COUNTS RECORDED MARCH 2018 - APRIL 2018 ROOSTING

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No: FIGURE D2.4 REV: 0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Cormorant Count

- 1

DRAWING STATUS:
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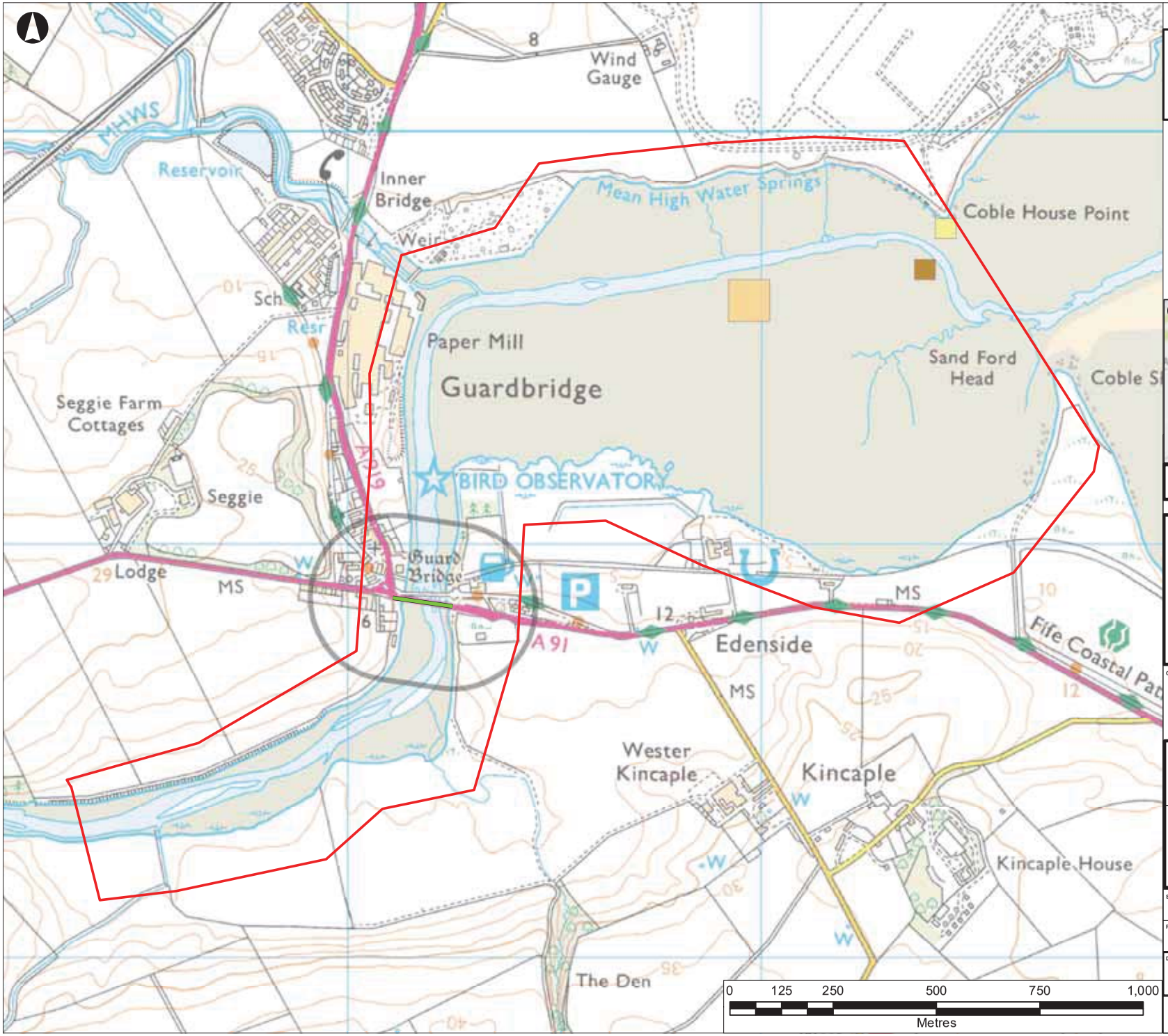
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
CORMORANT COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING AND LOAFING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.5	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Eider Count

- 1
- 3
- 12

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

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CLIENT:
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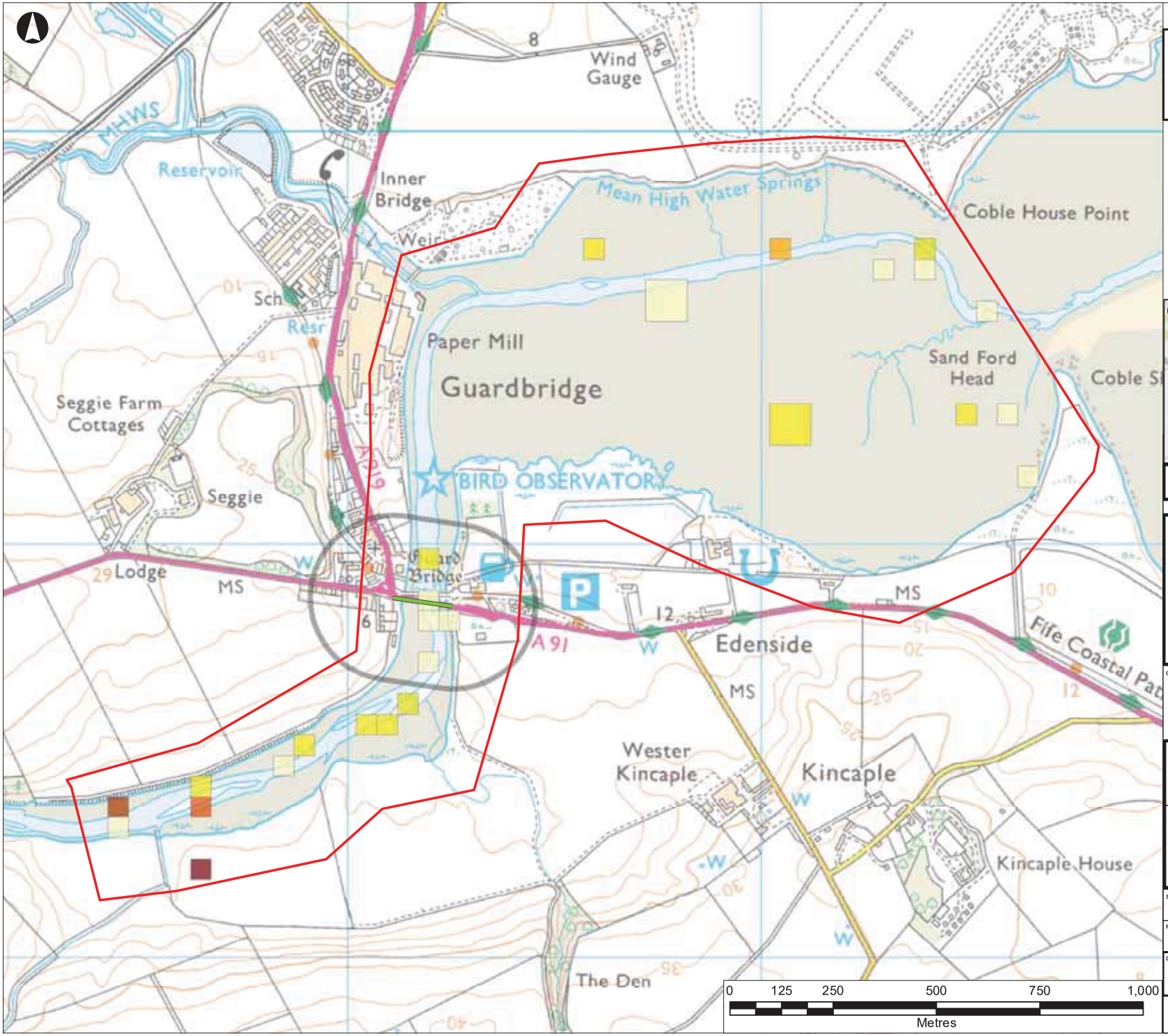
PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
EIDER COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING AND LOAFING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.6	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Goldeneye Count

- 1
- 2
- 3
- 4
- 6
- 8
- 11

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

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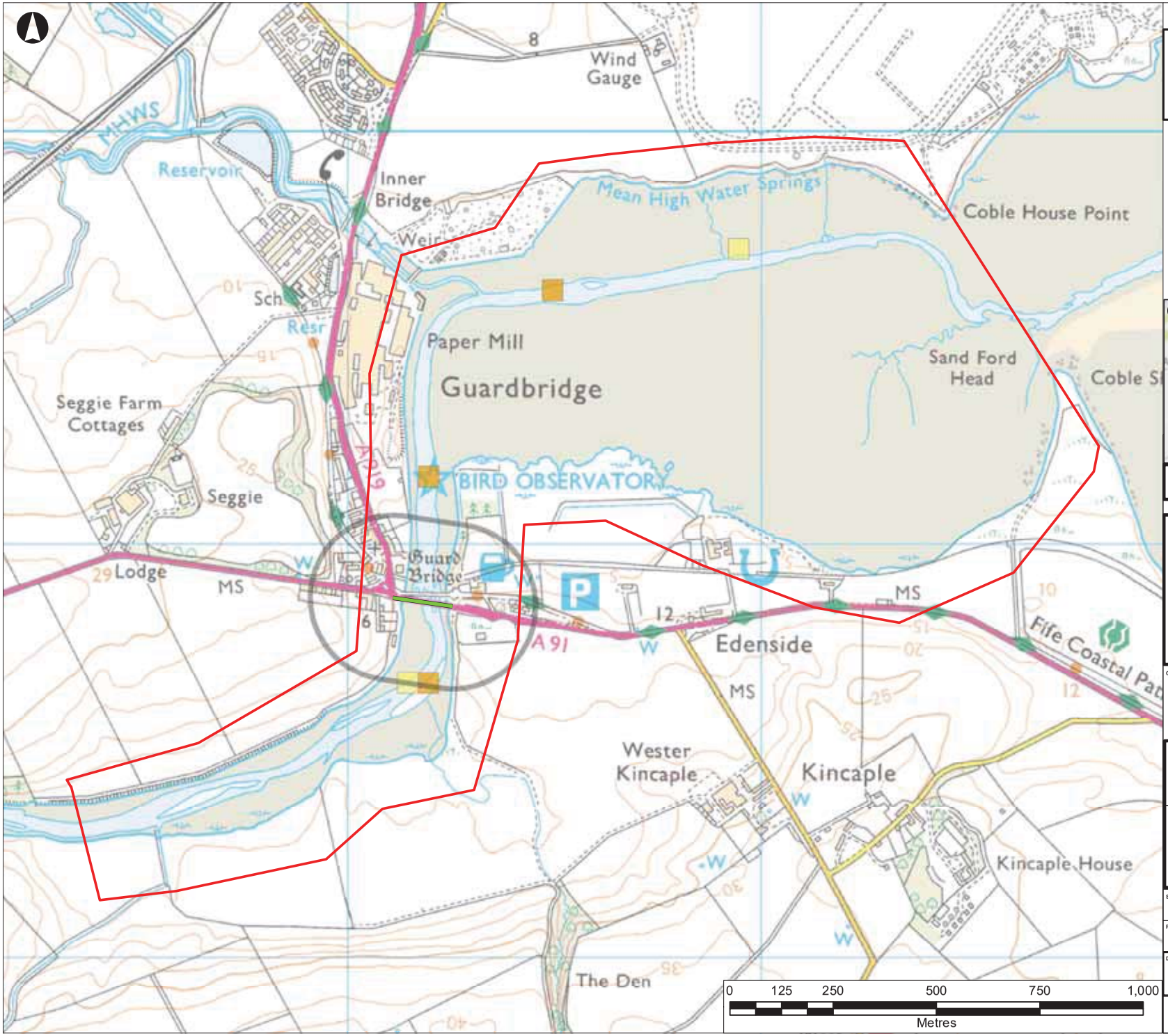
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
GOLDENEYE COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING AND LOAFING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.7	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Goosander Count

- 1
- 2

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
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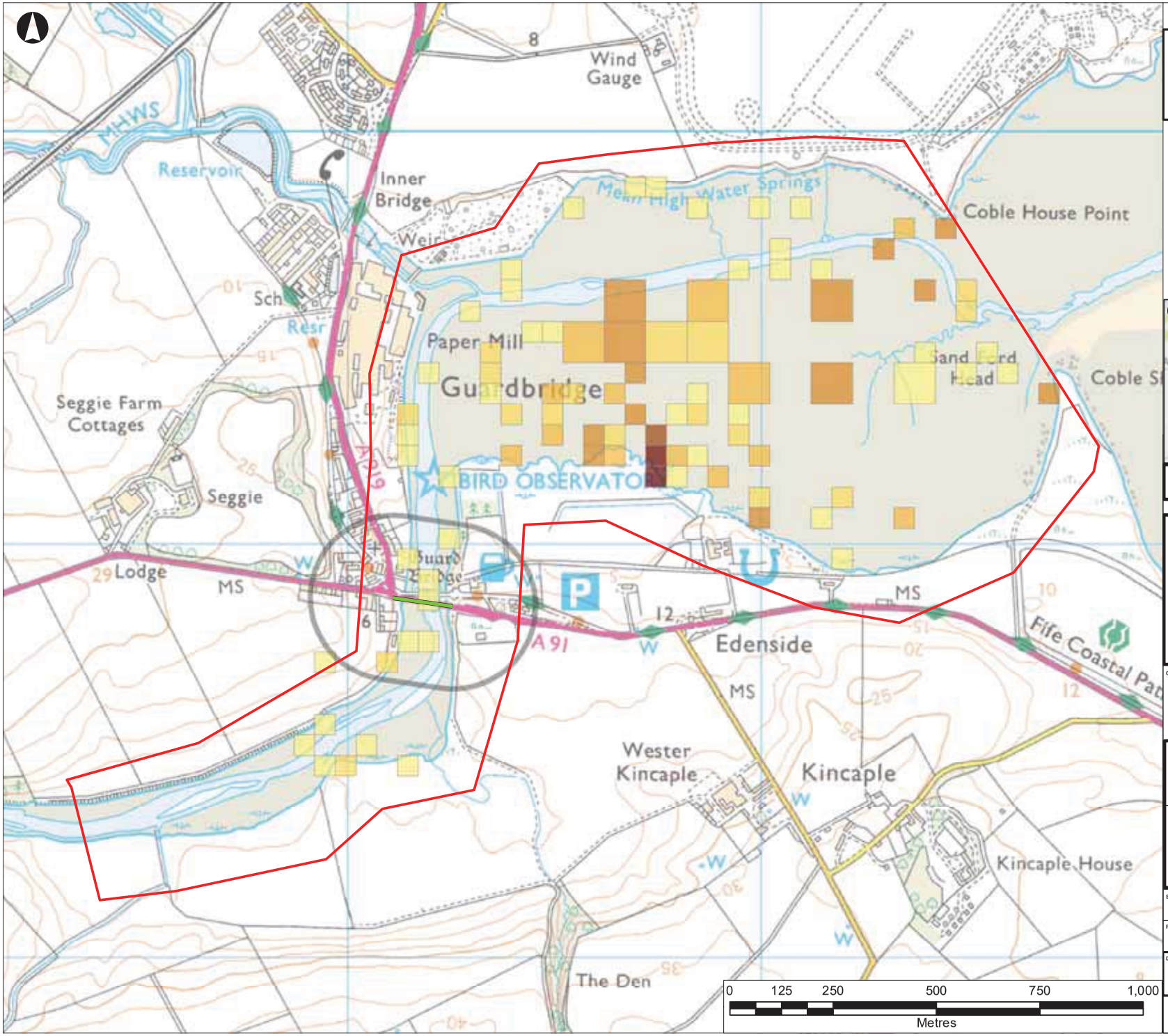
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
GOOSANDER COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING AND LOAFING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No:	REV:
FIGURE D2.8	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Oystercatcher Count

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 20
- 21 - 40
- 41 - 80

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

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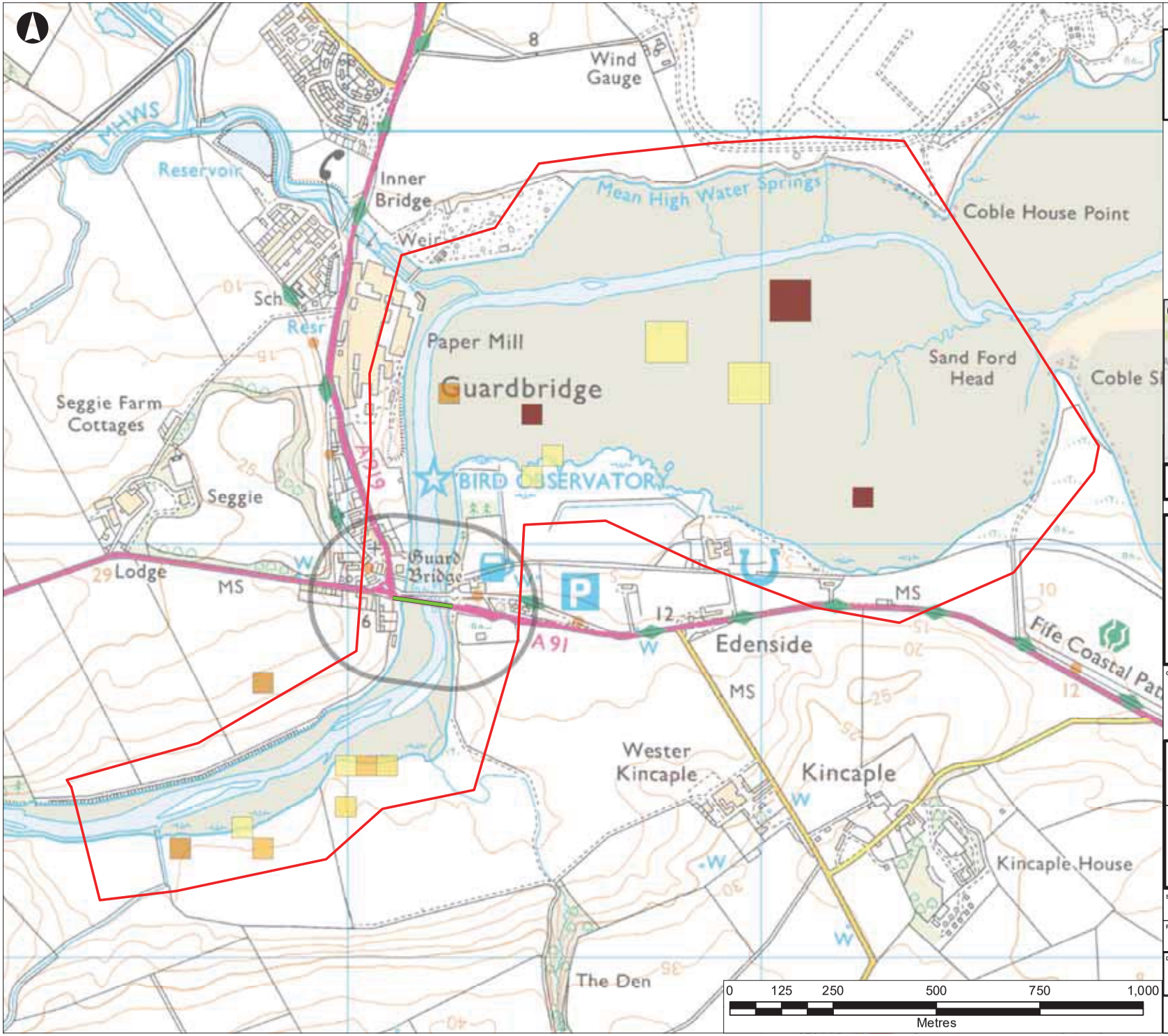
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
OYSTERCATCHER COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 25/07/2018

DRAWING No:	REV:
FIGURE D2.9	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Pink-Footed Goose Count

- 1 - 10
- 11 - 20
- 21 - 40
- 41 - 80
- 81 - 160
- 161 - 320

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
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wsp.com

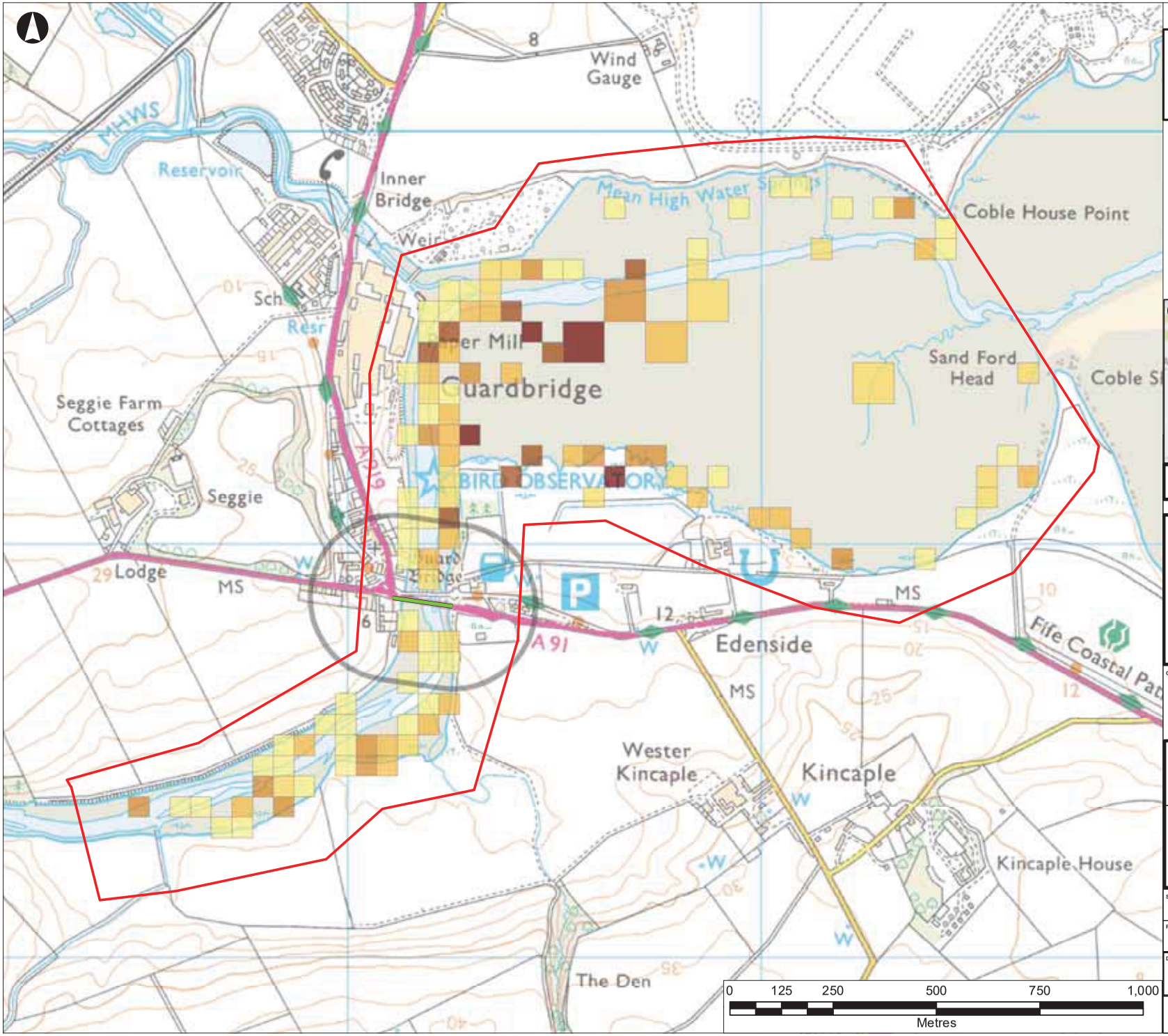
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
PINK-FOOTED GOOSE COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 25/07/2018

DRAWING No:	REV:
FIGURE D2.10	0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Redshank Count

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- 51 - 125
- 126 - 300

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
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wsp.com

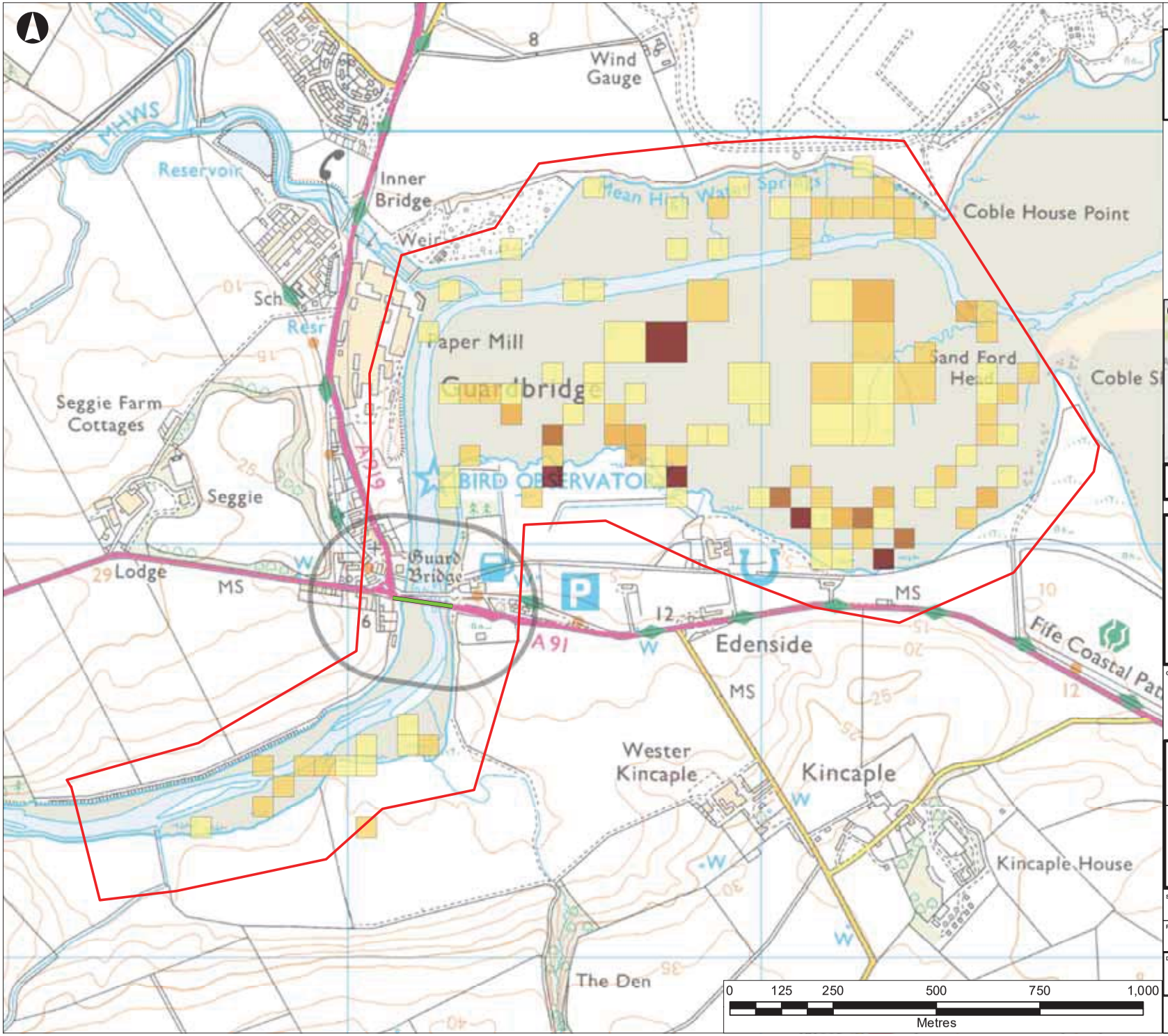
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
REDSHANK COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 25/07/2018

DRAWING No: FIGURE D2.11 | REV: 0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Shelduck Count

- 1 - 2
- 3 - 10
- 11 - 15
- 16 - 27
- 28 - 42

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
T +44 (0) 151 242 5900
wsp.com

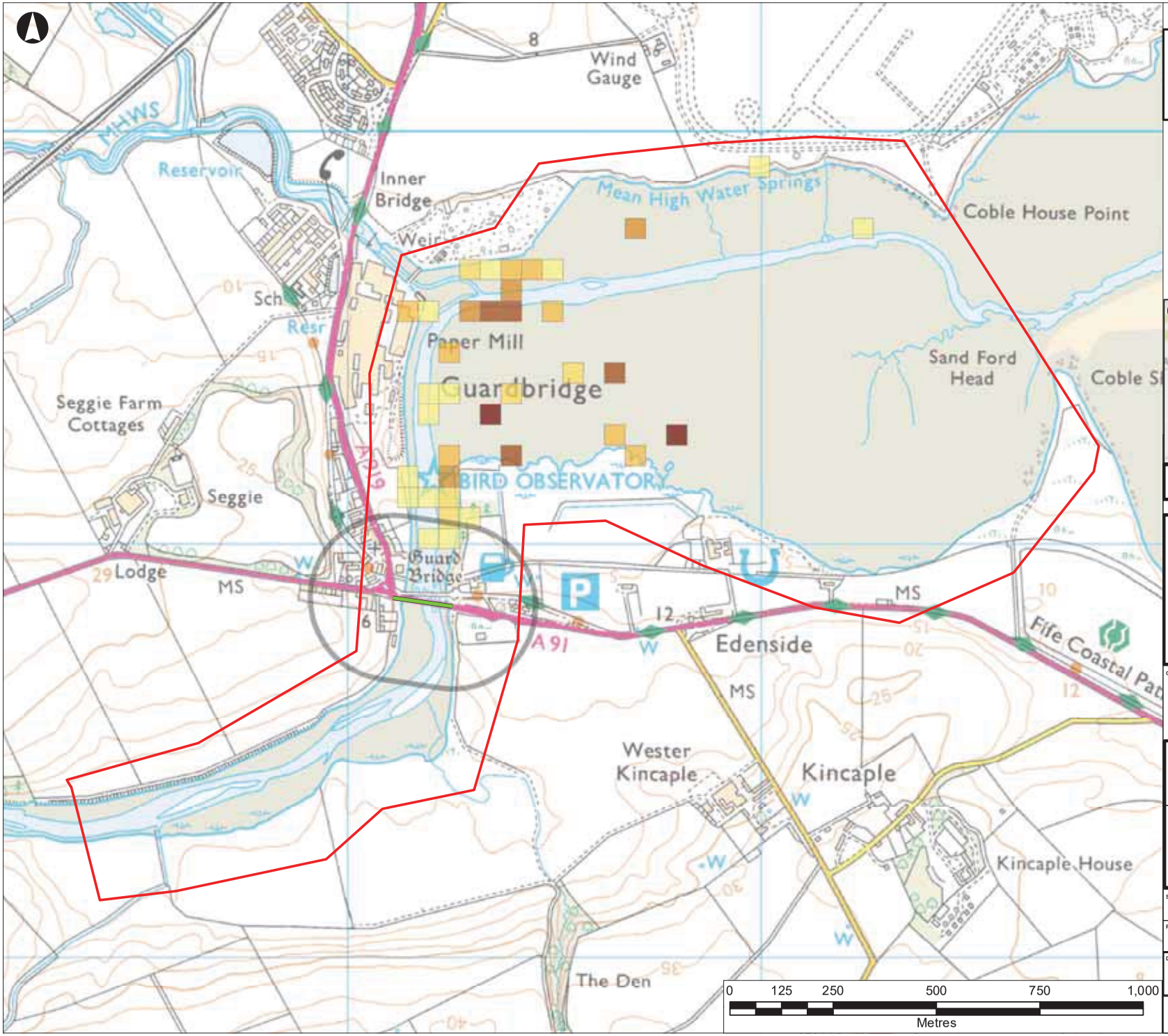
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
SHELDUCK COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 25/07/2018

DRAWING No: FIGURE D2.12 | REV: 0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Black-Tailed Godwit Count

- 1 - 5
- 6 - 15
- 16 - 40
- 41 - 80
- 81 - 120
- 121 - 190

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

Exchange Station, Tithebarn Street, Liverpool L2 2QP, UK
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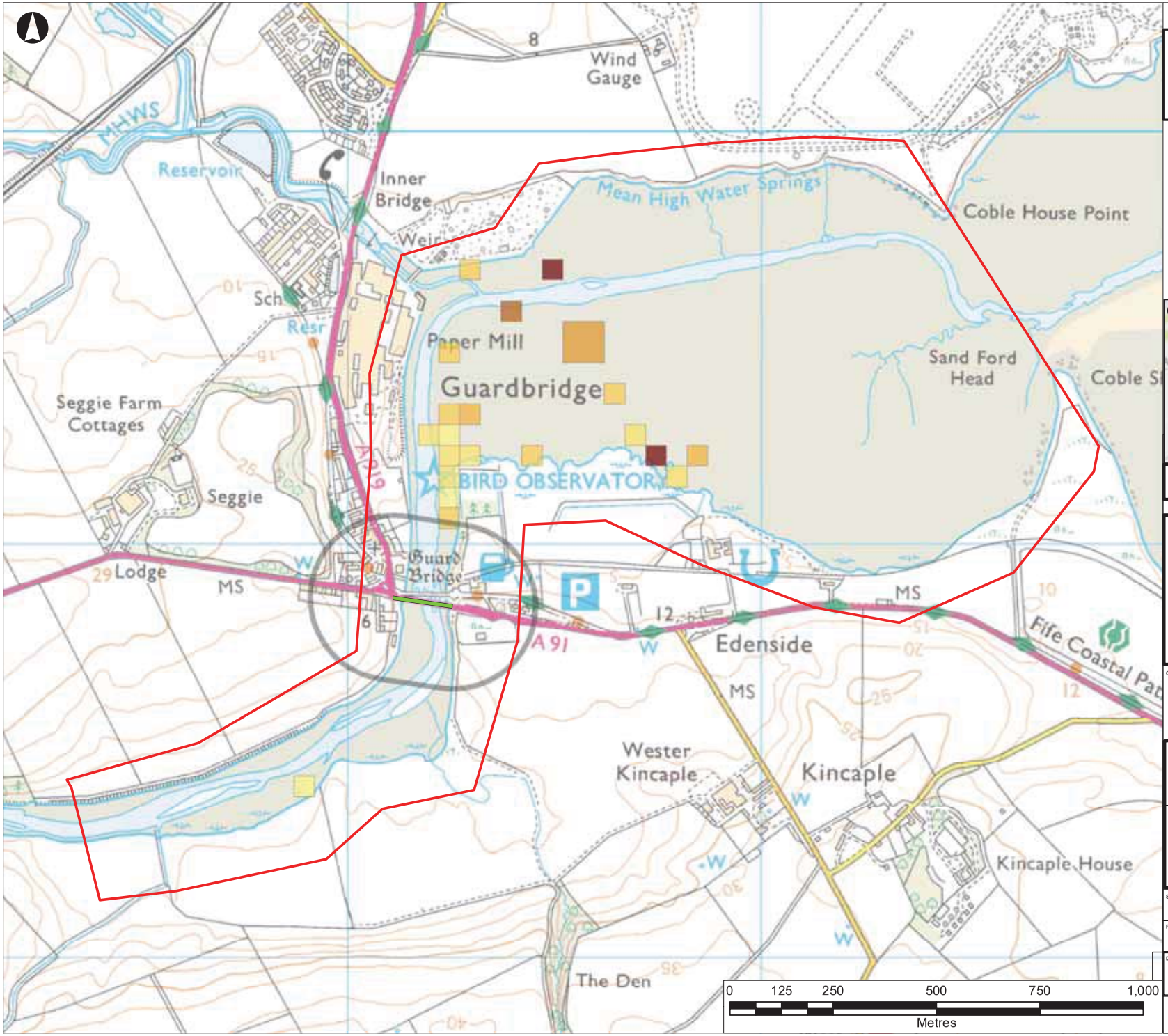
CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
BLACK-TAILED GODWIT COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No: FIGURE D2.13 | REV: 0



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distrubution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend

- A91 Road Bridge
- Survey Area
- 200 m Disturbance Buffer

Peak Dunlin Count

- 1 - 5
- 6 - 15
- 16 - 40
- 41 - 80
- 81 - 130
- 131 - 200
- 201 - 300
- 301 - 420

DRAWING STATUS:
SUITABLE FOR INTERNAL REVIEW & COMMENT

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CLIENT:
FIFE COUNCIL

PROJECT:
NEW BRIDGE, GUARDBRIDGE BRIDGE REFURBISHMENT: HABITATS REGULATIONS APPRAISAL

TITLE:
DUNLIN COUNTS RECORDED
MARCH 2018 - APRIL 2018
ALL BEHAVIOURS (FORAGING, LOAFING AND ROOSTING)

SCALE @ A3:	CHECKED:		APPROVED:
1:9,000	AH		RW
PROJECT No:	DESIGNED: NM	DRAWN: BS	DATE: 24/07/2018

DRAWING No: FIGURE D2.14 | REV: 0

Table D.1 Weather data for TTTC Surveys March-April 2018

DATE	OBSERVER	START TIME	FINISH TIME	TIDAL PERIOD	TIDE HEIGHT (M)	HOUR	WIND SPEED	WIND DIRECTION	RAIN	CLOUD COVER (EIGHTHS)	VISIBILITY	FROST	SNOW	CLOUD HEIGHT	TEMP DEGREES C
14.03.18	GS	08:10	11:10	Mid		1	3	SE	0	6	Excellent	0	0	2	3
14.03.18	GS	08:10	11:10	Mid		2	3	SE	0	5	Excellent	0	0	2	3
14.03.18	GS	08:10	11:10	Mid		3	3	SE	0	6	Excellent	0	0	2	5
14.03.18	GS	11:10	14:10	High	4.8m	1	5	SE	0	6	Excellent	0	0	2	7
14.03.18	GS	11:10	14:10	High	4.8m	2	5	SE	0	7	Excellent	0	0	2	7
14.03.18	GS	11:10	14:10	High	4.8m	3	5	SE	0	6	Excellent	0	0	2	7
16.03.18	GS	06:20	09:20	Low	1.3m	1	6	E	1	8	Good	0	0	1	3
16.03.18	GS	06:20	09:20	Low	1.3m	2	6	E	2	8	Good	0	0	1	3
16.03.18	GS	06:20	09:20	Low	1.3m	3	6	E	2	8	Good	0	0	1	3
16.03.18	GS	10:15	12:25	Mid		1	6	E	1	8	Excellent	0	0	1	3
16.03.18	GS	10:15	12:25	Mid		2	6	E	1	8	Excellent	0	0	1	3
16.03.18	GS	10:15	12:25	Mid		3	6	E	1	8	Good	0	0	1	3
20.03.18	GS	11:41	14:41	Mid		1	3	SW	0	3	Excellent	0	0	2	6
20.03.18	GS	11:41	14:41	Mid		2	3	SW	0	2	Excellent	0	0	2	7
20.03.18	GS	11:41	14:41	Mid		3	3	SW	0	2	Excellent	0	0	2	7
20.03.18	GS	14:42	17:15	High	5.7m	1	3	SW	0	2	Excellent	0	0	2	8
20.03.18	GS	14:42	17:15	High	5.7m	2	3	SW	0	2	Excellent	0	0	2	8

20.03.18	GS	14:42	17:15	High	5.7m	3	4	SW	0	1	Excellent	0	0	2	9
27.03.18	GS	10:20	13:00	High	4.7m	1	3	SE	2	8	Excellent	0	0	1	6
27.03.18	GS	10:20	13:00	High	4.7m	2	3	SE	0	8	Excellent	0	0	1	6
27.03.18	GS	10:20	13:00	High	4.7m	3	3	SE	0	8	Excellent	0	0	1	7
27.03.18	GS	13:10	16:10	Mid		1	3	SE	1	8	V Good	0	0	1	7
27.03.18	GS	13:10	16:10	Mid		2	3	SE	0	8	V Good	0	0	1	7
27.03.18	GS	13:10	16:10	Mid		3	3	SE	0	8	V Good	0	0	1	7
05.04.18	GS	08:30	10:30	Mid		1	2	NW	0	0	Excellent	0	0	0	1
05.04.18	GS	08:30	10:30	Mid		2	2	NW	0	0	Excellent	0	0	0	5
16.04.18	GS	07:40	10:40	Low	0.8m	1	2	SW	0	8	Good	0	0	1	7
16.04.18	GS	07:40	10:40	Low	0.8m	2	2	SW	0	8	Good	0	0	1	9
16.04.18	GS	07:40	10:40	Low	0.8m	3	2	SW	0	7	V Good	0	0	2	9
16.04.18	GS	11:30	13:45	Mid		1	3	SW	0	7	Excellent	0	0	2	10
16.04.18	GS	11:30	13:45	Mid		2	4	SW	2	7	Excellent	0	0	2	16
16.04.18	GS	11:30	13:45	Mid		3	4	SW	2	7	Excellent	0	0	2	16
25.04.18	GS	10:02	13:02	High	4.7m	1	5	W	2	5	Excellent	0	0	2	13
25.04.18	GS	10:02	13:02	High	4.7m	2	5	W	2	6	Excellent	0	0	2	13
25.04.18	GS	10:02	13:02	High	4.7m	3	5	W	2	6	Excellent	0	0	2	13
25.04.18	GS	13:17	15:40	Mid		1	5	W	0	6	Excellent	0	0	2	13
25.04.18	GS	13:17	15:40	Mid		2	6	W	0	5	Excellent	0	0	2	13
25.04.18	GS	13:17	15:40	Mid		3	6	W	0	5	Excellent	0	0	2	13

Appendix E

FLIGHT ACTIVITY SURVEY RESULTS

Table E.1 Flight Activity Survey Weather Conditions

DATE	OBSERVER	START TIME	FINISH TIME	HOUR	WIND SPEED	WIND DIRECTION	RAIN	CLOUD COVER (EIGHTHS)	VISIBILITY	FROST	SNOW	CLOUD HEIGHT	TEMP DEGREES C
14/03/2018	GS	07:10	08:10	1	3	SE	0	5	Excellent	0	0	2	3
14/03/2018	GS	14:20	15:20	1	5	SE	0	6	Excellent	0	0	2	7
16/03/2018	GS	09:15	10:15	1	6	E	1	8	Excellent	0	0	1	3
16/03/2018	GS	12:50	13:50	1	6	E	1	8	Good	0	0	1	3
04/04/2018	GS	07:20	08:20	1	3	NW	0	0	Excellent	0	0	0	-1
04/04/2018	GS	14:00	15:00	1	4	W	0	3	Excellent	0	0	2	8
16/04/2018	GS	06:30	07:30	1	4	SW	0	7	Excellent	0	0	2	
16/04/2018	GS	13:50	14:50	1	3	E	1	8	Moderate	0	0	1	7
25/04/2018	GS	09:00	10:00	1	4	W	0	5	Excellent	0	0	2	7
25/04/2018	GS	15:50	16:50	1	6	W	0	6	Excellent	0	0	2	13

Key:

- **Cloud cover:** 0-8 oktas.
- **Cloud height:** 0=<150m, 1=150-500m, 2=>500m.
- **Wind speed Beaufort Scale:** 0=calm, 1=light air (smoke drifts in wind), 2=light breeze (leaves rustle, wind felt on face), 3=gentle breeze (light flags extended, small twigs in constant motion); 4=moderate wind (dust, leaves and loose paper raised, small branches move), 5=fresh wind (small trees sway), 6=strong wind (large branches move, whistling in phone lines, difficult to use umbrellas), 7-12=inappropriate conditions (7=moderate gale, 8=fresh gale, 9=strong gale, 10=whole gale, 11=storm, 12=hurricane).
- **Wind Direction:** N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW.
- **Rain:** 0=none, 1=drizzle, 2=light, 3=moderate (or heavy showers), 4=heavy.
- **Snow:** 0=none, 1=on site, 2=high ground.

- **Frost:** 0=none, 1=ground, 2=all day.
- **Visibility:** Excellent, very good, good, moderate, poor.

Table E.2 Flight Activity Survey Results

DATE	SURVEY TIMES	OBSERVER	SPECIES	NUMBER	TIME	UNDER OR OVER BRIDGE	DIRECTION
14.03.18	07:10-08:10	GS	CM	4	07:19	Over	SW
14.03.18	07:10-08:10	GS	CU	1	07:20	Over	SW
14.03.18	07:10-08:10	GS	CU	2	07:22	Over	SW
14.03.18	07:10-08:10	GS	BW	2	07:24	Over	NE
14.03.18	07:10-08:10	GS	CM	3	07:24	Over	SW
14.03.18	07:10-08:10	GS	HG	1	07:29	Over	SE
14.03.18	07:10-08:10	GS	HG	1	07:30	Over	NE
14.03.18	07:10-08:10	GS	CM	2	07:33	Over	SW
14.03.18	07:10-08:10	GS	CU	2	07:35	Over	SW
14.03.18	07:10-08:10	GS	RK	6	07:39	Over	SW
14.03.18	07:10-08:10	GS	RK	3	07:41	Over	SW
14.03.18	07:10-08:10	GS	CU	1	07:42	Over	SW
14.03.18	07:10-08:10	GS	HG	1	07:42	Over	SW
14.03.18	07:10-08:10	GS	MA	1	07:43	Over	SW
14.03.18	07:10-08:10	GS	CU	2	07:45	Over	SW
14.03.18	07:10-08:10	GS	RK	1	07:45	Over	SW
14.03.18	07:10-08:10	GS	RK	5	07:48	Over	SW
14.03.18	07:10-08:10	GS	RK	3	07:55	Over	NE

14.03.18	07:10-08:10	GS	OC	1	07:55	Over	NE
14.03.18	07:10-08:10	GS	CM	17	08:01	Over	NE
14.03.18	07:10-08:10	GS	CU	1	08:02	Over	SW
14.03.18	07:10-08:10	GS	CU	1	08:03	Over	NE
14.03.18	07:10-08:10	GS	CM	2	08:04	Over	NE
14.03.18	14:20-15:20	GS	CM	16	14:28	Over	NE
14.03.18	14:20-15:20	GS	CM	2	14:39	Over	SW
14.03.18	14:20-15:20	GS	HG	1	14:50	Over	NE
14.03.18	14:20-15:20	GS	PG	1	14:51	Over	NE
14.03.18	14:20-15:20	GS	PG	1	14:55	Over	SW
16.03.18	09:15-10:15	GS	CU	1	09:40	Over	NE
16.03.18	09:15-10:15	GS	RK	5	09:41	Over	NE
16.03.18	09:15-10:15	GS	HG	3	09:44	Over	NE
16.03.18	09:15-10:15	GS	MA	2	09:45	Over	SW
16.03.18	09:15-10:15	GS	HG	6	09:45	Over	NE
16.03.18	09:15-10:15	GS	RK	1	09:47	Over	NE
16.03.18	09:15-10:15	GS	HG	6	09:50	Over	NE
16.03.18	09:15-10:15	GS	HG	7	09:59	Over	NE
16.03.18	09:15-10:15	GS	MA	2	10:00	Over	NE
16.03.18	09:15-10:15	GS	LB	1	10:02	Over	NE
16.03.18	09:15-10:15	GS	HG	1	10:02	Over	NE

16.03.18	09:15-10:15	GS	CU	1	10:05	Over	NE
16.03.18	09:15-10:15	GS	RK	5	10:10	Over	NE
16.03.18	12:50-13:50	GS	HG	1	12:53	Over	NE
16.03.18	12:50-13:50	GS	HG	4	12:59	Over	SW
16.03.18	12:50-13:50	GS	CA	1	13:05	Over	NE
16.03.18	12:50-13:50	GS	HG	2	13:22	Over	NE
16.03.18	12:50-13:50	GS	HG	1	13:22	Over	NE
16.03.18	12:50-13:50	GS	CM	1	13:32	Over	NE
16.03.18	12:50-13:50	GS	HG	1	13:43	Over	NE
4.04.2018	07:20-08.20	GS	RK	3	07:32	Over	SW
4.04.2018	07:20-08.20	GS	HG	1	07:33	Over	NE
4.04.2018	07:20-08.20	GS	HG	3	07:39	Over	NE
4.04.2018	07:20-08.20	GS	RK	1	07:41	Over	SW
4.04.2018	07:20-08.20	GS	RK	3	07:42	Over	SW
4.04.2018	07:20-08.20	GS	CU	9	07:48	Over	SW
4.04.2018	07:20-08.20	GS	RK	7	07:50	Over	SW
4.04.2018	07:20-08.20	GS	PG	1	07:52	Over	SW
4.04.2018	07:20-08.20	GS	RK	6	07:55	Over	SW
4.04.2018	07:20-08.20	GS	RK	3	07:56	Over	SW
4.04.2018	07:20-08.20	GS	RK	2	07:57	Over	SW
4.04.2018	07:20-08.20	GS	CU	9	07:59	Over	SW

4.04.2018	07:20-08.20	GS	CU	7	07:59	Over	SW
4.04.2018	07:20-08.20	GS	CU	2	08:00	Over	SW
4.04.2018	07:20-08.20	GS	RK	5	08:01	Over	SW
4.04.2018	07:20-08.20	GS	CU	2	08:04	Over	SW
4.04.2018	07:20-08.20	GS	CU	4	08:05	Over	SW
4.04.2018	07:20-08.20	GS	PG	100	08:06	Over	SW
4.04.2018	07:20-08.20	GS	OC	1	08:09	Over	SW
4.04.2018	07:20-08.20	GS	RK	1	08:09	Over	SW
4.04.2018	07:20-08.20	GS	OC	1	08:12	Over	SW
4.04.2018	07:20-08.20	GS	CU	1	08:12	Over	SW
4.04.2018	07:20-08.20	GS	RK	2	08:15	Over	SW
4.04.2018	07:20-08.20	GS	CA	1	08:15	Over	NE
4.04.2018	14:00-15:00	GS	OP	1	14:15	Over	SW
16.04.2018	06:30-07:30	GS	LB	1	06:50	Over	SW
16.04.2018	06:30-07:30	GS	MA	1	06:54	Over	NE
16.04.2018	06:30-07:30	GS	HG	1	06:54	Over	SW
16.04.2018	06:30-07:30	GS	HG	1	06:59	Over	SW
16.04.2018	06:30-07:30	GS	CU	1	07:05	Over	NE
16.04.2018	06:30-07:30	GS	OC	1	07:05	Over	NE
16.04.2018	06:30-07:30	GS	HG	1	07:09	Over	NE
16.04.2018	06:30-07:30	GS	HG	3	07:10	Over	NE

16.04.2018	06:30-07:30	GS	HG	2	07:11	Over	NE
16.04.2018	06:30-07:30	GS	CA	1	07:11	Over	NE
16.04.2018	06:30-07:30	GS	CU	2	07:15	Over	SW
16.04.2018	06:30-07:30	GS	CU	1	07:16	Over	NE
16.04.2018	06:30-07:30	GS	HG	2	07:20	Over	SW
16.04.2018	06:30-07:30	GS	CA	1	07:21	Over	NE
16.04.2018	13:50-14:50	GS	CU	1	13:59	Over	NE
16.04.2018	13:50-14:50	GS	LB	2	13:59	Over	SW
16.04.2018	13:50-14:50	GS	CU	2	14:10	Over	NE
16.04.2018	13:50-14:50	GS	CU	1	14:34	Over	NE
16.04.2018	13:50-14:50	GS	OC	1	14:39	Over	NE
25.04.2018	09:00-10:00	GS	LB	1	09:27	Over	SW
25.04.2018	09:00-10:00	GS	HG	1	09:58	Over	NE
25.04.2018	09:00-10:00	GS	HG	1	10:00	Over	NE
25.04.2018	09:00-10:00	GS	LB	2	10:00	Over	SW
25.04.2018	09:00-10:00	GS	H	1	10:07	**Under**	SW
25.04.2018	15:50-16:50	GS	GB	1	16:05	Over	SW
25.04.2018	15:50-16:50	GS	HG	1	16:05	Over	SW
25.04.2018	15:50-16:50	GS	OC	2	16:05	Over	NE
25.04.2018	15:50-16:50	GS	SU	1	16:24	Over	NE

25.04.2018	15:50-16:50	GS	MA	1	16:35	Over	SW
25.04.2018	15:50-16:50	GS	LB	1	16:41	Over	SW
25.04.2018	15:50-16:50	GS	HG	1	16:42	Over	NE

Appendix F

HRA SCREENING - FEATURES

SCREENED OUT

Table F1 - Features screened out of the HRA

Qualifying Feature	LSE	Explanation
Firth of Tay and Eden Estuary SAC		
Sandbanks covered by seawater all the time	No	▪ No work is proposed to take place on sandbanks covered by seawater all the time. ▪ No new discharges are proposed during the works and surface run-off water will remain as current. ▪ LSE not anticipated.
Harbour Seal	No	▪ Instances of harbour seal foraging upstream are uncommon and are restricted to during high tide where water allows such movement. ▪ As works will not be undertaken during high tide periods, potential for disturbance is limited and will not result in LSE.
Firth of Tay and Eden Estuary SPA		
Bar-tailed Godwit	No	The species does not habitually utilise the inner estuary area, favouring the outer estuary for foraging, roosting primarily at Goose Pools in the north east of the estuary and Tentsmuir. LSE not anticipated.
Common Scoter	No	A recognised sea duck species that doesn't commonly frequent the inner reaches of the estuary. Primarily found in St. Andrews bay and off Tentsmuir. LSE not anticipated.
Cormorant	No	A scarce visitor to the Eden estuary area, preferring to utilise habitat within the Tay estuary area, with the main roost within the SPA located on southern piers of the fallen and replacement Tay rail bridges at Newport-on-Tay.
Eider	No	Rarely frequenting the upstream area of the Eden estuary (i.e. the New Bridge area), and only normally found on the rising tide, they are primarily located within the outer Tay estuary with WeBS Low Tide Survey counts of 12,669 birds in 2012/13. Although birds are recorded within the Eden estuary channel their numbers are generally less than 250 individuals (peak of 270 birds Feb 2011, more recently a peak of 220 birds in Oct

		2014), with birds preferring the outer reaches of the estuary rather than the upstream channel.
Goldeneye	No	Seldom visit the upper reaches of the estuary towards the bridge. Some birds do utilise estuary waters at high tide for foraging.
Goosander	No	Small numbers of birds frequent the Eden estuary channel infrequently, with only one bird recorded across the winter of 2014/15 (Feb 2015 record).
Grey Plover	No	Not regularly present as feeding or roosting within the inner estuary area with the main feeding area located at Balgove Bay.
Greylag Goose	No	Historically known to roost on/and around the Guardbridge area and Eden estuary at night. The species will not be significantly adversely affected by the Proposed Developemnt given their absence during daytime periods.
Little Tern	No	None currently nest within the SPA and their presence in the upper reaches of the estuary is absent.
Long-tailed duck	No	This sea duck species does not frequent the upper reaches of the estuary, tending to be located towards the estuary mouth area.
Marsh Harrier	No	Following conversations with SNH, and in the knowledge that species breeds in the inner Tay reedbeds, making no use of the Eden estuary aside from records of passage, this species is screened out.
Pink-footed Goose	No	As with greylag goose, pink-footed goose is known to roost at night within Edenside. This species will not be significantly adversely affected.
Red-breasted Merganser	No	Does not regularly frequent Edenside or the upper estuary channel near the New Bridge.
Sanderling	No	A species that prefers the estuary mouth rather than the inner estuary areas.

Shelduck	No	The main feeding and roosting area for over-wintering birds is in Balgove Bay, with the species not found to frequent the upper reaches of the estuary near the bridge.
Velvet Scoter	No	A sea duck species that does not frequent the inner reaches of the estuary.
Pink-footed Goose	No	See above.
Firth of Tay and Eden Estuary Ramsar		
Greylag Goose	No	See above.
Bar-tailed Godwit	No	See above.

Appendix G

NOISE MODELLING DATA

REPORT Nº 70027582-01

A91 - GUARDBRIDGE

TECHNICAL NOTE

CONFIDENTIAL

JANUARY 2017

WSP | PARSONS BRINCKERHOFF

A91 - GUARDBRIDGE

TECHNICAL NOTE

Fife Council

Type of document (version)
Internal

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QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks				
Date				
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Signature				
Project number				
Report number				
File reference				

TABLE OF CONTENTS

TABLES

APPENDICES

1 INTRODUCTION

WSP | Parsons Brinckerhoff has been commissioned to prepare a baseline noise model detailing road traffic noise at the Firth of Tay and Eden Estuary SPA/SAC and Ramsar. Concerns have been raised as to the disturbance of birds foraging along the river channel and mouth of the estuary during construction works during the proposed renovation and installation of cathodic protection to New Bridge, Guardbridge, Fife.

This report presents the noise contour map of the area in question and predicted noise levels associated with road traffic noise along the river bank. The methodology employed to calculate the noise model is presented in chapter two.

The noise contour plot is presented in Appendix A.

2 METHODOLOGY

2.1 ROAD TRAFFIC NOISE MODEL

The results of the baseline road traffic noise model have been calculated in accordance with the Department of Transport (Welsh Office) 1988 Calculation of Road Traffic Noise (CRTN)[1].

Sections I and II of CRTN outline the general method of calculation for predicting noise levels at a distance from a road. Assessment levels are presented in $L_{Aeq,18h}$, the A-weighted equivalent continuous noise level, a theoretical continuous sound, over a stated time period, T, which contains the same amount of energy as a number of sound events occurring within that time, or a source that fluctuates in level.

Parameters used in the calculation process are:

- The AAWT (Average annual weekday traffic) flow for the 18-hour period 0600-2400hrs
- The mean traffic speed
- The proportion of heavy vehicles
- The type of road surface
- The road gradient
- The height of the receptor above ground level (0.5m)
- The nature of the ground cover between the road and the receptor(s)

Reasonable worst case assumptions have been adopted for input parameters not specified in the available information. Specifically, it assumed the road will be of a standard surface type (i.e. no noise-attenuating properties), and road gradients are assumed not to affect traffic speeds significantly, which would result in slightly overestimated noise levels for uphill road segments.

CRTN stipulates the limitations of the calculation methods in regard to low traffic flows. The noise level flow function for traffic flow between 50 - 200 cars per hour takes a different form to the standard rate, and changes more rapidly with traffic flow. The flow expected at the survey area is likely to be within or at the boundary of this range.

The propagation of noise has been simulated using a 3D computer prediction model, which has been configured to incorporate CRTN calculation methodologies.

2.2 ROAD TRAFFIC DATA

The calculations used the two-way, Annual Average Weekday Traffic (AAWT) flows, assumed HGV compositions and vehicle speeds derived from the speed limit for the A91 and A919 in accordance with CRTN. The road traffic flow data used in the calculations are shown in Table 2.1 below.

[1] Department of Transport, Welsh Office (1988). *Calculation of Road Traffic Noise*. Crown Copyright.

Table 2-1 - 18 Hour Traffic Flow All Vehicles (7-11 September 2015)

DIRECTION	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	A91 (DFT 2015)	A919 (DFT 2015)	AAWT
Eastbound	7959	7701	7655	8084	8561			
Westbound	8605	8213	8211	8537	8735			
Two-way	16564	15914	15866	16621	17296	7230	9115	16452

Speed Limit – 40mph

HGV percentage – No data available, assumed 10%.

3 RESULTS

3.1 NOISE CONTOURS

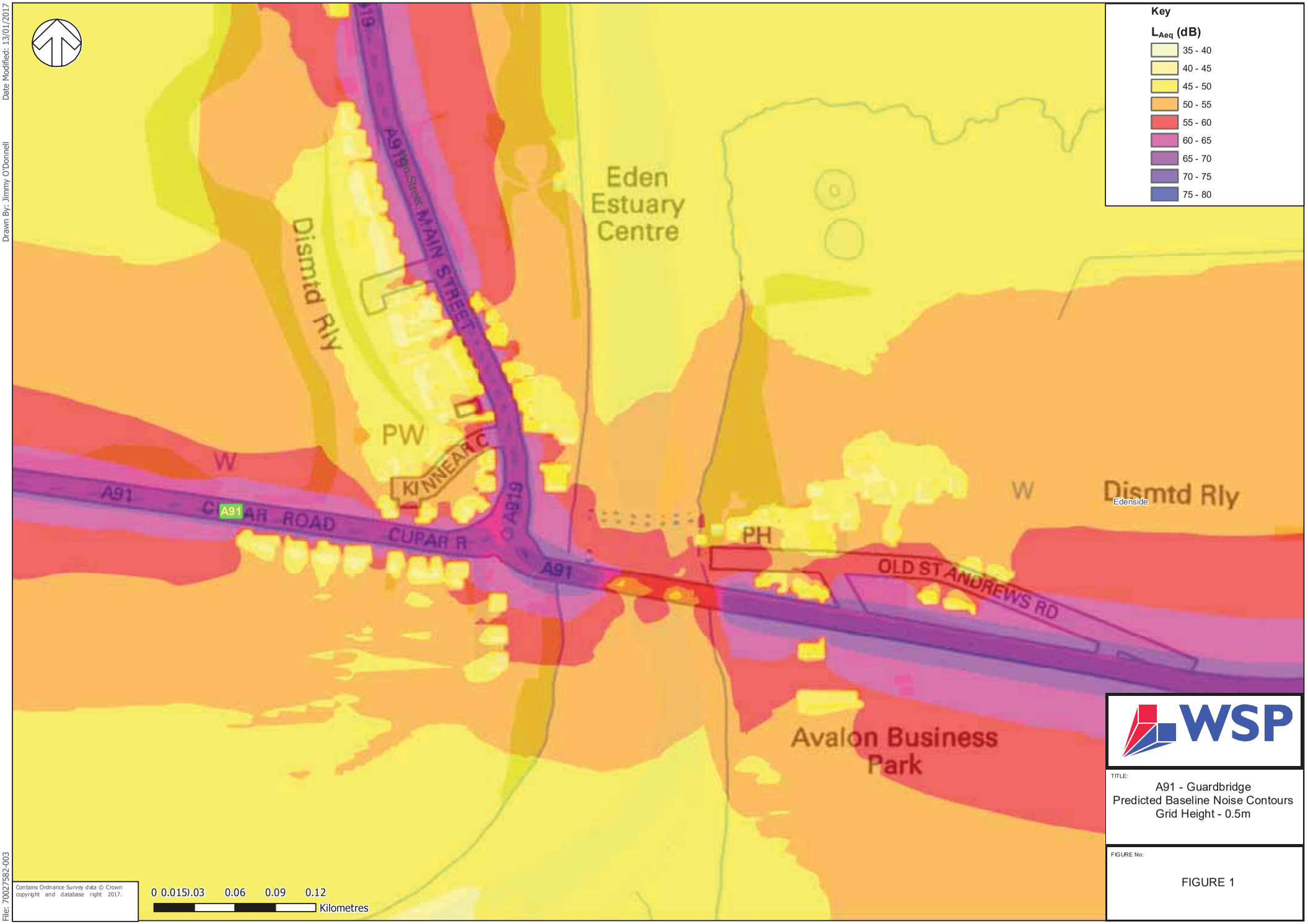
The baseline noise contours presented in Figure 1 in Appendix A have not been validated against a noise survey however, the predicted noise levels along the river bank at the location of the proposed works are detailed in Table 3-1 below.

Table 3-1 - Predicted Noise Levels at Location of Proposed Works

LOCATION	DISTANCE FROM BRIDGE	NOISE LEVEL RANGE (DB)
North of Bridge, East Bank	0-10m	60.0-70.0
	10-20m	55.0-65.0
	20-30m	55.0-60.0
	30-70m	50.0-60.0
	>70m	45.0-55.0
South of Bridge, East Bank	0-10m	60.0-70.0
	10-20m	55.0-65.0
	20-30m	55.0-60.0
	30-50m	50.0-60.0
	50-150m	45.0-55.0
	>150m	45.0-50.0
North of Bridge, West Bank	0-10m	55.0-60.0
	10-20m	55.0-60.0
	20-30m	50.0-60.0
	30-50m	50.0-55.0
	50-200m	50.0-55.0
	>200m	45.0-50.0
South of Bridge, West Bank	0-10m	55.0-60.0
	10-20m	50.0-60.0
	20-150m	45.0-55.0
	>150m	45.0-50.0

Appendix A

BASELINE ROAD TRAFFIC NOISE CONTOUR PLOT



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WSP

TITLE:

A91 - Guardbridge
Predicted Baseline Noise Contours
Grid Height - 0.5m

FIGURE No:

FIGURE 1

Date Modified: 13/01/2017

Drawn By: Jimmy O'Donnell

File: 70027582-003

7 Lochside View
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