

## Appendix A9.2: Detailed Methods and Baseline Data

### 1 Purpose of Appendix

1.1 This appendix provides detailed information on the survey methods and baseline data for each ecological feature outlined in Chapter 9 (Terrestrial Ecology). The baseline data are used to inform the Ecological Impact Assessment (EclA) for the A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement scheme (hereafter referred to as the proposed scheme).

### 2 Phase 1 Habitat Survey

2.1 An extended Phase 1 habitat survey (JNCC 2010) was undertaken in June 2017, and again in November 2019, within 250m around Kincardine Bridge to identify and map the habitats present, and record evidence of protected or notable species, including invasive non-native animal and plant species. Target notes (TN) from the site survey undertaken in June 2017 are detailed in Table 1 and their location is also referenced in Figure 9.2. No additional TNs or updates to the previous TNs were required as a result of the survey undertaken in November 2019.

**Table 1: Phase 1 Habitat Survey Target Notes**

TN	Grid Reference	Description
1	NS 91940 86997	Bats - two outbuildings. One open timber building with low bat roost potential, used as animal shelter (east building). Second building was stone with render and corrugated metal roof used as storage - moderate bat potential. Various access points, gaps in stone work and at roof and broken timber doors. Tall ruderal growing around buildings (rosebay willowherb, thistle, nettles, cow parsley).
2	NS 91937 86964	Bats - modern houses. Recently constructed with no obvious access points - low bat potential. Semi-mature willow treeline boundary. Conifer hedgerow and fence along boundary with side road.
3	NS 91902 86956	Mature sycamore. Mature sycamore with inactive corvid nest; within hawthorn hedge (elder, sycamore and dog-rose also present).
4	NS 92011 87194	Bats - Clackmannanshire Bridge. Formed concrete bridge over river - some drainage holes/gaps in parapet - low bat potential.
5	NS 92129 87040	Bats - four concrete bunkers. Negligible hibernation potential. Assessed from a distance.
6	NS 92047 87044	Bats - animal sheds. Brick and timber construction. Low/negligible bat potential. Nesting swallows.
7	NS 92865 87462	Amenity grassland. Amenity grassland with small children's play park. Grassland bordered by treeline of laurels to the north-west
8	NS 92819 87553	Bats - dead tree. On verge beside track (as path splits). Knot holes within cavity and dead wood at 1.5m. Dead limb at 1m. Moderate to high potential for small numbers of bats.
9	NS 92826 87543	Watercourse. North: shallow brick-lined watercourse 1.2m wide, heavy with silt, grated at culvert, 1.5m high banks. South: shallow, 2m wide with silt and mud bed. Banks 1.5m high. Low potential for otter and water vole. Solid gate on culvert.
10	NS 92793 87523	Tall ruderal, scattered scrub and bare ground. Complex mosaic habitat. Planted oak stand, with fenced off area of amenity ground. Tall ruderal with scattered scrub. Large area of bare ground with scattered scrub along the shore side, and saltmarsh habitat adjacent to the watercourse. Species including scurvy grass, lesser sea-spurrey.
11	NS 92804 87334	Bats - small brick building.

TN	Grid Reference	Description
		Small brick building with flat felted roof. Gaps under felt - moderate potential for small numbers of bats.
12	NS 92925 87322	Bats - residential house. Multiple stone residential houses with slate or tile roofs - high bat potential.
13	NS 92874 87324	Bats - building. Metal craft workshop - stone and render walls and flat felted roof - moderate bat potential. Substation with render walls and pitched felted roof - moderate bat potential.
14	NS 92909 87225	Wetland. Small area of wetter ground with bulrush growing. Tall ruderal along path verge -nettle, rosebay willowherb, fern, bramble, water avens, hazel, willow and birch sp.
15	NS 91820 86715	Dry watercourse. 2m wide dry ditch. 2.5m high steep banks, well vegetated bed - dry for some time.
16	NS 92878 87201	Sea wall. Sea wall with railway line running adjacent. Exposed gravel at toe of sea wall.

### 3 Bats

#### Desk-based Assessment

- 3.1 National Biodiversity Network (NBN) Atlas Scotland (NBN Atlas Partnership 2018) provided 234 records of six bat species (Natterer's bat, Daubenton's bat, brown long-eared bat, common and soprano pipistrelle, and noctule bat) within 10km of the Kincardine Bridge between 2008-2016.
- 3.2 The 2009 Environmental Review Report (ERR) (Jacobs 2009a) identified the need for pre-construction bat surveys which were undertaken between May and September 2009. These surveys concluded that the likelihood of Kincardine Bridge being used by roosting or hibernating bats was low (Jacobs 2009b).

#### Ground-based Roost Assessment

- 3.3 A ground-based assessment of Kincardine Bridge was undertaken in November 2017 following Bat Conservation Trust's Bat Surveys for Professional Ecologists Good Practice Guidelines (Collins 2016). This involved inspection of the bridge focusing on the southern piled viaduct of Kincardine Bridge which is to be replaced. The survey also included any building, structure or trees with the potential to contain bat roosts within 50m of the proposed scheme.
- 3.4 The bridge was identified as having low bat roost potential: '*a structure with one or more potential roost sites that could be used by individual bats opportunistically*' (Collins 2016). However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (Collins 2016). Four additional structures were identified within 50m of the proposed scheme. These were solid concrete structures located on the saltmarsh to the north of the proposed scheme and were assessed as having negligible bat roost potential.

#### Emergence and Re-entry Surveys

- 3.5 Three activity surveys were carried out at Kincardine Bridge on 22 June (dusk), 14 July (dawn) and 9 August (dusk) 2017 by eight surveyors standing at pre-defined locations around the bridge. No further surveys were carried out at the five structures listed in paragraph 3.2 due to their low/negligible potential as bat roosts.
- 3.6 Surveys were carried out using hand-held frequency division bat detectors (Batbox Duet) with Tascam DR-05 linear Pulse-code modulation (PCM) recorders and Anabat Walkabout and Echo Meter Touch full

spectrum detectors. Acoustic files were analysed using BatSound 4.2, Analoop W V4.1z or Analoop Insight version 21926.

- 3.7 No bats were observed emerging from or re-entering the bridge during the surveys. However, foraging and commuting behaviour was observed for soprano pipistrelle, common pipistrelle and *Myotis* sp. bats. These bats were observed commuting alongside and underneath the bridge.

### Passive Monitoring

- 3.8 Four zero-crossing analysis passive detectors (Anabat Express) were deployed at Kincardine Bridge in August to September 2017 and May to June 2018 (Figure 9.3). A total of 38 nights of data was recorded in 2017 and 33 nights in 2018. Acoustic files were analysed using Analoop W V4.1z.
- 3.9 Bat activity as recorded at all four of the passive monitoring locations is detailed in Table 2. The highest number of average bat passes per night was recorded at the northern end of the bridge. Activity was dominated by common and soprano pipistrelle bats, however, brown long-eared and *Myotis* sp. bats were also recorded.

**Table 2: Average Bat Passes Per Night at Each Passive Monitoring Location**

Position	Number of nights with data	Average Bat Passes per Night (BPN)						
		Myotis sp.	Brown long-eared	Common pipistrelle	Soprano pipistrelle	Pipistrelle sp.	Unknown	Total
1	38	1.3	0.3	15.7	36.7	3.6	0.1	58.0
2	70	1.7	0.2	17.8	35.7	4.9	0.2	61.7
3	67	0.3	0.1	16.2	25.8	4.4	0.2	48.2
4	60	0.2	0.2	42.1	41.8	6.3	0.1	96.0

- 3.10 Temporal variation was observed with bat activity higher later in the season (August-September). Further details of this are displayed in Table 3.

**Table 3: Average Bat Passes Per Night Per Month for Kincardine Bridge**

Month	Average Bat Passes per Night (BPN)						
	Myotis sp.	Brown long-eared	Common pipistrelle	Soprano pipistrelle	Pipistrelle sp.	Unknown	Total
May 2018	0.0	1.4	35.0	52.4	10.4	0.1	99.3
June 2018	0.3	0.8	34.2	57.1	12.5	0.6	105.5
August 2017	2.3	0.3	114.7	136.8	23.0	1.0	278.1
September 2017	8.4	0.4	112.3	198.8	17.5	0.4	337.8
<b>Average BPN Overall (May-September)</b>	<b>2.8</b>	<b>0.7</b>	<b>76.8</b>	<b>114.6</b>	<b>16.3</b>	<b>0.5</b>	<b>211.7</b>

## 4 Wetland Birds

### Desk-based Assessment

- 4.1 NBN Atlas Scotland (NBN Atlas Partnership 2018) did not provide any records of wetland birds. The 2003 Environmental Statement (ES) (Scottish Executive 2003) utilised data from Through The Tide Count (TTTC) surveys undertaken between December 1999 and September 2000 and concluded that

the estuarine habitat potentially impacts by the works is of lesser importance than areas immediately adjacent to the bridge, for example Skinflats.

- 4.2 The 2009 ERR details that as part of the commitments made in the 2003 ES the University of Exeter was commissioned to undertake a programme of monitoring. The results of the monitoring concluded that there was no strong evidence that bridge construction would have a negative impact on overall populations of wildfowl or shorebird species (Jacobs 2009a).

### Through the Tide Count Surveys

#### Survey Methods

- 4.3 TTTC surveys were undertaken from late April 2017 to April 2018 inclusive to record the numbers, distribution and behaviour of all estuarine water birds (including all qualifying species of the Firth of Forth Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI)) present in the Forth Estuary (the shoreline, intertidal and open water areas) within 500m of the proposed scheme and across four survey sectors (S1, S2, N1, N2) (Figure 9.1). The information gathered enabled identification of areas which are particularly important for overwintering and migratory bird assemblages.
- 4.4 The survey methods used were based on the Wetland Bird Surveys (WeBS) core counts methodology as described in Bibby, Burgess, Hill and Mustoe (2000). Only high tide is surveyed during WeBS core counts; however, surveys undertaken for the proposed scheme also encapsulated low and mid tide, as well as high tide, within the survey area. Wetland birds that were surveyed for included gulls, terns, divers, grebes, cormorants, herons, swans, geese, ducks, rails, waders and kingfisher, as defined by Wetlands International (Rose & Scott 1997).
- 4.5 During each count, birds were viewed with the assistance of binoculars and telescopes, from specific vantage points (VP) (Figure 9.1) along the shoreline. VPs were chosen during an initial site visit so as not to influence the survey results and enabling the entire shoreline within the survey area to be observed. Surveyors took 'snapshot' scans and recorded the number, location and behaviour of birds of each of the survey sectors. Care was taken to prevent double counting of birds during the counts. Data were recorded on maps using standard British Trust for Ornithology (BTO) bird species codes (BTO 2008), with the number of each species recorded in superscript and the related behaviour (flying, loafing, roosting or foraging) indicated in subscript text. In addition to bird data, weather (wind speed and direction, rainfall, cloud cover and visibility) and sources of potential or actual disturbance to birds were recorded during the counts.
- 4.6 Table 4 provides the survey dates for the TTTC surveys.

**Table 4: Survey Dates for TTTC Surveys at Kincardine**

Year	Day and Month
2017	27 April
	4 May, 19 May and 25 May
	9 June and 16 June
	24 July and 31 July
	21 August and 28 August
	14 September and 22 September
	6 October and 12 October
	7 November and 13 November
	4 December and 11 December
2018	9 January

Year	Day and Month
	1 February, 22 February and 27 February
	9 March and 20 March
	10 April and 18 April

Data Analysis

- 4.7 Analysis of the TTTC data was undertaken to identify the peak counts and distribution of waders and wildfowl within the survey area over the year. The analysis was conducted to account for the VPs being undertaken in sequence rather than simultaneously. Specifically, peak counts were derived from the highest counts of a species from a single sector (N1, N2, S1, S2) over a tidal state (High, Mid, Low), rather than an addition of the counts from each sector over the tidal state. The analysis was conducted in this way to take consideration of birds being mobile and the potential for the same birds to be recorded in multiple sectors over a tidal state, thus avoiding double counting of birds.
- 4.8 Bird data was derived for each species in the following ways:
- peak count - the highest individual count of birds recorded in the survey area;
  - monthly peak count - the highest peak count within a calendar month;
  - winter peak count - the highest peak count between September and March (inclusive); and
  - winter mean peak count - the mean (average) of all the monthly peak counts between September and March (inclusive).
- 4.9 The cumulative total of all records of each species is not presented as observations were recorded on multiple occasions during each survey day to identify peak counts.
- 4.10 In addition to peak counts, the number of times a species was recorded has been used to provide an indication of the prevalence of the species within the survey area. A record is defined within this assessment as an individual/group exhibiting a single behaviour during the surveys. For example, observation of one mallard loafing would be one record, as would observation of 20 oystercatchers roosting in a group.

TTTC Survey Results

- 4.11 A total of 39 species of wetland birds were recorded during the TTTC surveys between April 2017 and April 2018 (Figure 9.4). Monthly peak counts for all species recorded are shown in Table 5.

**Table 5: Monthly Peak Counts of All Wetland Birds for the Survey Period April 2017 to April 2018**

Species	Apr 2017 (1)	May 2017 (3)	Jun 2017 (2)	Jul 2017 (2)	Aug 2017 (2)	Sept 2017 (2)	Oct 2017 (2)	Nov 2017 (2)	Dec 2017 (2)	Jan 2018 (1)	Feb 2018 (3)	Mar 2018 (2)	Apr 2018 (2)	Monthly Peak	Monthly Mean Peak	Winter Peak	Winter Mean Peak
Bar-tailed godwit	0	0	0	0	0	4	0	17	2	0	4	0	0	17	2.08	17	3.86
Black-headed gull	8	6	8	108	638	132	416	178	225	88	623	62	15	638	192.85	623	246.29
Canada goose	2	2	0	0	0	49	14	0	0	0	0	0	0	49	5.15	49	9
Common guillemot	0	0	0	0	0	0	0	0	0	0	0	2	5	5	0.54	2	0.29
Common gull	0	0	2	2	11	1	8	58	80	7	62	12	0	80	18.69	80	32.57
Common sandpiper	2	0	0	2	2	0	0	0	1	0	0	1	0	2	0.62	1	0.29
Common scoter	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.08	1	0.14
Common tern	0	10	2	2	2	0	0	0	0	0	0	0	0	10	1.23	0	0
Cormorant	2	3	1	8	23	9	31	26	19	16	29	10	5	31	14.00	31	20
Curlew	3	4	3	83	56	84	117	26	40	74	290	98	64	290	72.46	290	104.14
Dunlin	0	1	0	0	0	10	5	25	0	0	0	0	0	25	3.15	27	5.71
Eider	4	3	2	1	0	0	0	0	0	0	0	0	0	4	0.77	0	0
Golden plover	0	0	0	0	0	0	65	25	0	0	0	0	0	65	6.92	65	12.86
Goldeneye	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0.15	1	0.29
Goosander	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.15	2	0.29
Great black-backed gull	0	2	1	5	9	6	6	2	3	1	3	2	2	9	3.23	6	3.29
Greenshank	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.08	1	0.14
Grey heron	1	5	7	8	9	9	6	4	4	5	2	7	1	9	5.23	9	5.29
Greylag goose	0	0	0	16	389	9	0	1	17	0	1	0	1	389	33.38	17	4

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Species	Apr 2017 (1)	May 2017 (3)	Jun 2017 (2)	Jul 2017 (2)	Aug 2017 (2)	Sept 2017 (2)	Oct 2017 (2)	Nov 2017 (2)	Dec 2017 (2)	Jan 2018 (1)	Feb 2018 (3)	Mar 2018 (2)	Apr 2018 (2)	Monthly Peak	Monthly Mean Peak	Winter Peak	Winter Mean Peak
Herring gull	14	37	41	60	525	58	77	39	100	20	67	37	30	525	85.00	100	56.86
Kingfisher	See Appendix 9.3: Confidential Ecology Features																
Knot	0	0	0	0	0	0	0	0	0	0	1	7	0	7	0.62	7	1.14
Lapwing	1	0	0	0	0	0	29	0	0	0	0	3	0	29	2.54	29	4.57
Lesser black-backed gull	2	3	3	5	7	5	2	0	0	4	0	0	4	7	2.69	5	1.57
Little egret	0	0	0	0	1	0	0	2	2	2	2	1	2	2	0.92	2	1.29
Little grebe	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0.23	0	0
Mallard	6	26	18	32	22	90	66	37	62	32	50	10	16	90	35.92	90	49.57
Moorhen	1	6	3	1	1	1	0	1	0	0	0	1	0	6	1.15	1	0.43
Mute swan	0	2	4	0	0	2	7	2	8	0	0	0	1	8	2.00	8	2.71
Oystercatcher	61	20	9	20	16	46	43	61	72	27	113	42	35	113	43.46	113	57.71
Pink-footed goose	9	0	1	6	4	20	997	583	204	500	702	1,021	256	1,021	331.00	1,021	575.29
Red-breasted merganser	2	1	2	6	1	0	0	4	3	1	6	1	6	6	2.54	6	2.14
Redshank	0	2	0	0	2	26	120	114	16	2	39	9	2	120	25.54	120	46.57
Ringed plover	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.08	0	0
Sandwich tern	0	0	0	1	45	1	0	0	0	0	0	0	0	45	3.62	1	0.14
Shelduck	3	8	25	680	46	31	18	2	9	3	5	6	16	680	65.54	31	10.57
Teal	0	0	0	0	0	10	77	36	66	231	87	33	13	231	42.54	231	77.14
Whimbrel	See Appendix 9.3: Confidential Ecology Features																
Wigeon	0	0	1	0	0	1	20	77	103	42	136	58	0	136	33.69	136	62.43

(n) is the number of individual surveys in the month

Species shaded grey are Firth of Forth SPA, Ramsar and SSSI qualifying species

## Goose Roost Surveys

### Survey Methods

- 4.12 Starting in September 2017, goose roost surveys were undertaken once every two weeks until the end of March 2018 (Table 6) (Gilbert, Gibbons and Evans 1998). Surveys were undertaken from VP1 to VP6 in the S1 and S2 survey sectors (Figure 9.1) out to 500m from the Kincardine Bridge and commenced one hour before civil dawn (i.e. when the centre of the sun is 6° below the horizon) and lasted two hours in total. Geese were counted with the aid of binoculars and telescopes from the VPs.

**Table 6: Survey Dates for Goose Surveys at Kincardine**

Survey Number	Survey Date
1	22 September 2017
2	6 October 2017
3	20 October 2017
4	3 November 2017
5	20 November 2017
6	5 December 2017
7	21 December 2017
8	5 January 2018
9	17 January 2018
10	1 February 2018
11	16 February 2018
12	8 March 2018
13	20 March 2018
14	29 March 2018

- 4.13 The number (and species) of geese roosting in S1 and S2 survey sectors was recorded and their spatial locations marked on a paper map. Additionally, the number of geese flying over and landing in the S1 and S2 survey sectors from another site or taking off from the S1 and S2 survey sectors to another site, was noted.

### Data Analysis

- 4.14 Analysis of the goose survey data was undertaken to identify the population size and distribution of geese within the survey area over winter. Bird data was derived for geese in the following ways:
- monthly peak count - the highest individual count of geese in a month;
  - monthly peak roost count - the highest individual count of roosting geese in a month;
  - winter peak count - the highest peak count between September and March (inclusive);
  - winter mean peak count - the mean (average) of all the monthly peak counts between September and March (inclusive); and
  - winter mean peak roost count - the mean (average) of all the monthly peak roost counts between September and March (inclusive).

### Goose Roost Survey Results

- 4.15 Pink-footed geese roosted overnight within the survey area, with a peak of 1,285 roosting birds recorded on 20 October 2017. All birds, with the exception of four observations (a total of 16 birds), were recorded roosting in Sector S2, to the south of the Kincardine Bridge. Within the survey area, no roosting was observed on the north side of the estuary (Figure 9.5).



- 4.16 A total of 46 flyovers (totalling 4,055 individual geese) were recorded during the survey period, with flocks ranging from single birds to a peak of 1,200 (recorded in October 2017).
- 4.17 Table 7, below, presents the monthly peak counts of pink-footed geese recorded during the goose roost surveys. The counts include all individuals recorded, including birds recorded as flying or loafing, with specific peak roost counts presented separately.

**Table 7: Monthly Peak Counts of Pink-footed Geese**

Species	Sept 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Winter Peak Count	Winter Mean Peak Count
Pink-footed goose	7 (0)	3,249 (1,285 20-Oct)	824 (758 07-Nov)	225 (18 21-Dec)	2,739 (1,498 17-Jan)	1,594 (502 16-Feb)	2,206 (1,755 08-Mar)	3,249 (1,755 08-Mar)	1,549.14 (830.86)

(n) peak number roosting and *date of record*, if applicable.

**Species Accounts from TTTC surveys and Goose Roost Surveys**

- 4.18 Overall, 39 wetland bird species were recorded within the survey area. Full species accounts are provided in Table 8.

**Table 8: Wader and Wildfowl Species Accounts**

Species	Species Accounts
Bar-tailed godwit	Bar-tailed godwit was recorded on sixteen occasions during the TTTC all on the mudflats on the southern side of the bridge. A peak of 17 bar-tailed godwit was recorded in November 2017. This peak count in November also represents the winter peak count for this species. Bar-tailed godwit was recorded feeding, roosting and loafing throughout all tidal states during the survey period.
Black-headed gull	A total of 642 records of black-headed gull were made during the TTTC surveys; black-headed gull was the most recorded gull species with a monthly peak count of 638 on 28 August 2017. Of all the records, half (321 records) were records of individuals or groups flying over the survey area. Black-headed gull was frequently recorded feeding and loafing within the survey area, but most activity was recorded in the southern sectors (378 records in S1 and S2 compared to 264 records in N1 and N2).
Canada goose	Canada geese were recorded in April, May, September and October 2017 in small flocks, with a monthly peak count of 49. This monthly peak count was recorded in September and also represents the winter peak count for the species. All but one record was made within the southern sectors of the survey area. No Canada geese were recorded during the goose surveys and this species is not considered to roost in the survey area.
Common guillemot	All records of guillemot were made in spring 2018 with a monthly peak count of five on 10 April 2018. All birds were recorded loafing for feeding and were mostly observed in the northern sector of the survey area.
Common gull	Common gull was recorded 137 times in flocks up to 80 individuals. This record of 80 individuals comprises the monthly peak count and was recorded on 4 December 2017. This count also represents the winter peak count for the species. In total 656 common gulls were recorded over the winter surveys. During the breeding months, common gull was much less frequently recorded with a peak of only 11 gulls in late-August 2017.
Common sandpiper	Recorded occasionally over the survey period; common sandpiper was recorded nine times within the survey area. Most of the records were in the southern sectors of the survey area (seven records in S1/S2 and four records in N1/N2), with individuals recorded in the same area in consecutive surveys, foraging within the channels in the saltmarsh. A peak count of two was made in July and August, with only single birds recorded over the winter TTTC surveys.
Common scoter	Common scoter was recorded once during the surveys; loafing in the estuary on the southern side of the bridge. This single record was made in September 2018 and indicates that common scoter rarely utilise the estuary near Kincardine Bridge.
Common tern	Common tern was recorded in the summer within the survey area, mostly as flyovers. No records of this species were made in winter months. A peak count of ten common tern was recorded on 19 May 2017.

Species	Species Accounts
	This species was recorded using the southern sectors more than the northern sectors, with six records of common tern in the sector N1 and 13 records of common tern in S1 and S2 combined.
Cormorant	Cormorant was recorded regularly over the survey period with a total of 243 records pertaining to 584 individual birds. Of these records only 32 were made in the northern sectors; a distinct preference for the southern side of the bridge was noted in the survey area. A monthly peak count of 31 cormorants was recorded in October 2017. This record also represents the winter peak count for this species during the surveys. Cormorant were observed fishing within the estuary and were frequently recorded in groups loafing on the saltmarsh and mudflats drying their wings.
Curlew	A total of 535 records of curlew were made during the TTTC surveys with a monthly peak count of 290 on 1 February 2018. This peak count represents the winter peak count for this species and was recorded in S2. Curlew was recorded in larger numbers over the winter, and as with other species, showed preference for the mudflats and estuarine habitats within the southern survey sectors.
Dunlin	A small number of records of dunlin were made during the TTTC surveys, all within 2017. A monthly peak count of 25 dunlin was recorded on 7 November 2017, loafing on mudflats south of the bridge. This count also represents the winter peak count for dunlin.
Eider	Records of eider were made in summer 2017 on both sides of the bridge. A monthly peak count of four eider was made in April 2017. All individuals were recorded during high tide.
Golden plover	Only recorded in the southern sectors, golden plover was recorded on five occasions during the TTTC surveys. A monthly peak count of 65 golden plover was made in October 2017, all of which were roosting on the saltmarsh. This count also represents the winter peak count for this species. Golden plover was only recorded in October and November 2017.
Goldeneye	Goldeneye was only recorded during the winter surveys in December 2017 and January 2018. A monthly peak of one, which also represents the winter peak count for goldeneye, indicates that the area around the Kincardine Bridge is not important in supporting this species over winter.
Goosander	A pair of goosanders were recorded in February 2018 loafing within the southern survey sector, S1. This was the only record of goosander over the entire survey period. Goosander are typically associated with freshwater.
Great black-backed gull	A total of 78 records of great black-backed gull were made over the survey period, mostly as single birds or small flocks. Most of the birds recorded were loafing within the survey area in groups with other gulls. A monthly peak count of nine was recorded in August 2017 recorded both in the southern and northern sectors of the survey area. The winter peak count for great black-backed gull was six and this peak count was recorded in both September and October.
Greenshank	A single loafing greenshank was recorded in October 2017 during low tide. No other records of greenshank were made during the surveys. Greenshank typically winter in larger numbers close to the coast.
Grey heron	Heron was recorded 172 times as single birds, up to groups of five. Most records pertain to loafing birds, however many birds were observed hunting at the edge of the saltmarsh and mudflats. Most records were made in the southern sectors (124 records in the south compared to 48 in the north) of the survey area. A winter peak count for this species of nine was recorded on September 2017. The peak count over the summer months was also 9 birds recorded in August 2018.
Greylag goose	Greylag geese were recorded in flocks up to 187 during the TTTC surveys, with a monthly peak count of 389 in late-August 2017. This species was not recorded during the roost surveys and is not considered to use the survey area as a key roost site. The winter peak count for this species was 17 made in December 2017.
Herring gull	The second most recorded gull species within the survey area; herring gull was recorded 690 times during the survey period and at least once on every survey. A monthly peak count of 525 was made on 28 August 2018 with birds recorded more frequently, and in much larger numbers, in the southern sectors on this survey. A total of 325 records of herring gull were flyovers only. Herring gull was also often recorded on the piers of Kincardine Bridge. The winter peak count for this species was 100 recorded in December 2017.
Kingfisher	See Appendix 9.3 (Confidential Ecology Features)
Knot	A peak count of seven knot was recorded on 20 March 2018. Knot was only recorded in February and March 2018 within the survey area and likely use the mudflats sporadically for foraging over-winter, likely favouring more coastal areas. The peak count of seven recorded in March also represents the winter peak count for this species.
Lapwing	Lapwing was recorded only to the south of the bridge. A peak count of 27 flying lapwing was recorded on 12 October 2017 however this flock was not observed on land within the survey area. This record represents the winter peak count for this species. Lapwing on the ground were observed as individuals or in groups of two only. It is likely that lapwing use the fields within the wider area.

Species	Species Accounts
Lesser black-backed gull	A total of 74 records of lesser-black backed gull were made during the TTTC surveys and this species was often recorded on the piers of Kincardine Bridge. A monthly peak count of seven was recorded in August 2018. Counts over the winter were lower, with four birds recorded as the winter peak count for this species.
Little egret	Little egret was recorded from August 2017 to April 2018 in the survey area, regularly observed during the surveys. Monthly peak counts of two were recorded in November to December 2017 and January, February and April 2018. Little egret was observed loafing and feeding on the saltmarsh and mudflats; all records were made in the southern sectors of the survey area.
Little grebe	Little grebe was recorded infrequently during the surveys with a total of five records over the whole survey period, all pertaining to individual records. Little grebe was only recorded in the Sustainable Drainage Systems (SuDS) pond to the south-west of the bridge. No records of little grebe were made during winter.
Mallard	The most frequently recorded waterfowl species within the survey area; mallard was recorded a total of 371 times over the TTTC surveys. Mallard was often observed roosting on the pipelines in the northern sector of the survey area at low tide. Mallard was recorded across the survey area and showed no obvious preference to the northern or southern survey sectors. A peak count of 66 birds was recorded in September 2017 and this represents the winter peak count for mallard also.
Moorhen	Moorhen was occasionally recorded during the TTTC surveys. A peak count of six moorhen was recorded in May 2017. All records of moorhen were in the SuDS pond within the S2 survey sector. Over winter moorhen were recorded on two occasions in November and March with a winter peak count of one.
Mute swan	Mute swan was recorded 18 times over the TTTC period with a peak count of eight in December 2017 flying over the survey area. This represents the winter peak count for this species. Most records of mute swan are loafing individuals or groups and almost entirely at the southern side of the bridge, with the exception of one record on 4 December 2017 in the northern survey sector.
Oystercatcher	Oystercatcher was recorded regularly over the survey period and a total of 261 records were made. A peak count of 113 oystercatcher was recorded on 1 February 2018. This record also represents the winter peak count for oystercatcher in the survey area. Oystercatcher was recorded in similar numbers in the winter and during the spring/summer months, however the monthly peak counts are higher over winter. Both sides of the estuary are used by oystercatcher and they appear to show less preference for the mudflats to the south than other waders recorded during the TTTCs.
Pink-footed goose	Pink-footed geese were the most recorded goose species within the survey area, recorded in large numbers particularly over winter. A total of 190 records of pink-footed geese were made during the TTTC of which 180 records were made on the southern side of the bridge. A monthly peak count during the TTTC surveys of 1,021 geese was made on 9 March 2018. This represents the winter peak count for this species during these surveys. However, the targeted goose roost surveys returned a monthly peak count of 3,249 geese in October 2018. Pink-footed geese were observed roosting on the mudflats and saltmarsh to the south of the bridge during the goose roost surveys, with many remaining to feed whilst others left the roost sites.
Red-breasted merganser	A total of 27 records of red-breasted merganser were made during the TTTC surveys, with most records pertaining to loafing birds. A peak count of six birds was recorded in July 2017 and April 2018. This species was more frequently recorded during the spring/summer months and more than half of the records were made in the southern sectors of the survey area. Over winter the peak count was six birds recorded in February 2018.
Redshank	Redshank was recorded on most of the surveys during the TTTC survey period and were recorded throughout the tidal states. Records of redshank were made on both sides of the estuary and a monthly peak count of 120 was made on 6 October 2017. This also represents the winter peak count for this species. Notably more redshank was recorded over winter than in the spring/summer months during the TTTC surveys.
Ringed plover	One loafing ringed plover was recorded in May in survey sector S2. This record was the only observation of ringed plover over the survey period. Habitats within the survey are suitable for this species for foraging, however ringed plover generally breed in coastal habitats.
Sandwich tern	Sandwich terns were mostly recorded in the summer which is expected for this species in the area, with a monthly peak count of 45 in August 2017. The majority of records pertain to small numbers of terns flying over the survey area. No records of Sandwich tern were made between September 2017 to March 2018.
Shelduck	Shelduck was recorded frequently in the spring/summer and a monthly peak count of 680 shelduck was recorded on 31 July 2017 (590 roosting, and 90 feeding, on the mudflats to the south east of the bridge (survey sector S2)). Over winter the counts of shelduck were lower with a winter peak count of 18 recorded in October 2017.
Teal	A total of 124 records of teal were made over the survey period, mostly within the winter months. A monthly peak count of 231 was made on 9 January 2018. This count also represents the winter peak count for this species. Most records pertain to loafing individuals or groups, however groups of roosting teal were also recorded, mostly on the southern side of the estuary.

Species	Species Accounts
Whimbrel	See Appendix 9.3 (Confidential Ecology Features)
Wigeon	A total of 89 records of wigeon were made during the TTTC with all but two records from the winter months. A monthly peak count of 136 wigeon was recorded in February 2018. This represents the winter peak count for this species. Wigeon was frequently recorded in the southern sectors of the survey area, with only one record of a pair of loafing wigeon on the north side of the estuary within the survey area.

## 5 Breeding Birds

### Desk-based Assessment

5.1 NBN Atlas Scotland (NBN Atlas Partnership 2018) provided eight records of bullfinch, two records of kingfisher and one record of each blackbird, woodcock, woodpigeon and chaffinch, within 10km of the Kincardine Bridge between 2008-2016 during the bird breeding season (March to August inclusive). Most records were of one individual; bullfinch were recorded in numbers more than one.

5.2 The 2003 ES undertook a breeding bird survey undertaken in April and May 2002 and recorded habitat suitability and presence of breeding birds (Scottish Executive 2003).

### Breeding Bird Survey Methods

5.3 Breeding bird surveys were undertaken between April-July (inclusive). A total of four surveys were carried out in 2017 (May to July) and two in 2018 (April to May) (Table 9). The surveys followed an adapted methodology based on common bird census (CBC) techniques (Marchant 1983) and Breeding Bird Survey (BBS) outlined in Bibby, Burgess, Hill and Mustoe (2000). A 'look-see' methodology was adopted whereby competent surveyors scanned the pre-defined survey areas and recorded breeding birds from each vantage point.

**Table 9: Survey dates for Breeding Bird Surveys at Kincardine**

Year	Day and Month
2017	5 May
	24 May
	20 June
	20 July
2018	11 April
	18 May

5.4 For each breeding bird survey, the surveyors followed the same routes and survey locations as stated for TTTC, utilising each of the VPs (Figure 9.1). All bird species were considered within 150m of the bridge. From 150m to 500m, surveys targeted SPA, Ramsar and SSSI designated species and any bird species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

### Data Analysis

5.5 Analysis was undertaken to identify species which were recorded breeding, the number of territories, and the distribution of breeding birds within the 500m survey area. Bird data was derived for each species in the following ways:

- number of records – the number of separate occasions an individual, or group, of birds was recorded;
- number of records of breeding evidence – the number of separate occasions an individual, or group, was recorded as:
  - nesting;

- singing;
- alarming or acting territorially;
- carrying food or nest material;
- paired in suitable habitat;
- recently fledged juvenile(s); and
- family groups.

**Breeding Bird Survey Results**

5.6 Sixty-eight species were recorded during the breeding bird surveys, of which 41 species (including one Schedule 1 species) showed breeding evidence within the survey area (Table 10 and Figure 9.6). Of these, ten are red listed species and 25 are amber listed species on the Birds of Conservation Concern (BoCC) Red List (Eaton, Aebisher, Brown, Hearn, Loch, Musgrove, Noble, Stroud and Gregory 2015). Two Schedule 1 species in total were recorded; peregrine and whimbrel. These species are discussed in Appendix 9.3 (Confidential Ecology Features).

**Table 10: Species and Breeding Evidence Recorded During Breeding Bird Surveys Only**

Species	BoCC Status	Scottish Biodiversity List	Breeding Evidence in the Survey Area (Number of Records of Breeding Activity)
Blackbird	Green	No	Yes (14)
Black-headed gull	Amber	Yes	Yes (1)
Blue tit	Green	No	Yes (3)
Bullfinch	Amber	Yes	Yes (1)
Buzzard	Green	No	Yes (2)
Canada goose	Green	No	Yes (1)
Carrion crow	Green	No	Yes (2)
Chaffinch	Green	No	Yes (16)
Chiffchaff	Green	No	Yes (15)
Coal tit	Green	No	No
Collared dove	Green	No	No
Common guillemot	Amber	No	No
Common gull	Amber	No	No
Common sandpiper	Amber	No	No
Common tern	Amber	Yes	No
Cormorant	Green	No	No
Curlew	Red	Yes	Yes (2)
Dunnock	Amber	Yes	Yes (9)
Feral pigeon	Green	No	No
Fulmar	Amber	No	No
Goldfinch	Green	No	Yes (7)
Great black-backed gull	Amber	No	No
Great crested grebe	Green	No	No
Great tit	Green	No	Yes (2)
Greenfinch	Green	No	Yes (4)
Grey heron	Green	No	No

Species	BoCC Status	Scottish Biodiversity List	Breeding Evidence in the Survey Area (Number of Records of Breeding Activity)
Herring gull	Red	Yes	Yes (2)
House martin	Amber	No	Yes (8)
House sparrow	Red	Yes	Yes (10)
Jackdaw	Green	No	No
Kestrel	Amber	Yes	No
Lapwing	Red	Yes	No
Lesser black-backed gull	Amber	No	No
Linnet	Red	Yes	Yes (9)
Little egret	Green	No	No
Little grebe	Green	No	No
Long-tailed tit	Green	No	No
Mallard	Amber	No	Yes (9)
Meadow pipit	Amber	No	Yes (11)
Moorhen	Green	No	Yes (1)
Mute swan	Amber	No	Yes (2)
Oystercatcher	Amber	No	Yes (11)
Peregrine	Green	Yes	See Appendix 9.3 (Confidential Ecology Features)
Pied wagtail	Green	No	Yes (1)
Pink-footed goose	Amber	No	No
Red-breasted merganser	Green	No	Yes (3)
Redshank	Amber	No	Yes (1)
Reed bunting	Amber	Yes	Yes (5)
Robin	Green	No	Yes (9)
Rook	Green	No	No
Sandwich tern	Amber	Yes	No
Sedge warbler	Green	No	Yes (4)
Shelduck	Amber	No	Yes (7)
Siskin	Green	Yes	No
Skylark	Red	Yes	Yes (16)
Song thrush	Red	Yes	Yes (10)
Sparrowhawk	Green	No	No
Starling	Red	Yes	Yes (11)
Stock dove	Amber	No	No
Swallow	Green	No	Yes (9)
Swift	Amber	Yes	No
Teal	Amber	No	Yes (5)
Whimbrel	Red	No	See Appendix 9.3 (Confidential Ecology Features)
Whitethroat	Green	No	Yes (8)
Willow warbler	Amber	No	Yes (14)
Woodpigeon	Green	No	Yes (4)

Species	BoCC Status	Scottish Biodiversity List	Breeding Evidence in the Survey Area (Number of Records of Breeding Activity)
Wren	Green	No	Yes (34)
Yellowhammer	Red	Yes	Yes (8)

5.7 Species breeding records by month are detailed in Table 11. The most abundant species recorded as showing evidence of breeding was wren.

**Table 11: Number of Records of Breeding Evidence within the Survey Area**

Species	May 2017*	June 2017	July 2017	April 2018	May 2018
Blackbird	3	3	2	4	2
Black-headed gull	0	0	0	1	0
Blue tit	0	0	0	3	0
Bullfinch	0	0	0	1	1
Buzzard	0	0	0	2	0
Canada Goose	1	0	0	0	0
Carrion Crow	0	0	0	2	0
Chaffinch	8	1	0	5	2
Chiffchaff	4	2	1	7	1
Curlew	0	0	2	0	0
Dunnock	3	0	0	4	2
Goldfinch	1	1	0	2	3
Great tit	0	1	0	0	1
Greenfinch	2	0	1	1	0
Herring gull	0	1	1	0	0
House martin	4	2	2	0	0
House sparrow	4	2	2	0	2
Linnet	4	3	0	2	0
Mallard	4	0	2	2	1
Meadow pipit	3	1	5	2	0
Moorhen	0	0	1	0	0
Mute Swan	1	0	0	1	0
Oystercatcher	3	1	1	4	2
Peregrine	See Appendix 9.3 (Confidential Ecology Features)				
Pied wagtail	0	0	0	1	0
Red-breasted merganser	1	0	1	1	0
Redshank	0	0	0	1	0
Reed bunting	3	1	0	0	1
Robin	4	1	0	3	1
Sedge warbler	2	2	0	0	0
Shelduck	0	2	2	2	1
Skylark	4	4	0	3	5
Song thrush	7	1	0	2	0
Starling	3	5	2	1	0
Swallow	5	3	1	0	0
Teal	0	0	0	5	0



Species	May 2017*	June 2017	July 2017	April 2018	May 2018
Whimbrel	See Appendix 9.3 (Confidential Ecology Features)				
Whitethroat	6	2	0	0	0
Willow warbler	14	0	0	0	0
Woodpigeon	1	0	0	2	0
Wren	13	5	5	8	3
Yellowhammer	2	2	1	2	1

\*Numbers are a combination of records from two surveys undertaken in May 2017

### Species Accounts from Breeding Bird Surveys

5.8 Full species accounts for birds recorded are detailed in Table 12. This includes a breakdown and discussion of breeding activity for each species within the survey area of the proposed scheme.

**Table 12: Breeding Bird Species Accounts**

Species	Species Accounts
Blackbird	Blackbird was regularly recorded in all survey months and bred within the survey area, with one adult observed carrying food for young in May 2017 in survey sector N1, and 13 other records indicating breeding throughout the season. A monthly peak count of three singing males in June 2017 provides an indication of a minimum number of three blackbird territories.
Black-headed gull	Black-headed gull was recorded in all months in flight over the survey area on 12 occasions including a peak count of 72 in May 2017. In April 2018 a pair of black-headed gulls were observed, however this species was not confirmed to have bred within the survey area.
Blue tit	A total of 15 records of blue tit were noted with three records indicating breeding presence. Breeding presence was only noted in April 2018, however this species was recorded during all surveys, but only once in the southern survey sectors. The majority of records were from survey sector N1 within scrub habitat.
Bullfinch	Only three records of bullfinch were recorded in the surveys. A bullfinch pair were observed in suitable habitat in April 2018 and this species is considered to have bred within the survey area. Records were from the northern survey sectors only.
Buzzard	Buzzard was recorded flying within the survey area (in survey sector S2 only), with pairs observed in April 2018. Buzzard are likely to have bred within the habitat surrounding the survey area, however breeding presence was not confirmed.
Canada goose	A pair of Canada geese were observed in May 2017 in the survey sector S1. Only one record of Canada geese during the breeding surveys was made and no conclusive evidence of breeding was noted.
Carrion crow	A total of 38 records of carrion crow were noted across the survey months, including two records indicating breeding presence. In April 2018 a pair of carrion crow were observed with nest material indicating breeding nearby. This species was recorded in all survey sectors.
Chaffinch	Chaffinch was regularly recorded in all survey months and are considered to have bred within the survey area. The records indicate a minimum of seven chaffinch territories within the survey area. Most of the records of chaffinch were from the northern survey sectors (N1 and N2), however chaffinch was recorded at least once in all survey sectors over the course of the breeding bird surveys.
Chiffchaff	Chiffchaff was recorded in all four survey months, mostly in song. A peak count of seven singing males in April 2018 indicated a minimum number of territories within the survey area. No other evidence of breeding was noted, but this species is considered a possible breeder within the area. All records were from the north side of the estuary within vegetation adjacent to the railway.
Coal tit	Only one observation of coal tit was recorded during the breeding bird survey. This species is not considered to have bred within the survey area due to the lack of observation, however suitable habitat exists within the area so breeding in future is possible.
Collared dove	One record within the survey area during the breeding season. This species was only observed flying over the survey area and is not considered to have bred.
Common guillemot	Eight records of this species were recorded during the breeding surveys, all as individuals (except one group of three). The species was only observed foraging in the area and no evidence of breeding was noted.
Common gull	This species was only observed flying over or on the ground. A peak count of five common gull was made during the May 2017 survey. This species is not considered to have bred within the survey area.
Common sandpiper	Two observations of common sandpiper, foraging in the saltmarsh in survey sector S1, were recorded in May and June 2017. No evidence of breeding was recorded.



Species	Species Accounts
Common tern	Six records of common tern were made in the breeding bird surveys, with a peak count of four flying over in May 2017. No breeding evidence for this species was observed. It is likely that birds observed were foraging from a nearby breeding site.
Cormorant	Recorded during each of the surveys, cormorant utilise the survey area regularly throughout the breeding season. No evidence of breeding was recorded; however, this species was recorded all year round.
Curlew	A total of 45 records of curlew were made during all the surveys with a peak of 28 in July 2017. One record of curlew alarm calling was made in July 2017 and a juvenile was present during this survey also.
Dunnock	Dunnock was recorded in most of the survey months, mostly within the northern survey sectors, with a total of nine records of singing males. A peak count of four males in song in April 2018 indicate a minimum number of territories. Dunnock are likely to have bred within the survey area.
Feral pigeon	Recorded on one survey as a flyover. This species is likely to breed nearby, however no evidence of breeding within the survey area was noted.
Fulmar	A single fulmar was observed flying over the survey area in May 2017. No other records of this species were made. Fulmar did not breed within the survey area.
Goldfinch	Goldfinch was recorded regularly in all survey months and breeding evidence was noted for this species within the survey area (specifically, males in song). A peak of three males in song in May 2018 indicates a minimum number of goldfinch territories in the survey area. The majority of goldfinch observations were made in the northern survey sectors within the scrub and vegetation adjacent to the railway.
Great black-backed gull	Great black-backed gull was observed in the survey area in all months; however, no evidence of breeding was noted. All records were either flyovers or individual birds.
Great crested grebe	One record of great crested grebe was made in April 2018. No breeding evidence was noted and this record likely pertains to a single foraging individual.
Great tit	Two records of great tit indicate breeding within the survey area, however no confirmed breeding presence was noted. Great tits were only recorded four times over all surveys, with three records in survey sector N1 and one in survey sector S1.
Greenfinch	Greenfinch was recorded seven times during the surveys, with males recorded in song in May and July 2017 and April 2018. This species is a probable breeder within the survey area (specifically survey sector N1 where all records were made).
Grey heron	Individual grey herons were recorded within the survey area regularly during the breeding surveys, and at least once in each survey month. No evidence of breeding was noted, however the survey area does offer good foraging for this species.
Herring gull	Herring gull was regularly recorded within the survey area and juveniles were observed in June and July 2017. This species is considered to have bred within the survey area.
House martin	House martin was recorded nesting on the Kincardine Bridge at the northern extent (within survey sector N2). The nest was active throughout the surveys in 2017.
House sparrow	House sparrow was regularly recorded and bred within the survey area, evidence by adults observed carrying food in May 2017. All records are on the northern side of the bridge, particularly associated with the scrub vegetation and residential properties nearby.
Jackdaw	One record of jackdaw was made in the survey period. This record comprises a flyover and no evidence of jackdaw breeding was noted.
Kestrel	A single kestrel was recorded in May 2017. It is considered that kestrel did not breed within the survey area.
Lapwing	Only one record of lapwing was recorded during the breeding bird surveys; this record was of a single bird flying over the north survey sector (N2). No evidence of lapwing breeding was recorded during the surveys.
Lesser black-backed gull	Lesser black-backed gull was recorded regularly during the surveys, although no confirmed breeding was noted. All records made were relating to single birds or flyovers in the survey area.
Linnet	Probably breeding within the survey area, linnet was recorded showing evidence of breeding nine times in total over the survey period. Pairs of linnets were observed in May and June 2017 and April 2018. A total of 27 records of linnet were recorded during the breeding season.
Little egret	Recorded only as a flyover during the breeding bird surveys, no evidence of breeding activity was noted during the surveys. Of note, this species was recorded several times during the TTTC surveys, with two individuals recorded in the area during the same surveys. The little egrets recorded at Kincardine are considered to be towards the northern extent of their range in the UK.
Little grebe	Recorded twice in the 2017 surveys (June and July), this species is unlikely to have bred within the survey area. Each record is a single individual, within the southern survey sector S2, and there was no further evidence to suggest this species bred.
Long-tailed tit	Long-tailed tit was recorded once in May 2017. This species may breed within the area; however, no evidence of confirmed breeding was recorded and only one record over the breeding season was made.

Species	Species Accounts
Mallard	Mallard was recorded in all survey months within the survey area. This species was observed in pairs, during the breeding season on seven occasions and juveniles and a family group were also recorded in July 2017. This species is confirmed to have bred within the survey area.
Meadow pipit	Meadow pipit was recorded throughout the breeding season with a peak of nine records in July 2017. In July 2017 adults with food were recorded, as well as family group and juveniles. In April 2018 aggressive displays were recorded indicating early breeding attempts for this species.
Moorhen	Recorded in the SuDS pond on the southern side of the bridge, moorhen was recorded on three occasions during the breeding surveys. This species was recorded as a pair in July 2017 and is likely to use the SuDS pond for breeding, however no confirmed breeding presence was noted.
Mute swan	Mute swan was recorded on four occasions during the surveys in May, June and July 2017 and April. In May and April this species was observed in pairs indicating breeding behaviour; no conclusive evidence of breeding was observed during the surveys however.
Oystercatcher	A total of 55 records of oystercatcher were noted within the survey area, of which 11 pertain to breeding evidence records. Oystercatcher were observed nesting in May 2017 and in May 2018. This species is observed frequently throughout the year and has bred in consecutive years within the survey area.
Peregrine	See Appendix 9.3 (Confidential Ecology Features)
Pied wagtail	Pied wagtail was recorded occasionally during the breeding season. One observation of a pair was made in April 2018, however no confirmed breeding evidence was noted. Habitats within the survey area offer nesting opportunities for pied wagtail.
Pink-footed goose	Pink-footed geese were recorded 23 times during the breeding season surveys and were regularly recorded during all surveys over the year. Pink-footed geese did not breed within the survey area, however the site is used by this species during the breeding season.
Red-breasted merganser	This species was recorded six times during breeding season, with two records pertaining to pairs of red-breasted merganser and one to a family group. This confirms breeding presence of this species with the survey area in 2017. No confirmation of breeding was recorded during the 2018 surveys.
Redshank	Redshank was recorded on two surveys during the breeding bird surveys (June 2017 and April 2018). No evidence of confirmed breeding was recorded, however agitated behaviour was recorded in April 2018 indicating possible breeding nearby. This species was recorded on several occasions throughout the year during TTTC surveys also.
Reed bunting	Reed bunting was recorded on 12 occasions within the survey area during the breeding bird surveys. Five records indicate breeding evidence within the survey area. This species is a probable breeder within the survey area nearby the SuDS pond; most records of this species located near this pond.
Robin	Recorded in song on eight occasions, robins are considered to breed within the survey area. Three males in song during the April 2018 survey indicate a minimum number of robin territories in the survey area. Most records of robin were made in survey sector S1 particularly adjacent to the access road that runs along the sector boundary.
Rook	Rook was recorded once during the breeding bird surveys. Rook are not considered to breed within the survey area.
Sandwich tern	Two records of flyovers (an individual and a group of 12) were recorded in the surveys in July 2017. This species uses the survey area for foraging, however no breeding evidence was noted.
Sedge warbler	Sedge warbler was recorded in May and June 2017 only, however records were made in the same survey sector on consecutive visits. Breeding evidence indicates a minimum of two territories within the area.
Skylark	Skylark was recorded on 17 occasions during the breeding bird surveys. All records except one were made in the fields to the south of the bridge. Breeding evidence suggests a minimum of four skylark territories.
Shelduck	Recorded in a family group in June and July 2017 and in pairs on several occasions, mostly within the southern survey sectors, during the breeding surveys. This species is confirmed to have bred within the area.
Siskin	One male siskin was recorded flying away from a perch on the northern side of the estuary. No other records of siskin were made in the breeding season and this species is not considered to have bred within the survey area.
Song thrush	A total of 14 records of song thrush were noted across the survey months, including 10 records indicating breeding presence within the survey area. Five males were recorded singing in May 2017 indicating a minimum number of territories.
Sparrowhawk	Two observations of individual sparrowhawks in flight were made in July 2017 and May 2018. It is considered that sparrowhawk did not breed within the survey area.
Starling	Starling was recorded on 30 occasions across all survey months with a peak count of 350 in July 2017. Eleven records of breeding evidence were made with juveniles recorded in May to July 2017.

Species	Species Accounts
Stock dove	Only two records of stock dove were made in July 2017, both of which pertain to flying records. No other observations of this species were made during any other surveys. This species is not considered to have bred within the survey area.
Swallow	A total of 38 records of swallow were made during the breeding bird surveys. Swallows were recorded nesting on the Kincardine bridge in 2017, with nests active from late May 2017. No observations were made in 2018, however the surveys were conducted earlier in the breeding season and it likely the swallows had not yet started breeding.
Swift	Swift was recorded in flight on one occasion. It is possible that this species bred within the survey, however no evidence of breeding was noted.
Teal	Five pairs of teal were recorded in April 2018, indicating possible breeding. No other evidence of breeding was noted, however teal are recorded regularly at the site over the year.
Whitethroat	Whitethroat was recorded on nine occasions from May and June 2017. A peak count of three singing males were recorded in June. This species is likely to have bred within the survey area.
Willow warbler	A total of 15 records of willow warbler were noted in May 2017. A peak of 12 males were recorded singing on 5 May 2017 on the northern side of the bridge (survey sectors N1 and N2).
Woodpigeon	A total of 64 records of woodpigeon were noted within the survey area. Woodpigeon bred within the survey area, evidenced by juvenile woodpigeons recorded in May and June 2017.
Wren	Wren was the most abundant breeding bird recorded during the survey and bred within the survey area. The records indicate a minimum of eight wren territories within the survey area.
Yellowhammer	Yellowhammer was recorded in each month in hedgerows and scrub vegetation north and south of the bridge. Breeding evidence suggests at least two territories within the survey area.

## 6 Great Crested Newt

### Desk-based Assessment

- 6.1 NBN Atlas Scotland (NBN Atlas Partnership 2018) provided records of great crested newt (GCN) within 10km of the Kincardine Bridge between 2008-2014 at Dunmore and Polmont. The 2003 ES did not identify any records of GCN (Scottish Executive 2003).

### Habitat Suitability Index Assessment

- 6.2 A Habitat Suitability Index (HSI) assessment of ponds was undertaken following the standard survey approach detailed in Evaluating the Suitability of Habitat for the Great Crested Newt (*Triturus cristatus*) (Oldham, Keeble, Swan and Jeffcote 2000; Amphibian and Reptile Group (ARG) 2010). This approach considers ten aspects of a waterbody to determine suitability to support a population of GCN, covering factors such as waterbody size and location, fish and waterfowl presence, and suitable adjacent terrestrial habitat. Results of the HSI assessment define waterbody suitability as one of five categories, ranging from Poor to Excellent. As HSI assessments were conducted outwith the GCN breeding season, Factor 10: Macrophytes was also removed from the calculations.
- 6.3 A desk-based assessment identified one pond for investigation (including HSI), which was the existing SuDS pond located at NS 91902 86740, which achieved a HSI score of 0.30 (poor suitability) (ARG 2010). In addition, there was poor connectivity to the wider environment from this pond and negligible hibernation potential for GCN within the study area.
- 6.4 An updated HSI assessment of the SuDS pond was completed in November 2019. The pond achieved a slightly lower HSI score of 0.29 which is still within the poor pond suitability category (ARG 2010).

## 7 References

### Legislation

Wildlife and Countryside Act 1981 (as amended)

### Reports and Documents

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