RiverOak Strategic Partners

5.2-7 Environmental Statement Volume 7: Appendices 7.3 – 8.1

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Project Name:	Manston Airport Development Consent Order
Regulation:	Regulation 5(2)(a) and 5(2)(e) (Appendix 8.2) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, as amended
Date:	July 2018

Volume 7 Contents

APPENDIX 7.3
BIODIVERSITY RECEPTORS, EVIRONMENTAL CHANGE AND ZOI TABLES

Appendix 7.3A: Evaluation of receptors

A1.1 **Table 7A.1** lists the receptors that are relevant to the assessment because they are either legally protected or of sufficient biodiversity importance that an effect on them could be significant, and which could be affected by the proposed development. A justification is provided for any receptors that are scoped out of further assessment because they are assessed as being of insufficient value for likely effects to be significant.

Table 7A.1 Evaluation of important receptors

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	**Legally protected and controlled species (see Box 7.2 in Chapter 7)?**	**Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?**	**Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)**	**Scoping conclusion**
Arable	No	No	All monoculture fields with little floral diversity. Common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value. Arable fields do support wintering waders including golden plover (Thanet Coast & Sandwich Bay SPA qualifying interest species), which is evaluated separately.	Scoped Out
Arable field margins	No	Yes	Very narrow field margins populated by common arable weed species. Receptor considered of poor quality and does not fulfil Priority Habitat criteria. Assessed as being of insufficient biodiversity value.	Scoped Out
Poor semi-improved grassland	No	No	Poor-semi-improved grassland is present across much of the Site. Poor semi-improved grassland is a common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value. This habitat may support priority species of invertebrate or invertebrate assemblages, as well as breeding priority bird species, which are evaluated separately.	Scoped Out
Semi improved grassland	No	No	Areas of semi improved neutral grassland is abundant within the site with as yet unknown degree of floral diversity. Areas of semi improved grassland are widely replicated within Kent. Past and current management practices include regular cuts and fertiliser application. Assessed as being of insufficient biodiversity value.	Scoped Out
Tall ruderal	No	No	A species-poor habitat which is common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value.	Scoped Out

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	Legally protected and controlled species (see Box 7.2 in Chapter 7)?	Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?	Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)	Scoping conclusion
Scrub (dense and scattered)	No	No	A species-poor habitat which is common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value.	Scoped Out
Amenity grassland	No	No	A species-poor habitat which is common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value.	Scoped Out
Buildings	Yes	Yes	Many site buildings with potential for roosting bats/barn owl.	Scoped In
Scattered trees	No	No	Scattered trees present within the Site typically comprising locally common, immature species. Where they are part of a hedgerow they are considered within that receptor. Otherwise, they are a common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value on this Site.	Scoped Out
Hedgerows (species-poor)	No	Yes	Few hedges of low quality, and some with ornamental species. Assessed as being of insufficient biodiversity value.	Scoped In
Standing open water/ponds	No	No	Two small waterbodies: one structure below ground levels and with no aquatic or marginal vegetation; the other an above ground level tank. Assessed as being of insufficient biodiversity value.	Scoped Out
Hardstanding	No	No	Extensive areas of hardstanding comprising concrete or tarmac surfaces (e.g. former runway, taxiing aprons and access roads) are present. Very limited flora. A common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value.	Scoped Out
Bare ground	No	No	Areas of disturbed soil and gravel, principally around buildings with limited flora. A common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value.	Scoped Out
Ephemeral/short perennial	No	No	Area of former bare ground (disturbed soil/gravel) with a sparse vegetation community comprising abundant and	Scoped Out

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	Legally protected and controlled species (see Box 7.2 in Chapter 7)?	Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?	Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)	Scoping conclusion
			widespread plant species. A common and widespread habitat throughout Kent and the UK. Assessed as being of insufficient biodiversity value.	
Traditional orchards	No	Yes	Habitats not sensitive to the any changes in air quality. It is not known if these orchards are intensively managed e.g. with densely planted apple trees with a heavily managed short amenity grassland understorey. Assessed as being of insufficient biodiversity value.	Scoped Out
Native woodland: Semi-natural broad-leaved woodland, broad-leaved plantation woodland and ancient semi-natural woodland, wet woodland	No	Yes	See Table 7B.1	Scoped In
Coastal floodplain/grazing marsh	No	Yes	See Table 7B.1	Scoped In
Bats	Yes	Yes	See Table 7B.1	Scoped In
Great crested newts	Yes	Yes	Absent from site and surrounding 500m	Scoped Out
Reptiles	Yes	Yes	See Table 7B.1	Scoped In
Breeding bird assemblage: **Priority/BoCC Red list species**	No	Yes	See Table 7B.1	Scoped In
Nesting birds	Yes	No	See Table 7B.1	Scoped in (legal requirements)
WCA Schedule 1 species: Breeding barn owl	Yes	Yes	See Table 7B.1	Scoped In
Kestrel	Yes	Yes	See Table 7B.1	Scoped out
Invertebrates/ invertebrate assemblages	No	Yes	See Table 7B.1	Scoped In

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	Legally protected and controlled species (see Box 7.2 in Chapter 7)?	Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?	Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)	Scoping conclusion
Badger	Yes	No	No evidence of badgers found on Site. Badgers are sufficiently common and widespread in Kent that an impact upon the local population would not be significant (in EIA terms). However, they cannot be scoped out at this stage due to legal requirements only.	Scoped out (except in relation to legal requirements only)
Terrestrial priority species (brown hare, common toad, hedgehog)	No	Yes	See Table 7B.1	Scoped In
Thanet Coast & Sandwich Bay SPA/Ramsar: **Wintering: Golden plover**	Yes	Yes	See Table 7B.1	Scoped In
Thanet Coast & Sandwich Bay SPA: **Wintering: Turnstone**	Yes	Yes	See Table 7B.1	Scoped In
Thanet Coast & Sandwich Bay SPA: **Breeding: Little tern**	Yes	Yes	See Table 7B.1	Scoped In
Thanet Coast & Sandwich Bay Ramsar: **Ramsar criterion 2: Supports 15 British Red Data Book wetland invertebrates.** **Ramsar criterion 6: Turnstone occurr at levels of international importance.**	Yes	Yes	See Table 7B.1	Scoped In
Stodmarsh SPA/Ramsar: **Wintering: Hen harrier**	Yes	Yes	See Table 7B.1	Scoped In
Stodmarsh SPA/Ramsar:	Yes	Yes	See Table 7B.1	Scoped In

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	Legally protected and controlled species (see Box 7.2 in Chapter 7)?	Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?	Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)	Scoping conclusion
Wintering: Bittern				
Stodmarsh SPA/Ramsar: **Breeding: Gadwall**	Yes	Yes	See Table 7B.1	Scoped In
Stodmarsh SPA/Ramsar: **Wintering: Gadwall**	Yes	Yes	See Table 7B.1	Scoped In
Stodmarsh SPA/Ramsar: **Wintering: Shoveler**	Yes	Yes	See Table 7B.1	Scoped In
Stodmarsh Ramsar: **Ramsar criterion 2 - six British Red Data Book wetland invertebrates, two nationally rare plants and five nationally scarce species; and a diverse assemblage of rare wetland birds.**	Yes	Yes	See Table 7B.1	Scoped In
Stodmarsh SAC: **Annex II species - Desmoulin`s whorl snail**	Yes	Yes	See Table 7B.1	Scoped In
Thanet Coast SSSI: **Annex 1 reefs and submerged or partially submerged sea caves.**	No	Yes	See Table 7B.1	Scoped In
Margate and Long Sands SCI (inshore marine): **a number of Annex I Sandbanks slightly covered by seawater at all times**	No	Yes	See Table 7B.1	Scoped In
Sandwich Bay SAC: **complex of Annex 1 shifting dune systems**	No	Yes	See Table 7B.1	Scoped In

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	**Legally protected and controlled species (see Box 7.2 in Chapter 7)?**	**Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?**	**Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)**	**Scoping conclusion**
Stodmarsh SAC/SSSI and Stodmarsh NNR: **Annex II species - Desmoulin's whorl snail**	No	Yes	See Table 7B.1	Scoped in
Sandwich Bay to Hacklinge Marshes SSSI: **Sand dune system and sandy coastal grassland; mudflats; saltmarsh; chalk cliffs; outstanding assemblages of marine plants and invertebrates; freshwater grazing marsh, scrub and woodland; outstanding assemblages of terrestrial plants and invertebrates; and nationally significant populations of waders.**	No	Yes	See Table 7B.1	Scoped in
East Blean Woods SSSI: **Primary deciduous woodland comprising mixed coppice with oak and sweet chestnut and a small plantation of Scot's pine. Diverse ground flora indicative of a long history of woodland cover. Also of interest for its moth and butterfly assemblage which includes the rare heath**	No	Yes	See Table 7B.1	Scoped in

Legally protected and/or 'Important' receptors recorded within the study area from desk study and/or field surveys	Legally protected and controlled species (see Box 7.2 in Chapter 7)?	Designated biodiversity sites and priority habitats and species (see Box 7.1 in Chapter 7)?	Justification if receptors are of insufficient value for effects to be significant (Box 7.3 in Chapter 7)	Scoping conclusion
fritillary. A wide range of woodland bird species.				
Preston Marshes SSSI: **fen vegetation and one of only two known localities in Kent for the rare sharp-leaved pondweed *Potamogeton acutifolius*.**	No	Yes	See Table 7B.1	Scoped in
Sandwich and Pegwell Bay NNR and Kent Wildlife Trust Reserve: **a complex mosaic of habitats of international importance for its bird population**	No	Yes	See Table 7B.1	Scoped in
Blean Woods SAC/NNR: **Ancient woodland and Blean Complex SAC Annex 1 sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli* and are one of the British strongholds for the heath fritillary butterfly**	No	Yes	See Table 7B.1	Scoped in
Prince's Beachlands LNR: **a complex mosaic of habitats of international importance for its bird population.**	No	Yes	See Table 7B.1	Scoped in
Bishopstone Cliffs LNR: **Clifftop grassland**	No	Yes	See Table 7B.1	Scoped in

Appendix 7B: Environmental changes and zones of influence

A1.2 Receptors have only been assessed against potential environmental changes to which they are likely to be sensitive. For example, “hedgerow” as a receptor would not be sensitive to light, noise and vibration. Whether a receptor is sensitive or not to an environmental change has been determined based on professional judgement, project design, statutory guidance and appropriate relevant literature.

A1.3 All designated sites with birds listed on the citation and individual bird assemblages are included within the ornithological section of **Table 7B.1** and assessed against specific environmental changes relating to birds only. Where designated sites also cite terrestrial habitats/species these are dealt with in Section 1 of the table. All environmental changes and the associated Zones of Influence (ZoI) in relation to ecological and ornithological receptors are described in **Table 7C.1**.

Table 7B.1 Environmental changes and Zones of Influence (ZoI)

Section 1 deals with ecological receptors and Section 2 with ornithological receptor

Receptor	**Environmental Change**	**ZoI (where receptor is sensitive to the environmental change) – distances defined in Table 7C**	**Receptor within ZoI?**	**Conclusion – is there the potential for significant effect and/or contravention of protected species legislation? (Yes/No – if no, a justification is provided on why the effects are scoped out)**
Section 1 – Ecological Receptors				
Deciduous woodland: Semi-natural broad-leaved woodland, broad-leaved plantation woodland and ancient semi-natural woodland, traditional orchard, wood pasture and parkland	Land-take/Land cover change/construction/ decommissioning	Within the construction/ decommissioning area	No	Yes – The receptor is within the ZoI.
	Dust deposition	Within 50m of construction/the Site	Yes	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of road, aircraft flight path	Yes	
Hedgerows	Land-take/Land cover change/construction/ decommissioning	Within the construction/ decommissioning area	Yes	No – Receptors would not be subject to significant effects due to environmental measures included within the proposed development, including new hedgerow planting along boundary of land parcel 1362, subject of habitat creation/ enhancement.
	Dust deposition	Within 50m of the Site	Yes	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of road, aircraft flight path	Yes	

Great crested newts	Land-take/Land cover change/construction/ decommissioning	Within the construction area and to a distance of 500m	No	No: species considered absent
	Increased light, noise and vibration	100m from proposed working area	No	
	Dust deposition	Within 50m of a construction site	No	
	Pollution	Within 15m of discharge outfall	No	
Bats	Land-take/Land cover change/construction/ decommissioning	Within the construction area	Yes	Yes – Receptor is within the ZoI.
	Increased light, noise and vibration	500m from proposed working area	Yes	
Badger	Land-take/Land cover change /construction/ decommissioning	Within the construction area	No	Yes – Receptor is within the ZoI. Absent from the Site although present adjacent field (land parcel 1362), identified as location for compensation (mitigation).
	Increased light, noise and vibration	30m from active sett	Yes	
	Increased vehicle movement	Within the Site and immediate area	No	
Reptiles	Land take/Land cover change	Within the construction area	Yes	No – Receptors would not be subject to significant effects due to environmental measures included within the proposed development.
	Increase vehicle movement	Within the Site	Yes	
Terrestrial priority Invertebrates (*Dorycera graminum*, stag beetle, Black-headed Mason Wasp, Four-banded Weevil-wasp, Heath Grasper, Hornet Robberfly Desmoulin's Whorl Snail, *Paraclusia tigrina, Homoneura interstincta, Dolichopus virgultorum, Sisyra dalii, Tillus elongates, Ptiolina obscura, Pipizella virens, Platycheirus immarginatus, Volucella inflate, Aulogastromyia anisodactyla, Dicraeus scibilis, Elachiptera pubescens, Speccafrons*	Land-take/Land cover change /construction/ decommissioning	Within the construction area	No	No – Receptors would not be subject to significant effects due to environmental measures included within the proposed development.

halophile, *Zophomyia tenella, Hylaeus pictipes, Neurigona erichsoni*, picture-winged fly, *pipunculid Nephrocerus flavicornis, Brachypalpoides lenta, Anopheles algeriensis* and moths/butterflies)				
Aquatic/marine priority Invertebrates: Shining ramshorn snail; *Peltodytes caesus*, dog whelk, oyster	Land-take/Land cover change /construction/ decommissioning	Within the construction area	No	No – Receptors would not be subject to significant effects due to environmental measures included within the proposed development. See Water **Chapter 8** for details of assessment of water borne effects. Should these species be listed within a designated site, these are dealt with separately under the named designated site receptor.
	Pollution	Within 15m of discharge outfall	Yes	
Terrestrial priority species (brown hare, common toad, hedgehog)	Land-take/Land cover change construction/ decommissioning	Within the construction area/the Site	Yes	No. Receptor would not be subject to significant effects due to environmental measures included within the proposed development. Environmental measures such as leaving no trenches left open overnight, no external lighting used between dusk and dawn and following Method Statements would reduce the risk to terrestrial priority species. Large areas of suitable habitat would be retained. The proposed works and associated environmental measures would not significantly impact local species populations.
	Increased light, noise and vibration	~30m from the construction area	Yes	
	Increased vehicle movement	Within the Site and associated external access routes	Yes	
	Pollution	Within 15m of discharge outfall	No	

Marine mammals (common seal, grey seal)	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No – Receptor would not be subject to significant effects due to environmental measures included within the proposed development. Only few records of these species have been recorded along the River Stour. Both grey and common seal are considered to be rarely present and there are no suitable haul out areas. Following the environmental measures within the proposed development notably, and the risk of killing/injuring these species and contravening legislation is considered to be very low to negligible. If a protected species is recorded within the working area, works would stop immediately and the project ecologist contacted. All in-water works would follow environmental measures listed within Water Environment **Chapter 8**. These would ensure no direct or indirect effects upon the receptor occur.
	Pollution	Within 15m of discharge outfall	No	
Marine and/or Freshwater fish (barbell, European eel, sea trout, Atlantic salmon, sea lamprey, thornback skate)	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No – Receptor would not be subject to significant effects due to environmental measures included within the proposed development. All in-water works would follow environmental measures listed within Water Environment **Chapter 8.** These would ensure no direct or indirect effects upon the receptor occur (and are scoped out in that Chapter) Consequently, pollution would be kept to a minimum. The proposed works and associated environmental
	Pollution	Within 15m of discharge outfall	Yes	

				measures would not significantly impact local species populations. See Water Environment **Chapter 8** for details of assessment of water borne effects.
	Air quality change/deposition	Within 200m of access road, aircraft flight path	TBC	
Thanet Coast and Sandwich Bay Ramsar	Land-take/Land cover change/construction/ decommissioning	Within the construction area/Site	No	Terrestrial habitats and invertebrates listed within citation not significantly affected by proposals. Environmental measures reduce any risk of indirect effects of water-borne pollution. See Water chapter 8.for details of assessment of water borne effects, and Air chapter 6. For details of assessment of air quality effects.
	Pollution	Within 15m discharge outfall	Yes	
	Dust deposition	Within 50m of construction/Site	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	Yes	
Stodmarsh Ramsar: The site supports a number of uncommon invertebrates and plants	Land-take/Land cover change/construction/ decommissioning	Within the construction area	No	Habitats, plants and invertebrates listed within citation not significantly affected by proposals as too distant. See Air quality chapter 6. For details of assessment of air quality effects.
	Dust deposition	Within 50m of a construction site	No	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Thanet Coast SSSI: Annex I reefs and submerged or partially submerged sea caves.	Land-take/Land cover change/construction/ decommissioning	Within the construction area/Site	No	Receptor would not be subject to significant effects (other than potentially for air quality changes) due to environmental measures
	Dust deposition	Within 50m of a construction site	No	

	Pollution	Within 15m discharge outfall	No	included within the proposed development. Environmental measures would ensure pollution is prevented and no indirect effects upon these designated habitats would occur.
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Sandwich Bay SAC: complex of Annex 1 shifting dune systems	Land-take/Land cover change/construction/ decommissioning	Within the Site	No	Receptor would not be subject to significant effects due to environmental measures included within the proposed development The SAC is listed for its shifting dune habitats, environmental measures would reduce any potential indirect effects of the proposed works.
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	Yes	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	Yes	
Stodmarsh SAC/SSSI and Stodmarsh NNR: Annex II species - Desmoulin's whorl snail	Land-take/Land cover change /construction/ decommissioning	Within the Site	No	Receptor would not be subject to significant effects due to environmental measures included within the proposed development Stodmarsh SAC/SSSI and NNR is located 7.7km from the Site and as such there would be no direct impact on the site. See Water Environment Chapter 8 and Air Quality Chapter 6 for detailed measures and assessment on water/air pathways.
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Sandwich Bay to Hacklinge Marshes SSSI: Sand dune system and sandy coastal grassland; mudflats; saltmarsh; chalk cliffs; outstanding	Land-take/Land cover change /construction/ decommissioning	Within the Site	No	Receptor would not be subject to significant effects due to

assemblages of marine plants and invertebrates; freshwater grazing marsh, scrub and woodland; outstanding assemblages of terrestrial plants and invertebrates.	Dust deposition	Within 50m of a construction area	No	environmental measures included within the proposed development Although within the ZoI due to the potential spread of dust and pollution, environmental measures included specifically for dust suppression and measures included within the Water Chapter relating to indirect pollution would reduce any potential significant effects to a non-significant level.
	Pollution	Within 15m discharge outfall	Yes	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	Yes	
East Blean Woods SSSI: Primary deciduous woodland comprising mixed coppice with oak and sweet chestnut and a small plantation of Scot's pine. Diverse ground flora indicative of a long history of woodland cover. Also of interest for its moth and butterfly assemblage which includes the rare heath fritillary.	Land-take/Land cover change /construction/ decommissioning	Within the Site	No	No. Receptor would not be subject to any significant effects. The SSSI is located 11.3 km from the Site and any indirect effects are considered negligible. Heath fritillary butterfly legislation would not be contravened due to the distance from the Site.
	Increased light, noise and vibration	~30m from suitable heath fritillary habitat	No	
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Preston Marshes SSSI: fen vegetation and one of only two known localities in Kent for the rare sharp-leaved pondweed *Potamogeton acutifolius*.	Land-take/Land cover change construction/ decommissioning	Within the Site	No	No. Receptor would not be subject to any significant effects The SSSI is located 8.8 km from the Site and any indirect effects are considered negligible. Areas of sharp leaved pondweed would remain unaffected.
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	

Sandwich and Pegwell Bay NNR and Kent Wildlife Trust Reserve: a complex mosaic of habitats of international importance for its bird population	Land-take/Land cover change /construction/ decommissioning	Within the Site	No	No. Receptor would not be subject to significant effects due to environmental measures included within the proposed development The NNR and KWTR is located 0.925 km from the Site, any potential indirect effects of dust or pollution are minimised by environmental measures.
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	Yes	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	Yes	
Blean Woods NNR: Ancient woodland and Blean Complex SAC: Annex I sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli and are one of the British strongholds for the heath fritillary butterfly	Land-take/Land cover change /construction/ decommissioning	Within the Site	No	No. Receptor would not be subject to any significant effects. The SAC/NNR is located 11.5 km from the Site and any indirect effects are considered negligible due to the implementation of environmental measures. Heath fritillary butterfly legislation would not be contravened due to the distance from the Site.
	Increased light, noise and vibration	~30m from suitable heath fritillary habitat	No	
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Prince's Beachlands LNR: a complex mosaic of habitats of international importance for its bird population. Noted for butterflies, fungi and reptiles.	Land-take/Land cover change /construction/ decommissioning	Within the Site	No	No. Receptor would not be subject to any significant effects. The LNR is located 3.68 km from the Site and any indirect effects are considered negligible. Reptiles and butterflies within the LNR would remain unaffected by works due to the distance of the proposed works.
	Dust deposition	Within 50m of a construction area	No	
	Pollution	Within 15m discharge outfall	No	

	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Bishopstone Cliffs LNR: Clifftop grassland	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No. Receptor would not be subject to any significant effects.
	Dust deposition	Within 50m of construction site	No	
	Pollution	Within 15m discharge outfall	No	
	Air quality change/deposition	Within 200m of access road, aircraft flight path	No	
Section 2 - Ornithology Receptors				
Thanet Coast & Sandwich Bay SPA/Ramsar: Wintering: Golden plover	Land-take/Land cover change /construction /decommissioning	Within the construction area/Site	No	Yes – Receptor is within the ZoI.
	Land-take/Land cover change /construction/ decommissioning : displacement	Within 100m of the Site	Yes	
	Increased light, noise and vibration from Site: Disturbance	Within 250m of the Site	Yes	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80dB Lmax contour	Yes	
Thanet Coast & Sandwich Bay SPA: Breeding: Little tern	Land-take/Land cover change / construction/ decommissioning	Within the construction area/Site	No	Yes. Receptor is within ZoI

	Land-take/Land cover change /construction/ decommissioning : displacement	Within 100m of the Site	No	Little tern no longer breeds within the Thanet Coast & Sandwich Bay SPA. Given the absence of this qualifying interest species from the SPA, no significant adverse effects are considered during either construction or operation. However, it is also predicted that any disturbance from noise/visual activity from the Proposed Development would not prevent the species from re-colonising the SPA.
	Increased light, noise and vibration from Site: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80dB contour	No	
Thanet Coast & Sandwich Bay SPA: Wintering: Turnstone	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	Yes – Receptor is within the ZoI. Marked decline in numbers using the SPA this century with the majority of birds using the northern extremities of the SPA and peak winter counts for Pegwell Bay from 2010/11 to 2014/15 ranging from 7 to 65 birds.
	Land-take/Land cover change /construction /decommissioning : displacement	Within 100m of the Site	No	
	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80 dB Lmax contour.		
Stodmarsh SPA/Ramsar: Wintering: Hen harrier	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No. Receptor is not within the ZoI.
	Land-take/Land cover change /construction /decommissioning : displacement	Within 100m of the Site	No	

	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80dB Lmax contour.	TBC	
Stodmarsh SPA/Ramsar: Wintering: Gadwall	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No. Receptor is not within the ZoI to be confirmed with further information on flight paths. Stodmarsh is 7.6 km distant from the Site.
	Land-take/Land cover change /construction decommissioning: displacement	Within 100m of the Site	No	
	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80dB Lmax contour.	No	
Stodmarsh SPA/Ramsar: Breeding: Gadwall	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No. Receptor is not within the ZoI to be confirmed with further information on flight paths. Stodmarsh is 7.6 km distant from the Site
	Land-take/Land cover change /construction/ decommissioning: displacement	Within 100m of the Site	No	
	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft	Within 500m vertical distance (altitude) and 1 km lateral distance of	No	

	taking off and landing: Disturbance	aircraft flight paths; and, for noise, below 80 dB Lmax contour.		
Stodmarsh SPA/Ramsar: Wintering: Bittern	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No. Receptor is not within the ZoI to be confirmed with further information on flight paths. Stodmarsh is 7.6 km distant from the Site
	Land-take/Land cover change /construction/ decommissioning displacement	Within 100m of the Site	No	
	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80 dB Lmax contour.	No	
Stodmarsh SPA/Ramsar: Wintering: Shoveler	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	No. Receptor is not within the ZoI to be confirmed with further information on flight paths. Stodmarsh is 7.6 km distant from the Site.
	Land-take/Land cover change /construction/ decommissioning: displacement	Within 100m of the Site	No	
	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, within 80 dB Lmax contour.	No	

Sandwich Bay & Hacklinge Marshes SSSI: **Over-wintering: Grey plover and sanderling** **Passage: Ringed plover**	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	No	Yes – Receptor is within the ZoI
	Land-take/Land cover change /construction/ decommissioning: displacement	Within 100m of the Site	No	
	Increased light, noise and vibration: Disturbance	Within 250m of the Site	No	
	Pollution	Within 15m of a discharge outfall	Yes	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, within 80 dB Lmax contour.	Yes	
WCA Schedule 1 species: **Breeding barn owl**	Land-take/Land cover change /construction/ decommissioning	Within the construction area/Site	yes	Yes – Receptor is within the ZoI
	Increased light, noise and vibration: Disturbance	Nest site on/within 250m of the Site	Yes	
	Pollution	Within 15m of a discharge outfall	No	
	Increased light, noise and vibration from aircraft taking off and landing: Disturbance	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, within 80 dB Lmax contour.	Yes	

Appendix 7C: Justification for defining zones of influence

A1.4 Receptors have only been assessed against potential environmental changes to which they are likely to be sensitive. Whether a receptor is sensitive or not to an environmental change has been determined based on professional judgement, project design, statutory guidance and appropriate relevant literature.

Table 7C.1 Justification for defining zones of influence (ZoI)

Environmental change	Receptor (sensitive to environmental change or scale of environmental change)	Zone of Influence	Justification
Land-take/Land cover change /construction/decommissioning	All receptors	Within Site	Land-take/land cover change will take place in areas where construction/decommissioning are planned. Other areas within and outside the site boundary will not be affected by land-take/land cover change.
	Japanese Knotweed	Within ~7m of a construction area	Rhizomes from Japanese knotweed are considered to extend up to ~7m laterally from the base of the parent plant (Knotweed Code of Practice, Environment Agency 2013). Any ground disturbance within this area may promote the spread of the species.
Disturbance - Displacement	Golden plover	Within 250m of Site	This zone of influence is based on a combination of best practice and professional judgment. 250m is a mean displacement distance for wintering golden plover at wind farm sites in Germany (Hotker *et a*l. (2006)[1].
	Other/all SPA/SSSI bird species	Within 500m vertical distance (altitude) and 1 km lateral distance of aircraft flight paths; and, for noise, below 80dB Lmax contour.	Results from the literature review (**Appendix 7.4**) indicate a precautionary Lateral Disturbance Distance at ground level of **1km** from flight paths at altitudes up to **500 m**. This review also indicates that above 500 m, there would be negligible levels of visual disturbance to birds on the ground due to the visual presence and shadow cast from the overflying aircraft.

[1] Hötker, H., Thomsen, K.-M. & H. Jeromin (2006): Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Michael-Otto-Institut im NABU, Bergenhusen.

Environmental change	Receptor (sensitive to environmental change or scale of environmental change)	Zone of Influence	Justification
			The review also indicates that at ground level, noise levels below 80 dB LAmax (see **Table 12.1 in Chapter 12**) are unlikely to result in disturbance to birds.
Increased light, noise and vibration	Designated Sites	Dependent on site qualifying features	Flora not considered to be impacted by light, noise or vibration. If any of the species below listed as a designated feature, ZoI listed below are implemented.
	Bats	500m from a construction area	Typically disturbance of roosting bats is unlikely to take place in areas over **500m** from the source. This is a precautionary distance based on professional judgement following a review of the Natural England and Natural Resources Body for Wales (previously CCW) guidance document 'Disturbance and protected species: understanding and applying the law in England and Wales' (2007).
	Badger	Sett ~30m from construction area	This zone of influence is based upon guidance from English Nature "Badgers and Development" (2002).
	GCN	Up to 500m from a construction area	This zone of influence is based on best practice guidance. Great crested newt mitigation guidelines, English Nature 2001.
	Barn owl	Nest site within 200m of Site	This zone of influence is based on best practice guidance. Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting (Shawyer, 2011)
	All SPA/SSSI qualifying interest species	Within 250m of Site	This zone of influence is based on a combination of best practice guidance and professional judgement. Disturbance buffer zone distance represents a precautionary approach for golden plover, based on a recommended 250m distance (Cutts *et al* 2009), set to sensitive species such as redshank.

Environmental change	Receptor (sensitive to environmental change or scale of environmental change)	Zone of Influence	Justification
Dust deposition	Designated sites, watercourses, waterbodies, Priority habitat and Priority plant species	Within ~50m of Site	The zone of influence is based on usual deposition distances for dust from construction sites.
Increased vehicle movement	Badgers, brown hare, hedgehog, reptiles	Within the Site and associated external access routes	This zone of influence is based on an increase in vehicle movement on site during construction/decommissioning and risk of direct collision.
Pollution	Statutory sites, watercourses, waterbodies, great crested newts, otter, water vole, aquatic Priority species	Within 7m of a watercourse bank-top and 15m for a tidally influenced watercourse	This zone of influence is based on the Environment Agency stand-off distance that negates the requirements for a Flood Defence Consent (from a main river). Distance represents a precautionary approach for ditches i.e. non main river. Based on potential inputs of pollution to watercourses and waterbodies from construction related surface run off (in the absence of mitigation measures).
Deposition of oxides of nitrogen[2] from engine exhausts/vehicle emissions	Change can result in enrichment and/or acidification of the environment leading to alteration of the plant community through changes in baseline conditions	European/international sites within 10km, and national/local sites within 2km of the proposal site.	Based on the Environment Agency's guidance note "*Air emissions risk assessment for your environmental permit*"[3]. To identify any significant effect, the air quality assessment will determine, in the long term, if the process contribution (PC) to air concentration or deposition within any sensitive part of the designated site is more than 1% of the critical load and level. Where the PC is greater than 1% of a long term critical load or level and the predicted environmental concentration/deposition (PEC[4]) is greater than 70%

[2] Assessment of sulphur oxides (SO_2) has been scoped out as such emissions are expected to be negligible (see Air Quality chapter, section 6.4).
[3] Environment Agency (2016) 'Air emissions risk assessment for your environmental permit'. https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit, dated 2 August 2016.
[4] PEC = process contribution + background levels

Environmental change	Receptor (sensitive to environmental change or scale of environmental change)	Zone of Influence	Justification
	resulting in effects on (priority) habitats, flora, invertebrates, amphibians, bats, otters (as designated features of SACs) and birds (designated feature of SPAs)	European sites/ sensitive habitats within 200m of the construction/ operational site, and arrival/ departure roads to site.	this is a likely significant effect. In the short term, where the PC to concentrations within the designated site is less than 10% of the short term critical level, the emission is unlikely to have a significant effect. Over 10 km, the emissions due to aircraft moving to or from the airport are likely to be deposited in a dispersed manner due to their ejection at altitude. This will be determined as the assessment progresses. European sites/sensitive habitats within 200m of the construction/ operational site, and arrival/departure roads to site. This search parameter is based on Department for Transport (2005) Interim Advice Note 61/04: Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSIs.

Appendix 7.4
Bird Disturbance by Aircraft

amec foster wheeler

Technical note:
Bird Disturbance by Aircraft – a Literature Review

1. Introduction

1.1 Background

1.1.1 RiverOak Investment Corp LLC (RiverOak) is planning to reopen Manston Airport as a new air freight and cargo hub for the South East. This site is located within the district of Thanet in the county of Kent, close to the coastal town of Margate (the approximate central point of the site is at National Grid Reference [NGR] TR 330 657).

1.1.2 There was an operational airport at the site between 1916 and 2014. Until 1998, it was operated by the Royal Air Force as RAF Manston, and, for a period in the 1950s, was also a base for the United States Air Force (USAF). From 1998 it was operated as a private commercial airport with a range of services including scheduled passenger flights, charter flights, air freight and cargo, a flight training school, flight crew training and aircraft testing; in the most recent years it was operating as a specialist air freight and cargo hub servicing a range of operators. Although the airport was closed in May 2014 much of the airport infrastructure, including the runway, taxiways, aprons, cargo facilities and passenger terminal remain intact.

1.1.3 The proposed Manston Airport development involves the development of an air freight and cargo facility with the capacity to handle more than 10,000 air transport movements (ATMs) of cargo aircraft per year as part of the provision of air cargo transport services.

1.1.4 The airport location is within 2km of the Kent Coast which includes a number of sites designated for wildlife, and birds in particular. This includes Sandwich Bay to Hacklinge Marshes Site of Special Scientific Interest (SSSI), Thanet Coast and Sandwich Bay Special Protected Area (SPA) and Thanet Coast and Sandwich Bay Ramsar Site.

1.2 Bird Disturbance, Introduction

1.2.1 In an English Nature[1] Bird Network information note (Drewitt, 1999), disturbance to birds is described as “any situation in which a bird behaves differently from its preferred behaviour”. Disturbance of birds by naturally occurring phenomenon include changes of conditions (i.e. weather or tides) and the presence of predators. The same review also describes bird disturbance as “any situation in which human activities cause a bird to behave differently from the behaviour it would exhibit without the presence of that activity”. Human activities that can directly conflict with the natural environment, creating disturbance can include dog

[1] English Nature is now Natural England.

walking, fishing, over flight by aircraft, cycling and the use of boats and other vessels on water bodies.

1.2.2 Responses to disturbance can range from slight changes of behaviour such as becoming alert and observing the disturbance source to more major responses including taking flight and leaving a site for a number of hours or in some cases days (Drewitt, 1999). Species and individuals that respond to disturbance events by taking flight are typically expending greater levels of energy, and also reducing the time they have available to feed and as such are increasing pressure on their individual energy budgets, which has the potential to impact their survival and other functions such as breeding success (Burger 1981, Zonfrillo 1992, Davidson and Rothwell 1993).

1.2.3 In a review of disturbance of wildfowl in coastal/estuarine environments, (Davidson and Rothwell, 1993), disturbance of birds by overflying aircraft is identified as having the potential to cause widespread disturbance that can cause long-lasting changes in behaviour and in some cases, long term changes of distribution (Smit and Visser, 1989).

1.3 Purpose of this Report

1.3.1 This review looks at the available literature to assess typical responses of birds and in particular waterfowl (i.e. ducks, geese and waders) to overflights by aircraft. The effects of altitude, lateral distance and noise on the levels of disturbance are described, with the information being used to determine parameters that could inform the assessment of effects of aircraft operation on waterbirds. This includes:

1.4 Disturbance Altitudes and Distances – Existing Evidence

1.4.1 Bird disturbance due to commercial aircraft operation is an increasingly important issue in the UK due to current and proposed expansion of the aviation industry. In the UK to date, this issue has been identified as being investigated only with regard to two proposed extensions of smaller regional airports (i.e. at Lydd and Southend Airports. Impact assessments connected with these projects have identified much of the most relevant literature and this has highlighted that there is a paucity of contemporary and species or situation specific studies available.

1.4.2 Data from the UK and Europe is available, with much of the data relating to geese (Owens, 1977), waders (Heinen, 1986) and ducks (Komenda-Zehnder *et al.,* 2003), though there are also a number of studies from sites in the United States of America which provide useful information using analogous species (Belanger & Bedard 1989 and Miller 1994).

1.4.3 Additional information from airport management plans, bird strike management protocols and other construction manuals have also been reviewed and in some cases can provide useful information (IECS 2009 and Jacobs, 2009).

1.4.4 The most relevant report and a source of many of the references included in this review is the English Nature document from 1999 – *Disturbance effects of aircraft on birds* (Drewitt, 1999). This includes a summary of the disturbance effects of proximity on birds. Species referenced in this report include brent geese[2] (Owens 1977, Miller 1994 and Ward *et al.,* 1994), kittiwake, guillemot and gannet (Dunnet 1977, Zonfrillo 1992), waders; including lapwing, curlew and golden plover (Heinen 1986, Visser 1986 and Evans 1994) and ducks; including tufted duck and pochard (Komenda-Zehnder *et al.,* 2003).

1.4.5 Where possible, additional studies have been identified and accessed to provide additional evidence and figures.

1.4.6 In many of these studies, minimum disturbance altitudes have been estimated (i.e. the altitude at which no disturbance occurs) along with maximum disturbance altitudes (i.e. the

[2] The scientific names of all species mentioned in this report are provided in **Appendix 1**.

altitude at which all or the majority of birds are disturbed). A small number of the reports also provide lateral distances at which no disturbance occurs. Noise has also been considered in a number of reports, with studies and environmental assessments for other airports including measured noise levels to assess the tolerance limits of birds.

1.4.7 **Table 1.1** shows a summary of the species, the aircraft type observed and the disturbance altitude (minimum and maximum where available) and lateral distance (where available).

Table 1.1 Summary table of estimated disturbance altitudes and distances from available literature

Species and location	Aircraft type	Minimum disturbance altitude (m) (i.e. no disturbance)	Maximum disturbance altitude (m) (i.e. all or most birds disturbed)	Minimum lateral distance for no disturbance (Km)	Reference
Brent goose, Alaska, USA	Helicopter	1,220-1,830 m	305-460 m	-	Miller (1994)
Brent goose, Alaska, USA	Large plane	610 m	<610 m	>0.8km	Ward *et al* (1994)
Brent and Canada goose, Alaska, USA	Helicopter and civil aircraft	>1,000 m	305-760 m	1.2-2km	Ward *et al* (1999)
Brent goose, Alaska, USA	Helicopter	1,070 m	-	-	Jensen (1990)
Brent goose, Essex, UK	Small planes and helicopters	-	<500 m	1.5km	Owens (1977)
Kittiwake and guillemot, Aberdeenshire, UK	Helicopter/small fixed wing	150 m	-	-	Dunnet (1977)
Gannet, Firth of Clyde, UK	Larger fixed wing (Hercules)	-	200 m	-	Zonfrillo (1992)
Roosting shorebirds, Wadden Sea, Germany	Small planes	300 m	<150 m	-	Heinen (1986)
Shorebirds, Voordelta, Netherlands	Not specified	-	150 m	1km	Baptist & Meininger (1984)
Waders, Terchelling, Netherlands	Jets	-	-	>1km	Visser (1986)
Lapwing, curlew, golden plover and pink-footed goose, Ribble Estuary, UK	Microlights	300 m	<150 m	-	Evans (1994)
Tufted Duck, Coot, Pochard, Switzerland	Small plane	300 m	150 m	-	Komenda-Zehnder *et al* (2003)
Tufted Duck, Coot, Pochard, Switzerland	Helicopter	450 m	80 m	-	Komenda-Zehnder *et al* (2003)
Whooper Swan, Glasgow UK	Planes, Helicopter	-	-	1.3km	Rees *et al* (2005)
Brunnich's guillemot, Svalbard, Norway	Helicopter			>6km	Fjeld, *et al* (1988)

1.4.8 The studies of brent geese in the USA and UK provide a range of disturbance altitudes and distances. The studies from Alaska include both modelled (Miller, 1994) and observed responses (Ward *et al.* 1994 and 1999). The modelled approach used a simulation model that assessed the behavioural and energetic responses of a flock of 18,000 individual Pacific black brant[3]. This assessed two different types of helicopter (a Bell 206 and a larger Bell 412) flying through the area and modelled the responses of all geese within 3.3-3.5km from the flight line. The minimum disturbance altitudes for the two different aircraft were estimated at <915m for the Bell 206 and <1,065m for the larger Bell 412.

1.4.9 By contrast the field investigation at Izembek Lagoon, Alaska (Ward *et al.,* 1994) recorded responses to large fixed wing planes and found that the worst disturbance occurred with aircraft flying at altitudes of less than 610 m. This study also recorded a lateral disturbance distance with aircraft eliciting a response from the birds up to 800m away.

1.4.10 A later publication, regarding the same location (Ward *et al.,* 1999), investigated the impact of disturbance on Canada geese and found that species was less sensitive to disturbance events compared to brent geese. In this study, 51% of brent goose flocks flew in response to overflight by helicopters compared to only 11% of Canada goose. For planes, 33% of brent goose flocks flew, compared to only 5% of Canada goose flocks. For fixed wing aircraft, this study recorded a decreased disturbance impact, with increased altitude with minimum disturbance levels for both species occurring between 600 and 915m above ground level. For helicopters, no clear pattern is seen with fairly consistent levels of disturbance across all altitudes. This study found that lateral distance between the aircraft and bird flocks was the most important parameter, with responses of both species decreasing with increased distance values. Lowest levels of disturbance for both species were recorded at distances between 1.2km and 2km.

1.4.11 The variance in the results of these studies highlights a common theme across the literature that suggests that helicopters create greater levels of disturbance when compared to fixed-wing aircraft, often creating disturbance at much greater altitudes and lateral distances.

1.4.12 A study of brent geese in the UK (Owens, 1977) assessed the impacts of human disturbance at a number of sites around the Essex coast. A series of surveys were carried out, with the various responses to disturbance recorded. This included overflights by aircraft, loud noises and the presence of people on the ground. This study suggests that the brent geese were particularly susceptible to aircraft disturbance, particularly any plane less than 500m in altitude and up to 1.5km away. Slow and noisy aircraft were especially harmful, presumably due to the combination of both a visual and aural cue. The study does suggest that habituation is possible, with geese at Leigh Marsh ceasing to respond to regular aircraft departures from nearby Southend Airport, though unusual aircraft still caused a disturbance response in the same geese.

1.4.13 It is important to note that the type of aircraft encountered in 1977 are likely to have been considerably louder and slower than more modern aircraft. Additional studies have also suggested that brent geese are one of the more sensitive species of waterbird when considering disturbance by aircraft (Heinen 1986) suggesting that any altitudes or distances associated with this species are likely to be at the upper limit of any estimates for groups of species.

1.4.14 A review of research conducted in the Wadden Sea and delta area in the Netherlands (Smit and Visser, 1993) summarises disturbance altitudes and distances for a number of different species (including waders) and aircraft type. Observations from the Noordvaarder (Terschelling), an area in the Wadden Sea, (Visser, 1986) included instances of disturbance by military jets, helicopters and small civil aircraft as the area included test areas and shooting ranges for jets. The study suggested that helicopters and small civil aircraft cause considerably more disturbance both more frequently and over greater distances than the jet

[3] Brant is the North American name for Brent goose.

aircraft. This is likely to be connected to the speed and associated noise of the slower aircraft.

1.4.15 In this study, all of the aircraft encountered were at altitudes of less than 300m and while disturbance from jets could be detected up to 1.2km away, this caused relatively few disturbance events with birds taking flight between 5-16% of the time. Species studied in this research included oystercatcher, bar-tailed godwit and curlew. Oystercatcher were shown to be the most tolerant to disturbance, with bar-tailed godwit and curlew both exhibiting similar disturbance reactions.

1.4.16 The review by Smit and Visser (1993) provides a summary of the results from a PhD study carried out in the German Wadden Sea (Heinen 1986) that assessed disturbance responses of a number of different waterbird species. Brent geese were found to be the most strongly reacting species (disturbance in 64-92% of instances) along with curlew (42-86%) and redshank (70%); shelduck and bar-tailed godwit were found to be less sensitive (42% and 38% respectively). The study also found that civil aircraft flying at >300m disturbed in 8%, 150-300m in 66% and <150m 70% of cases.

1.4.17 In the UK, wader disturbance from overflights of ultra-light aircraft (i.e. microlights) were assessed in the Ribble Estuary (Evans 1994) along with the responses of over-wintering pink-footed geese. This report found that no detectable disturbance was observed in lapwing, curlew, golden plover and pink-footed geese when overflown by aircraft at altitudes greater than 1,000 feet (approximately 300 m), with the first signs of disturbance noted around 500 feet (approximately 150 m). Despite being based on a relatively short surveying period, the study suggests that the birds had become habituated to the aircraft.

1.4.18 A study of human disturbance impacts on overwintering whooper swans in the Black Cart floodplain, an area adjacent to Glasgow Airport (Rees *et al.,* 2005), found that while helicopters and aircraft created a disturbance response in feeding birds at lateral distances >1km, the response was only noted in a relatively low proportion of the feeding flock, especially when compared to other human disturbances (a mean of 31.5% birds, compared to a mean of 57.7% respectively). This study concludes that the reaction of the birds to aircraft was not “marked” and the presence of pedestrians had a significantly greater impact than vehicles (i.e. cars, vans, motorbikes) and aircraft. Whooper swans are particularly site faithful, often returning to the same wintering locations year on year. This study found that within the core flock of 100-130 birds, there were repeat sightings of a number of individuals that could easily be identified both within a winter and also to some extent between winters. Glasgow Airport is a fairly busy commercial airport with regular flights departing and arriving. The continued presence of this wintering population suggests that these birds have become habituated to the disturbance caused by the aircraft.

1.4.19 An experimental approach was taken to assess the effects of aircraft disturbance on waterbird populations on lakes in the lowlands of Switzerland (Komenda-Zehnder, 2003). A number of species were observed in these experiments, although the most abundant species were tufted duck, pochard and coot. In this experiment, 326 experimental overflights were carried out at a range of altitudes using both helicopters and civil aircraft. This study found that the behaviour of the birds was not significantly influenced if planes flew at 300m above ground level or 450m for the helicopter. The helicopters used in this study were larger and louder than the planes used making it difficult to determine whether the visual or acoustic cues were responsible for the differences in behaviour. The duration of the effect was also assessed, with most birds returning to “normal” behaviour within 5 minutes of the disturbance event. It was also noted that there were different responses to the two types of planes used in the experiment. A larger, slower plane had a much stronger effect, which is consistent with the findings of other studies (Smit and Visser 1993, Owens 1977).

1.4.20 Experimental overflights were also used to assess the effect of disturbance on a small sub-colony of Brünnich’s guillemot in Svalbard, Norway (Fjeld *et al.,* 1988). Using a Bell 212 helicopter, a large and quite noisy aircraft, a series of flights were carried out, with the responses of the colony recorded. The distance at which responses were recorded were as

far away as 6km (lateral distance). Responses were always recorded within the colony at lateral distances of 2.5km or less.

1.5 Noise Levels and Disturbance

1.5.1 Separating the effect of aircraft noise and the visual disturbance they can create is difficult, with the relevant literature often struggling to identify whether it is the audible or visual appearance of an aircraft that causes disturbance events. Kempf and Hüppop (1998) state that "*since the visual faculties of birds tend to be essentially far better developed than their auditory faculties, they respond less to noise than is generally assumed*" and while silent aircraft can cause similar reactions to noisy aircraft, some research (Ward *et al.,* 1999) suggests that louder aircraft cause more severe disturbance effects than comparable quieter aircraft.

1.5.2 Some efforts have been made to identify noise level thresholds, at which disturbance begins to have a detrimental effect, with modelled and observed noise levels becoming an important part of Ecological Impact Assessments of airport extension projects such as for London Ashford Airport (at Lydd, near Dungeness in south-east Kent) and London Southend Airport (in south Essex).

1.5.3 As part of supplementary information to the Environmental Statement for the expansion of London Ashford Airport (Parsons and Brinckerhoff, 2007), a literature review was completed, that drew together relevant studies that quoted recorded noise levels and bird disturbance, many of which focus on wildfowl species with much of the research carried out in North America.

1.5.4 In a study of harlequin duck in Canada (Goudie and Jones, 2004), birds that experienced regular exposure to overflights from military aircraft in a testing area, showed an intensification of alert responses when noise levels exceeded 80 dB(A)[4]. Repeated overflights were also shown to increase the likelihood of alert responses, with the effects of the exposure lasting for up to two hours after the event.

1.5.5 In response to a request to increase aircraft activity in a military area in North Carolina, USA, an assessment was carried out to determine if the waterfowl present at the site (American black ducks, American wigeon, gadwall and American green-winged teal) were adversely affected by aircraft disturbance (Conomy *et al.,* 1998). In this study, wildfowl responses were compared to aircraft overflights where the sound exposure levels exceeded 80dB(A). The level of 80dB(A) was chosen as the threshold to eliminate noise sources other than aircraft. This review suggests that the louder levels of aircraft disturbance did not adversely affect time-activity budgets for the observed waterfowl with ≤1.4% of their time spent responding to aircraft. Very few individual birds were disturbed by aircraft, with between 1.4% and 3.0% of the individuals observed showing any response.

1.5.6 Gadwall were also studied as part of this work. The study found that there was no relationship between the number of disturbance events (≥ 80dB(A)) and the number of disturbance reactions with only 3 out of 107 gadwall exhibiting any aircraft induced behaviour. Of these reactions, the disturbed gadwall typically returned to their normal behaviour after an average of 40 seconds (Conomy *et al*., 1998).

1.5.7 A study of crested tern, at a colony on the Great Barrier Reef, Australia (Brown, 1990), used recorded aircraft noise levels between 65dB(A) and 95dB(A) and recorded the behavioural responses of each bird in the colony. While alert and scanning behaviours became notable at noise levels of 65-70dB(A), the startle or escape responses were only recorded when exposure levels reached greater than 90dB(A).

1.5.8 Breeding gull colonies have been observed close to airports, and, as a consequence, it had been thought that they do not experience any negative effects from aircraft noise (Busnel,

[4] The noise metric 'A' in dB(A) stands for A-weighting. The term (A) can be taken as the same as L_{Amax} (the peak noise level).

1978 as cited in Burger, 1981). However, Burger (1981) showed that a herring gull colony located close to the Kennedy International Airport was disturbed by the high noise levels from landing supersonic planes (Concordes). To measure disturbance, the author counted the number of gulls that flew up in response to different noise conditions at the airport. The average noise levels were 77 dB(A) for ambient noise, 91.8 dB(A) for subsonic jet noise, and 108.2 dB(A) for noise from supersonic planes. The gulls did not react severely to the noise from subsonic planes, but did react to supersonic planes, such that there were twelve times as many birds that flew up than under normal conditions. These bird flights led to fights between individuals returning to their nests, which in turn caused eggs to be broken. The differences in responses to the subsonic and supersonic planes may also be due to other factors in addition to noise level. The author noted that the sound characteristics of supersonic planes are different and that they can cause vibrations when flying directly overhead. Furthermore, the supersonic planes landed once daily whereas subsonic jets landed every 2-3 minutes. Therefore, it was possible that the infrequency of the exposure to supersonic planes may not have allowed the gulls to habituate to the level of noise event.

1.5.9 In Minnesota, a study was conducted to investigate the effects of an airport expansion on nearby nesting black-crowned night heron, great blue heron and great egret (Grubb, 1979). A single engine propeller aircraft was flown over the nesting colony at 150-800 feet (490-2,620m). The calculated noise levels corresponding to these flight altitudes ranged from 61-88 dB(A), and were 9 dB(A) greater than calculated existing maximum aircraft noise levels and 20 dB(A) greater than measured ambient noise levels. No reactions were observed in the birds in response to these test overflights, although the author did not specify what behaviours he was examining.

1.5.10 In a study on the effects of low-flying military aircraft on a breeding wader colony in Florida (Black *et a*l., 1984), F-16 aircraft flights at 500 feet (152m) above ground level and with noise levels up to 100 dB(A) were not observed to greatly or adversely alter reproductive behaviour in the treatment colony. Breeding wading birds responded to military overflights in ways both similar to, and different from those reported for other species subjected to similar sound stimuli. The birds in this study responded differently during F-16 overflights with noise levels ranging from 55 to 100 dB(A) than they did during the absence of overflights. The responses to overflights, however, were not severe and were limited to no movement, head movement or in-place body movement (usually to an alert posture).

1.5.11 Whilst noise has the potential to have a disturbing effect on birds regularly overflown by aircraft, it is apparent from the literature that quantifying the level at which noise starts to have a detrimental effect on a population or concentrations of birds is difficult to separate from the visual impact and is likely to be both site and species specific.

1.6 Case Studies Related to Operational Airports/ Military Aircraft Activities in the UK

1.6.1 As stated previously, there is limited research and studies on the auditory disturbance effects of aircraft on birds in the UK, and therefore, it is important that any case studies into effects on birds at currently operational airports in the UK are also considered.

1.6.2 There are a number of operational airports in the UK that are located adjacent or close to SPAs designated for their congregations of non-breeding waterfowl and waders, including internationally important numbers of waders utilising mudflats for foraging. These include the civil airports at Belfast, Liverpool, Southampton, Bournemouth, London Ashford (Lydd) and Blackpool (amongst others), and military aviation activities/ operations.

1.6.3 **Table 1.2** presents a summary of results of a review of case studies related to the effects of aircraft flights from military and civil airports in the UK on nearby SPAs. This study was undertaken to inform the proposed expansion of London Ashford Airport in Kent (Parsons Brinckerhoff, 2007). Table 1.2 shows the nearby SPA(s) potentially affected by the airports (and the approximate distance of the SPA from the Airport runway, where applicable), and lists all the qualifying species of those SPAs in two columns. The first column ('Qualifying

species') shows only those species that are also qualifying species of the Thanet Coast and Sandwich Bay SPA/ Ramsar (in bold), and/or notified features of their constituent SSSIs. The second column ('Other qualifying species of wildfowl and waders') shows other qualifying species of wildfowl and waders that are not qualifying or notified features of the Thanet Coast and Sandwich Bay SPA/ Ramsar and constituent SSSIs. Species in italics appear only in the winter waterfowl assemblage qualifications for the SPAs. All qualifying features are for non-breeding populations unless otherwise stated.

Table 1.2 Airport Case Studies (Parsons & Brinckerhoff, 2007)

Airport Location(s)	Nearby SPA(s) and (distance from Airport)*[5]	Qualifying species	Other qualifying species of wildfowl & waders	Known impacts
Warton Aerodrome	Ribble Estuary SPA (100m)	**Golden plover**, ringed plover, sanderling, grey plover.	Bewick's swan, whooper swan, pink-footed goose, shelduck, teal, pintail, wigeon, *common scoter*, oystercatcher, *lapwing*, *curlew*, black-tailed godwit, bar-tailed godwit, dunlin, knot, redshank and common tern (breeding).	Despite noise from military and civil aircraft; the SPA has not been affected
Belfast City Airport	Belfast Lough SPA (200m)	**Turnstone**, *ringed plover*	*Shelduck, mallard, scaup, goldeneye, red-breasted merganser, great crested grebe, cormorant, oystercatcher, lapwing, curlew*, bar-tailed godwit, *black-tailed godwit, knot and dunlin*	Despite noise from jet and turbo-prop aircraft; the SPA has not been affected
City of Derry Airport	Lough Foyle SPA (100m)	**Golden plover**	Whooper swan, Bewick's swan*, greylag goose,* brent goose*, shelduck, mallard, teal, wigeon, eider, red-breasted merganser, great crested grebe, cormorant, oystercatcher, lapwing, curlew,* bar-tailed godwit*, redshank, knot and dunlin*	Despite noise from military and civil aircraft; the SPA has not been affected
Low-flying military jets from several airports	The Wash SPA, North Norfolk Coast SPA; Gibraltar Point SPA	**Golden plover, turnstone**, ringed plover, sanderling, grey plover and **little tern (breeding**)	Whooper swan, brent goose, *white-fronted goose*, pink-footed goose, shelduck, *mallard*, *wigeon*, pintail, *little grebe*, avocet, oystercatcher, *lapwing*, curlew, *whimbrel*, black-tailed godwit, bar-tailed godwit, redshank, dunlin, knot and common tern (breeding)	Despite noise from low-flying military jets, the SPA status has not been affected
RAF Lossiemouth & RAF Kinloss	Moray & Nairn Coast SPA (12km)*		Greylag goose, pink-footed goose, *wigeon, long-tailed duck, common scoter, velvet scoter, red-breasted merganser, oystercatcher*, bar-tailed godwit, redshank and *dunlin*	Despite mix of military jets (Tornado and Nimrod) and helicoptors, the SPA status has not been affected

[5] * For Airports marked with an *, functionally linked habitat used by qualifying bird species is likely to be located much closer to the airport

Dundee Airport & RAF Leuchars	Firth of Tay and Eden Estuary SPA (100m)	**Little tern (breeding),** *grey plover and sanderling*	Pink-footed goose, greylag goose, *shelduck, eider, goldeneye, long-tailed duck, common scoter, velvet scoter, red-breasted merganser, goosander, cormorant, oystercatcher,* bar-tailed godwit, *black-tailed godwit*, redshank and *dunlin*	Despite noise from military and civil aircraft; the SPA has not been affected
Glasgow Airport	Black Cart SPA (100m)		Whooper swan	Despite noise from civil aircraft; the SPA has not been affected

1.6.4 The case studies in Table 1.2 show that despite the visual and noise disturbance from civil and military aircraft flights over the SPAs, there have been no recorded adverse effects on their qualifying populations of waders and wildfowl. Further detail for some of these, and other, case studies is provided as follows.

Belfast City Airport

1.6.5 During 420 hours of detailed observation at Belfast City Airport (located 390m from Belfast Lough SPA), no significant bird disturbance events (defined for the purpose, as disturbance of >1% of any SPA feature species and/or SPA/ASSI assemblage species), were observed due to aircraft flights (Corvus Consulting, 2014). No behavioural reactions of roosting birds to aircraft overflight at altitudes of less than 20m, generating local peak noise levels of greater than 70dB(A), were recorded, indicating that local populations had readily habituated to continuing, regular, aircraft operations.

1.6.6 Flight operations have occurred at Belfast City Airport since 1937, with commercial aviation in operation since 1983. It was concluded that the birds using the nearby mudflats (primarily waders) had become heavily habituated to the sight of, and noise from over-flying aircraft. The high levels of habituation were likely a mechanism by which the birds were avoiding the need to take flight, which had resulted in maintaining the integrity of the SPA.

London Ashford Airport

A review was carried out by Parsons Brinckerhoff (2007) of studies, literature and case studies into the effects of noise from aircraft flights on birds for the purpose of informing the now consented expansion of London Ashford Airport, south of Lydd in Kent. The proposed airport expansion at Lydd, is to cater for up to 40,000 aircraft movements per year[6], including large aircraft, as proposed for the re-opening of Manston Airport. The number of pre-expansion, aircraft movements at London Ashford Airport had declined from 60,900 in 1979 to 19,400 in 1987[6].

The Dungeness to Pett Level SPA is located approximately 750m east and 500m south of the existing runway at London Ashford Airport. An extension to the SPA has been proposed (pSPA) which would result in the boundary of the SPA being closer to the Airport, and NE is also consulting on a proposed Ramsar site close to the airport. The SPA and pSPA consist largely of waterbodies used by roosting birds and arable and grassland fields adjacent to London Ashford Airport also provide feeding areas for concentrations of designated species.

The Parsons Brinckerhoff (2007) review concluded that disturbance effects in a range of bird species in response to aircraft noise do not occur at peak noise levels below 50 dB L_{Amax}. In some species, responses have been recorded at peak noise levels exceeding 80 dB L_{Amax}, whilst others were able to tolerate 90 or 100 dB L_{Amax}. At the time, the Dungeness to Pett Levels SPA already received peak noise levels from departing aircraft of 90 dB(A). In addition, the noise characteristics from jet aircraft appeared to be more tolerable to bird species than propeller-driven aircraft, and helicopters appear to be the most disturbing aircraft to birds.

1.6.7 The Environment Statement (ES) for the proposed development at London Ashford Airport concluded that there could be noise disturbance to some species at peak noise levels exceeding 80 dB(A), but that these species already occurred within the 88dB, 85dB, 82dB, and 79dB noise contours. No evidence was provided for any adverse effects on birds due to the sight of, and/or noise from over-flying aircraft during the operational period at London Ashford Airport (since the 1950s), and no link could be provided between the varying numbers of aircraft flights each year, and the corresponding size of the bird populations (London Ashford Airport, 2012). ES Supplementary Information provided for the London Ashford Airport application that referred to case studies at BAe Warton, Belfast City Airport, Derry Airport, Military Airports around the Wash SPA, Cape Wrath SPA, RAF Lossiemouth, Dundee Airport and Glasgow Airport demonstrated that

[6] Final court judgement for the expansion of London Ashford Airport. RSPB/Lydd Aiport v SSCLG & SST, dated 16 May 2014 (Neutral Citation Number: [2014] EWHC 1523 (Admin), Royal Courts of Justice Strand, London, WC2A 2LL.

ongoing activities at these airports had not affected qualifying bird species on nearby SPAs (see **Table 1.2**).

1.7 Existing Recommendations and Practice

1.7.1 The Civil Aviation Authority (CAA) recognise the potential impact of aircraft disturbance and provide the following recommendations for pilots with regard to areas with sensitive fauna (CAA 2012):

1.7.2 "*As elsewhere in the world, offshore islands, headlands, cliffs, inland waters and shallow estuaries attract flocks of birds for breeding, roosting and feeding at various times of the year. Within 20 nautical miles or so of such locations concentrations of birds flying mostly below 1,500 feet (457 metres) may be encountered.*

1.7.3 *In order to lessen the risk of bird strikes, pilots of low flying aircraft should, whenever possible, avoid flying at less than 1,500 feet above surface level over areas where birds are likely to concentrate. Where it is necessary to fly lower than this, pilots should bear in mind that the risk of a bird strike increases with speed (it is a fact that birds rarely hit an object moving slower than 80 knots). Apart from endangering aircraft by flying close to bird colonies, the breeding of the birds may be upset and the practice should be avoided on conservation grounds. It should also be appreciated that, especially in the case of sea bird colonies, concentrations of birds may be soaring on lee waves downwind of the areas where they breed.*"

1.7.4 Such advice is only an advisory notice for civil pilots and is made with reference to the disturbance risk to birds and also to bird strike risk for pilots. In addition to general avoidance altitudes, the CAA also publish information on "Bird Sanctuaries" which highlights locations of particular importance for breeding and wintering birds. Such locations are accompanied by specific avoidance altitudes and times of year, with sites protected by areas of up to 3 nautical miles (5.5km) and altitude limits up to 4,000 feet (1,219m) (CAA, 2012).

1.7.5 In the USA, the Federal Aviation Administration recommend that aircraft fly above 610m when crossing sensitive wildlife areas.

1.7.6 Many of the reviews and reports that have estimated disturbance altitudes and/or lateral distances have also provided recommendations of flight heights or distances that could be adopted to minimise disturbance to birds.

1.7.7 The English Nature information note (Drewitt, 1999) provided the following recommendations:

- Flights over sensitive bird areas should be at least 500m above surface levels and preferably over 1,000m (especially for helicopters).
- Unpredictable, curving flight lines are more disturbing than predictable, straight flight lines.
- Cliff-nesting and other colonial seabirds during the breeding season and flocks of waterfowl during the winter are most vulnerable, especially during severe weather conditions.

1.7.8 The experimental flights completed in Switzerland (Komenda-Zehnder, 2003) were commissioned by the Swiss Federal Office for Civil Aviation and the Swiss Agency for the Environment, Forests and Landscape with a view to informing advice relating to disturbance of birds by overflights of aircraft. This report, based on the responses of mixed assemblages of wildfowl, recommends a minimum flight altitude of 450m above ground level, an altitude that would compensate for both small planes and helicopters.

1.7.9 Expansion plans for Southend Airport were required to take into considerations the potential impact of aircraft disturbance on the adjacent Crouch and Roach Estuaries SPA/Ramsar/SSSI, which is located to the east of the airport and supports over 20,000 waterfowl during the winter (including brent geese). As part of discussions with Natural England, it was agreed that an increased flight frequency was not likely to result in any significant impact upon the designated features of the protected areas, assuming that "*the altitude of overflights remains unchanged from that currently employed*" (Jacobs 2009). Assessing the typical approach and departure protocols for the airfield, overflights of the designated areas by departing aircraft should be at altitudes of at least 1,500 feet

(457m) and between 1,500 feet (457m) and 730 feet (222m) on arrival. This provisional agreement was based on the assumption that the birds, already habituated to some degree to the flight paths and altitudes of aircraft would not be adversely impacted by an increase in the number of flights.

1.7.10 Guidelines for the operation of aircraft in Antarctica have been created to avoid conflict with the large breeding colonies of albatross, penguin and other seabirds (Antarctic Treaty Consultative Parties, 2004) suggest that all bird colonies are not to be over flown below 2,000 feet (approximately 610 m) above ground level and that all landings should not occur within half a nautical mile (approximately 930m) of bird colonies. It also goes on to recommend that a vertical separation of 2,000 feet (610m) and a horizontal separation of a quarter of a nautical mile (460m) should be maintained from the coastline where possible. Any flight that crosses the coastline should do so at right angles and above 2,000 feet (610m).

1.7.11 Similar flight altitudes are also recommended by the Canadian Wildlife Service, who carried out a detailed review of available literature, and concluded that any aircraft flying near areas with bird concentrations in the Inuvialuit Settlement Region, in the north-western Canada, should maintain a minimum altitude of 650m (2,100 feet) in areas known to support birds. However, where higher concentrations were known (bird sanctuaries, breeding colonies, moulting areas), a more cautionary altitude of 1,100m should be applied (Canadian Wildlife Service, 2006).

1.7.12 These final two recommendations have been prepared for particularly remote locations and the bird species found here are likely to be less habituated to disturbance events or background noise, so these should be treated as cautionary recommendations that suit these particular circumstances.

1.8 Bird Strike and Bird Scaring

1.8.1 In response to the potential risk of bird strike on and around airfields, most airfield operators utilise a range of different bird scaring methods to discourage birds from feeding, roosting or breeding on grass areas within airport boundaries.

1.8.2 The CAA provide detailed advice and recommendations for operators (CAA, 2014) and it is understood that this document will be used as the basis of any bird scaring activities within Manston Airport, should the site become operational.

1.8.3 The guidance document provides the following recommendation with reference to designated sites;

1.8.4 *"Aerodromes operating adjacent to or in close proximity to designated nature conservation sites should discuss their bird/wildlife control management plans with the relevant conservation agency to ensure that any activities carried out meet the requirements of the relevant environmental legislation."*

1.8.5 The guidance recommends that airfield operators undertake some degree of off-airfield wildlife surveys up to 13km from the airfield site to support their own policy with regard to safety. While there is some degree of flexibility in the design of any off-airfield bird/wildlife surveys, the assessments should be of a high enough quality to identify;

- Wildlife attractants; and
- Concentrations and regular movement patterns of hazardous birds at different times of the year.

1.8.6 Where airfields are located in close proximity to sensitive sites, this information can be used to tailor any bird scaring practices to ensure that scaring actions are not having any significant negative impact on designated species or locations.

1.8.7 Careful planning of grass management and the implementation of a "long grass policy" can discourage bird species from an airfield. However, in some cases, more active management practices may be required and it would likely be these that have the greatest potential to have a negative impact on any adjacent or nearby designated sites.

1.8.8 Active deterrents utilise a combination of visual and audible cues to control bird movements around an airfield, dispersing them effectively. Examples of active deterrents include;

- Distress calls;
- Pyrotechnic bird scaring cartridge (BSC) or bird scaring rockets;
- Lures;
- Birds of prey;
- Flags;
- Weighted plastic balls on water; and
- Plastic tape (that vibrates/hums in the wind).

2. Discussion

2.1 Designated Sites and Species

2.1.1 The proposed reopening of Manston Airport would result in increased volumes of air traffic arriving and departing directly overhead an area of coast that is protected by multiple designations. This section of coast is part of:

- Thanet Coast and Sandwich Bay SPA;
- Thanet Coast and Sandwich Bay Ramsar Site;
- Sandwich Bay to Hacklinge Marsh SSSI, and;
- Thanet Coast SSSI.

2.1.2 **Table 2.1** details the bird species that form part of the qualifying or notified interest of these statutory designated sites. The SPA and Ramsar sites, and Thanet Coast SSSI extend over considerable sections of the coast, covering areas of 1,881, 2,182 and 817 hectares (ha) respectively. These extend along the northern coast of Kent as well as the area around Ramsgate and Sandwich Bay. The area likely to be adjacent to the arrival and departure flight path, and therefore at greatest risk from regular disturbance, is Pegwell Bay, which forms the northern part of the Sandwich Bay to Hacklinge Marshes SSSI, but is also part of the Sandwich Bay and Thanet Coast SPA/Ramsar site.

Table 2.1 Summary of qualifying / notified bird species of statutory sites

Designated Site	Species included in designation
Thanet Coast and Sandwich Bay SPA (Natura 2000 Standard Data Form)	Turnstone (940 individuals representing at least 1.3% of the wintering Western Palearctic populations (5 year peak mean 1991/2-1995/6))
	Golden plover (411 individuals representing 0.2% of the wintering GB population (5 year peak mean 1991/92-1995/96)
	Little tern (six breeding pairs representing 0.3% of the GB breeding population 5 year mean, 1992-1996)
Thanet Coast and Sandwich Bay SPA (Third Review)	Turnstone (1,086 individuals representing at least 0.72% of the wintering Western Palearctic population (5 year peak mean 2004/5-2009/10))
Thanet Coast and Sandwich Bay Ramsar Site	Turnstone (1,007 individuals representing an average of 1% of the wintering Western Palearctic population (5 year peak mean 1998/9-2002/3))
Sandwich Bay to Hacklinge Marshes SSSI	The SSSI is notified for its non-breeding populations of golden plover, grey plover, ringed plover and sanderling, and its breeding bird assemblage associated with lowland open waters and their margins. The citation also makes reference to "*Large*" numbers of waders and wildfowl in winter and passage (spring & autumn), with dunlin being the most common species, and oystercatcher, curlew and redshank also occurring. Wildfowl include mallard, shelduck and brent goose, and breeding birds include ringed plover, oystercatcher and little tern.
Thanet Coast SSSI	The SSSI is notified for its internationally important numbers of non-breeding turnstone; nationally important numbers of non-breeding grey plover, ringed plover and sanderling; breeding little tern; and variety of passage birds. The SSSI citation makes reference to a breeding colony of little tern, in nationally important numbers, breeding on Plumpudding Island.

N.B. The numbers on the Natura 2000 Standard Data Form for Thanet Coast and Sandwich Bay SPA remain the figures to be used for Habitat Regulations Assessment purposes. The data from the Third Network Review of the UK SPA network (Stroud *et al*., [eds] 2016) is provided for context.

Turnstone

2.1.3 Turnstone is listed under both the Thanet Coast & Sandwich Bay SPA and Ramsar designations, and is a notified feature of the Thanet Coast SSSI; these sites supporting populations of both national and international importance. The species occurs almost exclusively in coastal habitats, particularly along rocky shorelines / beaches, and is very rarely seen inland.

2.1.4 Regular co-ordinated counts of turnstone have been carried out most winters between 2001 and 2016, designed to accurately record the number of turnstone within the Thanet Coast and Sandwich Bay SPA. The survey area is divided into 21 sectors, with the area around Pegwell Bay covered by two count sectors. The northern part of Pegwell Bay held peak numbers of 927 individuals in 2010 but in more recent years, as is common for the SPA in general, has supported fewer individuals. Between 2014 and 2016, typical counts were between 14-34 individuals though a count of 88 was recorded in March 2014 (Hodgson, 2016).

2.1.5 The survey also highlights that the main high tide roost sites for turnstone (i.e. roost sites that regularly support at least 10% of the total count) are located on the northern Kent Coast between Whitstable and Herne Bay (at its nearest point, approximately 13km northwest of Manston Airfield). During the monitoring program, other roost sites have periodically supported a larger proportion of the total count (than Whitstable to Herne Bay), such as the area east of Birchington (4km north of the airfield), however this site was used most regularly between 2001 and 2003. In the most recent survey (in 2016), all of the key roost sites were located on the northern part of the SPA between Whitstable and Margate.

2.1.6 Turnstone have been shown to habituate to human disturbance (Titley and Peckham, 2004) and were shown to tolerate presence of humans as close as 10 metres where activity was regular. Turnstone have been shown to habituate readily to regular disturbance and have a high tolerance to disturbance (see **Table 2.3**) and are therefore unlikely to be significantly affected by an increase in air traffic.

Golden Plover

2.1.7 Golden plover is also a qualifying species for the Thanet Coast & Sandwich Bay SPA, and is listed under “other noteworthy fauna” in the Ramsar designation. It is found throughout the winter (generally from October-March), where it feeds and roosts on both intertidal and inland areas around much of the Kent coast. One of the main concentrations of golden plover is around Pegwell Bay, where their main feeding habitat is on arable fields and grazing marsh located inland, outside of the SPA. The Wetland Bird Survey (WeBS) five-year peak mean count of golden plover for 2010/11-14/15 for Pegwell Bay (which is covered by WeBS Count Sector 22412) was 3,285 individuals (http://app.bto.org/webs-reporting/).

2.1.8 An English Nature Report from 2003 (Griffiths, 2003) identified the Pegwell Bay population of golden plover as one of two major populations within the wider Thanet Coast and Sandwich Bay SPA. This report found that while the Pegwell Bay population roosted or rested in significant numbers in the intertidal part of the bay, much of the populations’ feeding effort took place in the arable and pasture fields that border the designated area. This report recommended that all of the fields between Deal and Pegwell Bay (between Minster and Sandwich) and east of the River Stour should also be included in the SPA as they represented important feeding areas adjacent to the SPA.

2.1.9 More recent field utilisation has been discussed with the Sandwich Bay Bird Observatory and augmented with observations from winter bird surveys carried out by Amec Foster Wheeler in 2016/17. This has found that land utilisation by golden plover has not changed significantly (in terms of distribution and habitat type) since 2003. The southern part of Pegwell Bay is still well used by golden plover, along with a number of arable and pasture fields in the surrounding area. Of note in relation to potential disturbance from the proposals, is a small field directly to the south of Manston Airport (and adjacent to the northwest of Cliffs End village) where a flock of 530 golden plover were observed roosting by Amec Foster Wheeler staff on 9 November 2016. Golden plover were recorded in this field on two occasions, with the second and final observation involving two birds foraging there on 7 December) after which the field was ploughed, and no further golden plover were observed during the rest of the winter.

2.1.10 Unlike turnstone, golden plover show moderate response levels to disturbance (see **Table 2.3**). Of greatest concern with respect to the proposed development would be the potential impact of aircraft on feeding/roosting flocks using arable and pasture land in close proximity to the airfield that may also sit outside the SPA.

Little Tern

2.1.11 Little tern is listed as a designated species for the Thanet Coast and Sandwich Bay SPA and notified feature of the Thanet Coast SSSI, and historically has bred in two main locations; (i) Plumpudding Island (in Minnis Bay) on the northern coast (NGR TR280692, approximately 5km northwest of the airfield), and (ii) a point at the mouth of the River Stour and the northern extreme of Sandwich Bay, 2.5km from the eastern end of the airfield (English Nature 2000). The breeding population of little tern in the SPA has declined significantly since its designation, from a mean of 30 pairs during 1986-90 to six pairs during 1992-96. By 2000, regular breeding had ceased within the SPA and since 2009, no fledged young have been reported in the county (Clements *et al*. 2015). No nesting little terns were reported in Kent in 2014 (Privett [ed] 2016) and the species is now a passage migrant and non-breeding summer visitor to the Pegwell Bay area. Little terns are almost exclusively found in coastal habitats (and occur very infrequently inland), foraging in the shallow waters just offshore, and resting/ nesting on beaches.

2.1.12 Tern species have shown relatively high tolerance to aircraft noise (Brown, 1990), and it is likely that both of the breeding sites within the SPA are distant enough from the airfield for noise not to be of major significance.

Other Species

2.1.13 The Sandwich Bay to Hacklinge Marshes SSSI citation also makes reference to the SSSI providing an important landfall for migrating birds and supports large wintering populations of waders, some

of which regularly reach levels of national importance. **Table 2.2** provides the five-year peak mean counts (obtained from WeBS core high tide counts during 2010/11-2014/15) for the species listed in the SSSI citation (including grey plover, sanderling and ringed plover, which form part of the notified interest of the SSSI) for Pegwell Bay (http://app.bto.org/webs-reporting/). None of these figures exceed their respective national thresholds of importance for a site. The SSSI is also notified for supporting an important breeding bird assemblage associated with lowland open waters and their margins, though the citation provides no further details as to the species involved.

2.1.14 The Thanet Coast SSSI is also notified for its variety of migrant bird species that occur, though no specific species are provided in the citation.

Table 2.2 Five-year peak mean figures for species listed in the Sandwich Bay and Hacklinge Marshes SSSI (Pegwell Bay area only)

Species	5 year peak mean (2010/11 – 2014/15)
Brent goose	1,609
Shelduck	161
Mallard	362
Oystercatcher	946
Ringed plover	188
Grey plover	361
Sanderling	129
Dunlin	1,429
Curlew	520
Redshank	176
Little tern	52

2.1.15 TIDE (Tidal River Development) tool kit (http://www.tide-project.eu/), a project part funded by the European Union and created as part of Interreg IVB North Sea Region Programme. This toolkit has been developed to assist flood protection managers and ports developers in relation to waterfowl disturbance impacts arising from construction works within or adjacent to Natura 2000 sites. This tool is not designed to replace traditional methods of environmental assessment and monitoring, but to provide an initial high-level guidance in the identification of possible construction, waterfowl disturbance issues and assist in the development of appropriate mitigation methods where practicable.

2.1.16 As part of the tool kit, a waterbird disturbance mitigation tool (Cutts *et al.,* 2013) was created that features species accounts for a range of waterfowl and waders and categorizes them based on their tolerance of disturbance (green – least sensitive, to red – most sensitive). It has been assumed that all noise levels quoted, are measured as peak levels (dB_{LAmax}). As stated previously, the responses of birds to noise and visual stimuli are interlinked, and therefore direct comparison between ground-based construction works and over-flying aircraft is not always appropriate. **Table 2.3** provides details from the toolkit.

Table 2.3 Summary of species accounts included in the TIDE waterbird disturbance mitigation toolkit

Species	Disturbance Potential	Thanet Coast and Sandwich SPA	Thanet Coast and Sandwich Bay Ramsar Site	Sandwich Bay to Hacklinge Marshes SSSI
Brent goose	High Sensitivity - highly sensitive to noise disturbance and they react in a variable manner to visual disturbance. They have been found to react to up to 92% of aircraft passes although this declined to 64% with habituation.			**X**
Shelduck	High Sensitivity - generally highly sensitive to visual disturbance. However, the species is subject to a high degree of habituation and further exposure can lead to no response to stimuli.			**X**
Mallard	Moderate Sensitivity - relatively tolerant species that will habituate rapidly to activity. There is very little information on the effects of noise disturbance, but there was no observed response to loafing and foraging birds in a moderately 'noisy' tidal freshwater site on a busy navigation.			**X**
Oystercatcher	Moderate Sensitivity - relatively tolerant of disturbance and will habituate rapidly to ongoing activity. There is little information on the effects of noise disturbance, but direct observation at a highly disturbed site saw a reaction to only 9% of events with a degree of habituation assumed.			**X**
Ringed plover	Low Sensitivity; extremely tolerant with habituation - an extremely tolerant species that habituates to anthropogenic activities rapidly. Their reaction to noise or construction works is likely that again they have a high threshold given their general high tolerance.		**X**	**X**
Grey plover	Moderate Sensitivity - Limited data suggest that they are a relatively disturbance tolerant species, although their ability to habituate to works is unknown. It is also largely unclear how tolerant they are to noise disturbance			**X**
Dunlin	Low Sensitivity - a relatively tolerant species that habituates to various stimuli. Despite a general tolerance of visual disturbance they can be disturbed by overflying aircraft which combine visual stimuli with noise and have a resemblance to raptor predators.			**X**
Curlew	Moderate Sensitivity - evidence indicates that they are an extremely wary species that does not habituate to stimuli rapidly. Considered to be highly reactive to aircraft, although some observations have shown no reactions to machinery operation or aircraft passing overhead.			**X**
Redshank	High Sensitivity to Noise Disturbance; Tolerant of Visual Disturbance - relatively tolerant species that habituates to works rapidly. Despite a tolerance of visual disturbance, they are highly disturbed by overflying aircraft which have a resemblance to raptors. Redshank were seen to react to aircraft overhead at noise levels of 72 dB (heads-up) and 88 dB			**X**

Species	Disturbance Potential	Thanet Coast and Sandwich SPA	Thanet Coast and Sandwich Bay Ramsar Site	Sandwich Bay to Hacklinge Marshes SSSI
Turnstone	Low Sensitivity; extremely tolerant with habituation - thought to be an extremely tolerant species that habituates rapidly. There is no published evidence with regard their reaction to noise, but it is likely that again they have a high threshold.	**X**	**X**	
Golden Plover	Moderate Sensitivity; Reasonably tolerant of moderate level visual disturbance but birds closer than 200m to potential activities should be considered when commencing works and efforts should be made to avoid high level disturbance. Of particular note is the potential for inland roosts in arable fields adjacent to estuarine/riverine habitat – a similar disturbance distance threshold should be used. Golden Plover are moderately sensitive to noise stimuli but with little direct evidence, a precautionary approach assumes tolerance of noise up to 72dB being acceptable but with caution at levels above 55 dB (60dB in a highly disturbed area). As Golden Plover will roost to within 300m of plant this means that a source noise threshold of 120-125dB may be acceptable, but with caution above 107-112dB. As the species often flies between the intertidal and adjacent terrestrial habitat to roost and feed the presence of activity behind flood defences can also have an influence on behaviour.	**X**		**X**
Sanderling	Low Sensitivity; extremely tolerant with habituation - thought to be an extremely tolerant species that rapidly habituates to anthropogenic activity. They are tolerant of people, allowing walkers to approach as close as 6-50 m. No direct disturbance reactions relating to aircraft are listed in the toolkit though there was no evidence of reactions to noise levels up to 90 dB(A) from nearby piling operations.		**X**	**X**

N.B. **X** indicates species included in designation.

2.2 Conclusion and Recommendations

2.2.1 Given the species found in close proximity to Manston Airfield, the referenced material relating to wading bird species is of particular relevance and can be used as a proxy when estimating the likely responses to increased disturbance of the birds found in the area. It is also important to consider other species that are attracted to the area such as wintering mallard, shelduck and brent goose.

2.2.2 The altitudes at which aircraft are unlikely to disturb wading birds have been found to be on average 300m or more above ground level. Disturbance to other wildfowl (such as brent goose) is reduced at greater altitudes, typically between 450-610m. English Nature (now Natural England) recommend that flights should be in excess of 500m altitude, over sensitive areas for birds (Drewitt, 1999)

2.2.3 Lateral distances have not been as widely reported, though disturbance distances in excess of 1km have been reported for some species such as brent goose and whooper swan.

2.2.4 Noise levels in excess of 80dB(A) have been recorded as causing the more severe disturbance incidents in a number of studies. This included species such as harlequin duck, American wigeon, gadwall and crested tern. For golden plover, tolerance of noise levels up to 72dB(A) have been identified as having the potential not to disturb this species (Cutts *et al*., 2013).

2.2.5 To conclude, for the species that form the qualifying/notified interest of the Thanet Coast and Sandwich Bay SPA/Ramsar and Sandwich Bay to Hacklinge Marshes SSSI, significant levels of disturbance are unlikely to occur (within the SPA, and on other functionally linked habitat[7] used by the SPA/SSSI species), if:

- All over-flights are at, or in excess of altitudes of 500m;
- Aircraft flight routes ensure that aircraft are in excess of 1km from the SPA boundary; and
- The SPA boundary and functionally linked habitat used by SPA/SSSI species is outside the 80dB(A) noise contour for aircraft operations at the airfield (where noise levels would be at their greatest). For species that potentially react to lower levels of noise (such as golden plover), this noise contour can be lowered to 70dB(A).

2.2.6 While it is anticipated that some degree of habituation is likely to occur, given that the aircraft departures and arrivals at the Proposed Development will become regular and predictable, maintaining these buffer distances of both altitude and lateral distance should restrict the levels of disturbance and the designated areas affected.

[7] Functionally linked habitat in this context is defined as: Areas of land or sea outside of the boundary of a European site that may be important ecologically in supporting the populations for which the European site has been designated or classified. Occasionally impacts to such habitats can have a significant effect upon the species interest of such sites, where these habitats are considered to be functionally linked to the site (Natural England, 2016).

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Appendix 1. Species Names

The following table details the scientific names of any species listed in the above report

Species name	Scientific name
American black duck	*Anas rubripes*
American wigeon	*Anas americana*
Bar-tailed godwit	*Limosa lapponica*
Brent goose (Brant)	*Branta bernicla*
Brünnich's guillemot	*Uria lomvia*
Canada goose	*Branta canadensis*
Coot	*Fulica atra*
Crested tern	*Thalasseus bergii*
Curlew	*Numenius arquata*
Dunlin	*Calidris alpina*
Gadwall	*Anas strepera*
Gannet	*Morus bassanus*
Golden plover	*Pluvialis apricaria*
Great crested grebe	*Podiceps cristatus*
Greenshank	*Tringa nebularia*
Green-winged teal	*Anas carolinensis*
Grey plover	*Pluvialis squatarola*
Guillemot	*Uria aalge*
Harlequin duck	*Histrionicus histrionicus*
Kittiwake	*Rissa tridactyla*
Lapwing	*Vanellus vanellus*
Little tern	*Sternula albifrons*
Mallard	*Anas platyrhynchos*
Oystercatcher	*Haematopus ostralegus*

Pink-footed goose	*Anser brachyrhynchus*
Pochard	*Aythya ferina*
Redshank	*Tringa totanus*
Red-throated diver	*Gavia stellata*
Ringed plover	*Charadrius hiaticula*
Sanderling	*Calidris alba*
Shelduck	*Tadorna tadorna*
Tufted duck	*Aythya fuligula*
Turnstone	*Arenaria interpres*
Whooper swan	*Cygnus cygnus*

Appendix 7.5
Winter Bird Survey Report

RiverOak Strategic Partners

Manston Airport DCO EIA

Winter Bird Survey Report 2016-17

March 2018

Amec Foster Wheeler Environment
& Infrastructure UK Limited

Report for

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Document revisions

No.	Details	Date
1	Draft version	08/06/17
2	Final	26/03/2018

Contents

1. Introduction

1.1 Background

1.1.1 RiverOak Strategic Partners (RiverOak) intends to submit an application for development consent to reopen Manston Airport (hereon within this report referred to as the Site/ Order Limits) as a new air freight and cargo hub for the South East. The Site, covering approximately 303.2 hectares (ha), is located within the district of Thanet in Kent, close to the coastal town of Ramsgate. The approximate central point of the Site is at National Grid Reference (NGR) TR 330 657 (see **Figure 1.1**). The Order Limits for the Proposed Development include the operational part of the airport, and the outfall which runs into Pegwell Bay.

1.1.2 There was an operational airport at the Site between 1916 and 2014. Until 1998 it was operated by the Royal Air Force as RAF Manston, and, for a period in the 1950s, was also a base for the United States Air Force (USAF). From 1998 it was operated as a private commercial airport with a range of services including scheduled passenger flights, charter flights, air freight and cargo, a flight training school, flight crew training and aircraft testing. In the most recent years it was operating as a specialist air freight and cargo hub servicing a range of operators. Although the airport was closed in May 2014, much of the airport infrastructure, including the runway, taxiways, aprons, cargo facilities and passenger terminal remain intact.

1.1.3 The proposed Manston Airport development involves the development of an air freight and cargo facility with the capacity to handle more than 10,000 air transport movements (ATMs) of cargo aircraft per year as part of the provision of air cargo transport services.

1.2 Purpose of Report

1.2.1 This report details the methods adopted and results of a programme of winter bird surveys undertaken in 2016-17. These results will be used, along with the results from other ecological studies, to inform an Environmental Impact Assessment (EIA) to support a Development Consent Order (DCO) application for the Site. A list of the bird species mentioned in this report, with their scientific names is provided in **Appendix A**, with summary information on the legislation and designations relating to birds in **Appendix B**.

620000 625000 630000 635000 640000 645000

175000 170000 165000 160000 155000

Key

Order Limits

0 1 2 3 4 5km

Scale at A3: 1:80,000

Client

RSP

Manston Airport DCO
Environmental Statement
Winter Bird Report 2016/17

amec foster wheeler

Figure 1.1
Location of the Site

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2. Methodology

2.1.1 There are eight statutory designated nature conservation sites of ornithological importance within 10 km of the Site, the details of which (including the reasons for their designation and distance from the Site) are provided **Table 2.1**. The search distance of 10km is considered to be a distance beyond which, any statutory designated sites are highly unlikely to be adversely affected by the proposed development, through for example: visual and noise disturbance from overflying aircraft, noise disturbance from the airport itself, and any potential air pollution. It is acknowledged however that this distance may need to be reviewed and potentially increased as further information becomes available, and in light of consultation with bodies such as Natural England. The locations of these statutory sites are shown on **Figure 2.1**.

Table 2.1 Statutory designated sites of ornithological importance within 10km of the Site

Site name and designation	Site interest features	Distance and (direction) from Site
International		
Thanet Coast and Sandwich Bay – Ramsar	The Ramsar site (covering 2,169ha) is designated for supporting internationally important numbers of non-breeding turnstone (under Ramsar Criterion 6), and 15 Red Data Book invertebrate species associated with wetlands (under Criterion 2). In addition, the Ramsar site supports nationally important numbers of ringed plover and greenshank during spring/autumn passage, and golden plover, sanderling, red-throated diver and great crested grebe in winter.	925m (South-east)
Thanet Coast and Sandwich Bay – SPA	The SPA (covering 1,838ha) is designated for populations of European importance of turnstone (non-breeding); golden plover (non-breeding) and little tern (breeding)	925m (South-east)
Outer Thames Estuary – Marine SPA	This marine Sea inlet (covering 379,824ha) regularly supports internationally important numbers of the Annex I Species (red-throated diver) in winter.	3.5km (North)
Stodmarsh – Ramsar	The Ramsar site (covering 481ha) is designated under Ramsar Criterion 2 for supporting: six British Red Data Book wetland invertebrates; 2 nationally rare and 5 nationally scarce plant species; and its diverse assemblage of rare wetland birds which includes gadwall during passage and the breeding season, and bittern, shoveler and hen harrier in winter.	8.5km (South-west)
Stodmarsh - SPA	The SPA (covering 481ha) is designated for its populations of European importance of bittern, gadwall, shoveler and hen harrier (during winter), and gadwall during the breeding season.	8.5km (South-west)
National		
Sandwich Bay to Hacklinge Marshes – SSSI	The SSSI (covering 1,790ha) contains the most important sand dune system and sandy coastal grassland in South East England. Notified features include: non-breeding populations of golden plover, grey plover, ringed plover and sanderling, and the assemblage of breeding birds within areas of lowland open waters and their margins.	925 m (South-east)
Thanet Coast - SSSI	The SSSI (covering 817ha) is notified for its coastal habitats and the plant and invertebrate communities they support; geological features and breeding and non-breeding bird populations. Non-breeding populations of golden plover, grey plover, ringed plover and sanderling; breeding little tern; and the variety of passage bird species all form notified features of the SSSI.	4.5km (East)
Stodmarsh – SSSI	The SSSI (covering 623ha) is notified for its wetland habitats and the plant and invertebrate communities they support. The SSSI is also notified for its breeding bird assemblage associated with open waters and their margins, and specifically for nationally important breeding	7.7km (South-west)

Site name and designation	Site interest features	Distance and (direction) from Site
	populations of bearded tit, Cetti's warbler, gadwall, pochard and shoveler.	

2.1.2 It is therefore necessary to consider the potential for airport operations to result in adverse effects on the bird species which form the qualifying / notified interest of these designated sites, in particular, due to its proximity, the nearby Thanet Coast and Sandwich Bay SPA/SSSI (and their constituent SSSIs) which are primarily designated for their numbers of waders and waterfowl they hold outside the breeding season. In order to better understand the use of the intertidal habitats by birds in the area where direct effects may manifest (such as Pegwell Bay) and associated functional habitats outside of the designated site boundaries, a programme of winter bird surveys was initiated in September 2016. It should be noted that at the time the surveys were undertaken, details of the likely aircraft flight paths in and out of the proposed airport; the flight altitudes (within close vicinity of the airport) and the aircraft types that would be used were not known.

2.1.3 To establish the level of usage and distributions of interest species within the area, two survey methodologies were employed: a 'Functional Habitat Survey' and 'Pegwell Bay Distribution Survey'. Each method is standalone and focuses on different land areas (see **Figures 2.2 and 2.3**), with the Functional Habitat Survey covering land surrounding the Site. Both methods involve surveys undertaken during the non-breeding period (in particular, during winter) when the notified/qualifying species and other relevant species are most likely to be present.

2.1.4 For both methodologies, all surveys were undertaken by a suitably experienced and qualified ornithologist, with extensive experience in undertaking intertidal surveys and surveys for golden plover. All surveys were undertaken in daylight hours and in various weather conditions, with stoppages made only for severe winds, impenetrable fog or heavy rain due to associated health and safety risks, and bird recording implications. The results of each survey were recorded on pre-formatted field survey sheets, which were photographed / scanned and electronically stored soon after completion of the survey.

2.2 Functional Habitat Survey

2.2.1 The aim of the Functional Habitat Survey was to determine the extent of use of the farmland surrounding the Site by birds, focussing on those listed as interest species in the non-breeding period for the nearby designated nature conservation sites (in particular, golden plover). There was no access to the Site itself though an estimated 45% of the land within the red line boundary of the Site could be viewed from outside. Much of the Site not viewable from outside its boundary comprised of the hardstanding of the runway, a habitat of limited value to any bird species. The Survey Area (shown on **Figure 2.2**) included all open land (excluding residential areas) extending to approximately 2km from the Site boundary, or to the nearest significant boundary. It was envisaged that the survey area would include all land in which any target species present, might potentially be disturbed by over-flying aircraft or activities within the airport, although as stressed previously, details of the flight paths and altitudes were not known at the time of survey commencement, and the preparation of this document. The survey area also encompassed the area potentially disturbed by pyrotechnics, gas cannons etc. (a potential technique to scare birds from the airport runway and adjacent land). A review of studies into disturbance to birds by aircraft indicates that birds are generally disturbed by over-flying aircraft up to 500m in altitude, and to a lateral distance of 1km (Amec Foster Wheeler, 2017).

2.2.2 Within the survey area, a walk / drive-over method of survey was employed, during which (publicly accessible) transects and standing observation points were identified. These vantage points and transects provided coverage of all land parcels within the survey area. Surveys involved the field surveyor driving / walking between optimal observation points and intensively scanning each field with binoculars and a telescope. The main focus was on recording the number and activity (foraging, loafing, roosting etc.) of target species, but other notable species / assemblages seen are also recorded, together with an estimate of their numbers (see below).

2.2.3 The following species were recorded during the Functional Habitat Survey:

- Target Species
  - Golden plover; and
  - Ringed plover, grey plover, turnstone, sanderling and little tern (as other qualifying species of the Thanet Coast and Sandwich Bay SPA/Ramsar Site and notified species of their constituent SSSIs: the Thanet Coast SSSI and Sandwich Bay to Hacklinge Marshes SSSI);
- Notable species / assemblages
  - Species listed on Schedule 1 of the *Wildlife and Countryside Act 1981 (as amended)*[1];
  - Species listed on Annex 1 of the Birds Directive[2];
  - Species of Principal Importance (SPI), on Section 41 of the *Natural Environment and Rural Communities Act 2006* (NERC)[3] (in particular, lapwing);
  - Birds of Conservation Concern (BoCC); red-listed species (Eaton *et al*., 2015);
  - Flocks of 20 or more birds of all other species (winter thrushes, gulls, corvids); and
  - All other waterfowl.

2.2.4 For both target species and notable species, the following details were recorded:

- Time of observation
- Location of observation (the coded field within which it was recorded)
- Habitat type (winter-sown cereals, ploughed/bare ground etc.)
- Number of individuals present; and
- Activity (foraging, roosting, commuting, loafing etc.).

2.2.5 All the fields / land parcels within the survey area were given a unique field identification code for ease of recording and reporting findings (see **Figure 2.1**). The Functional Habitat Survey was undertaken once per month from September 2016 to March 2017 inclusive, with each monthly visit taking up to two days to complete.

2.3 Pegwell Bay Distribution Survey

2.3.1 The main aim of the Pegwell Bay Distribution Survey was to determine the current population size, distribution and usage by each waterbird species in Pegwell Bay. The survey area included those extensive areas of intertidal habitat (primarily mudflats, but also adjacent habitats) likely to be used by congregations of foraging and roosting waders and wildfowl. The counts primarily focussed on the area of intertidal mudflats north of the River Stour (which separates Pegwell Bay to the north, from the Sandwich Flats to the south); these being clearly visible from the survey viewpoints, adjacent to the west and north of the saltmarsh and mudflats. Where visible, any congregations of birds south of the River Stour were also recorded, though this area was only partly visible from the

[1] Though protection given to listed Schedule 1 species only extends to breeding birds, some species potentially present within the Survey area, such as Peregrine, are largely sedentary, individuals seen in winter are therefore likely to nest within the local area, if not within the survey area.

[2] Some species receive protection at a European level due to appearing on Annex 1 of the *Directive 2009/147/EC* of The European Parliament and if the Council of 30th November 2009 on the conservation of wild birds (codified version).

[3] In May 2008, Natural England and Defra published the Section 41 list of habitats and species of principal importance for the conservation of biodiversity in England. The list contains all UK Biodiversity Action Plan (BAP) priority habitats and species known to occur in England in addition to species of particular conservation significance in England. The production of the list is a requirement of the *Natural Environment & Rural Communities (NERC) Act 2006* and it will be used to guide and prioritise future conservation action in England.

viewpoints (the dashed red line in **Figure 2.3** shows the extent of intertidal habitat visible from the viewpoints).

2.3.2 During each survey visit, the surveyor walked along the publicly accessible transect, stopping at convenient viewpoints to record the birds. From each viewpoint, the surveyor intensively scanned the areas of intertidal habitat with binoculars and a high powered, high-specification telescope[4]. The viewpoints allowed an almost full coverage of the survey area to be achieved. The focus of the Distribution Survey was on the recording and mapping of waders and other waterbirds using Pegwell Bay throughout the tidal cycle. Any major recreational (or other) disturbances during the visits were recorded.

2.3.3 A six-hour diurnal survey was undertaken one day per month (from October 2016 to March 2017 inclusive), capturing a partial tidal cycle within each visit, and where possible, including a high tide. During each survey visit, three counts were undertaken, each over an approximately one-hour period, where possible, capturing the bird numbers at low, mid and high tide. Within each count, the following information was recorded:

- The distribution and number of all species of wader and wildfowl (and any large congregations of gulls) using the intertidal and adjacent habitats;
- the behaviour of observed waterbirds (foraging, loafing[5], roosting etc.);
- tidal state and location of water's edge;
- time of observations; and
- any disturbance, via public or otherwise (predator etc.).

2.3.4 During each one-hour count, the flocks of birds were given a unique 'flock number' and their location marked on recording maps. To enable the results to be analysed and shown visually, the data from the recording maps was transferred onto a spreadsheet and each flock allocated a National Grid Reference (NGR) 500 x 500m Square, equating to their approximate location at the start of each one-hour count (the birds were continually moving with the tide)[6].Each 500m square was given a unique identification letter (A-Z) (see **Figure 2.3**).

[4]Telescope – Leica APO Televid 82 (Angled) with 25-50x WW ASPH, zoom lens
[5] Loafing refers to birds that are resting but are alert (not roosting)
[6] It should be noted that flocks of foraging waders often moved rapidly over the mudflats with the changing tide, and so the 500m squares allocated to each flock position represent their approximate location at the start of viewing / detecting the flock.

620000 625000 630000 635000 640000 645000

175000 170000 165000 160000 155000

Outer Thames Estuary SPA

Thanet Coast SSSI

Thanet Coast & Sandwich Bay Ramsar

Thanet Coast & Sandwich Bay SPA

Sandwich Bay to Hacklinge Marshes SSSI

Stodmarsh SPA

Stodmarsh SSSI

Stodmarsh Ramsar

MARGATE

NORTH FORELAND

BROADSTAIRS

RAMSGATE

ISLE OF THANET

THANET DISTRICT

SANDWICH

SANDWICH BAY

THE SMALL DOWNS

Key

- Order Limits
- 10km search area
- SPA
- Ramsar
- SSSI

0 1 2 3 4 5 km

Scale at A3: 1:90,000

Client

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Figure 2.1
Statutory designated sites of ornithological importance within 10km of the Site

Key

Order Limits

Survey Area for the Pegwell Bay Distribution Survey

Functional habitat survey area

0 0.5 1 1.5 km

Scale at A3: 1:30,000

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Figure 2.2
Functional Habitat Survey: Survey Area and Field Identification Codes

March 2018

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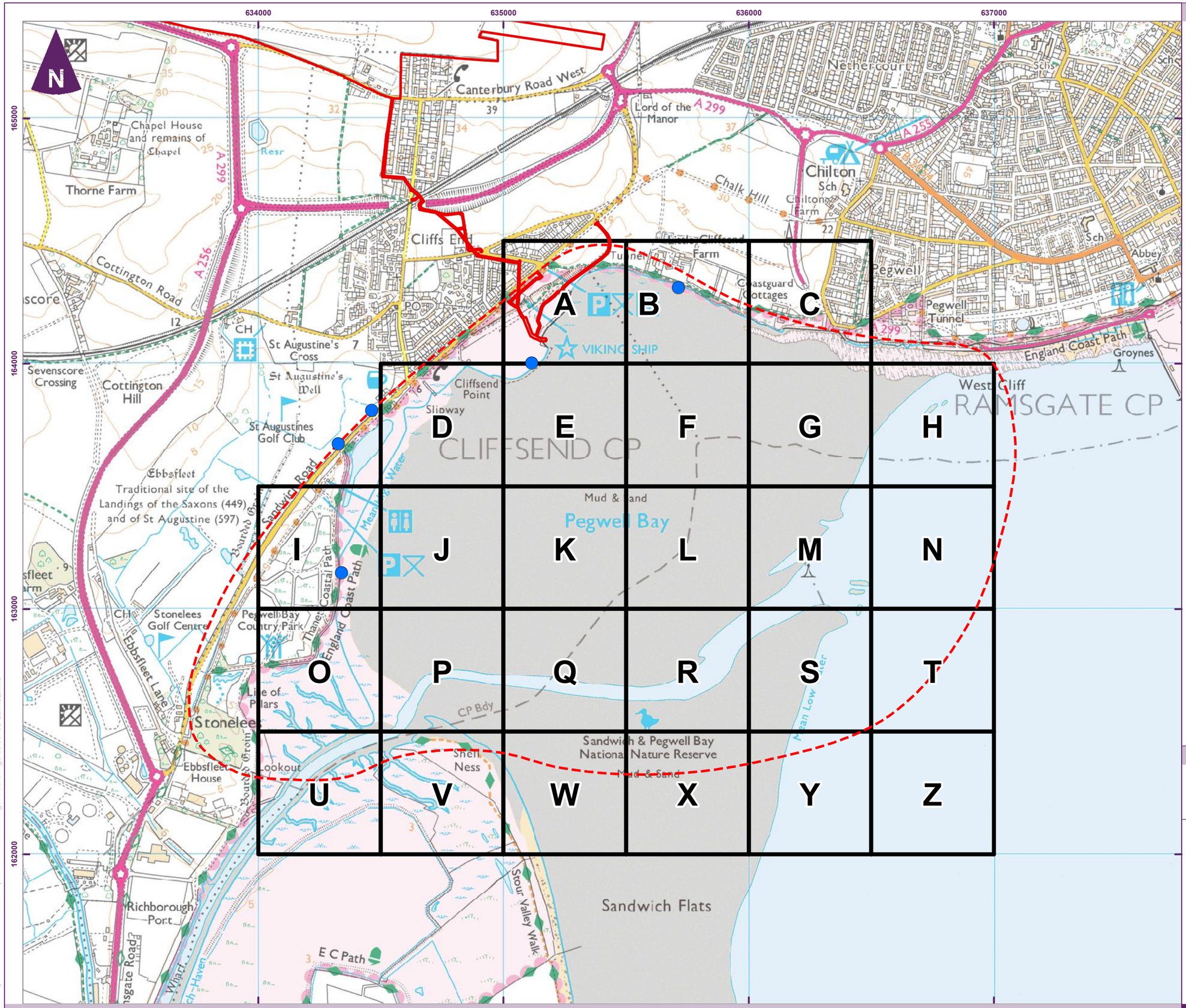

Key

- Order Limits
- Survey area
- Viewpoints
- 500 x 500 m recording grid

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

Client

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Figure 2.3
Pegwell Bay Distribution Survey: Survey Area and View Points

March 2018 38199-Lon452.mxd squij

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3. Results

3.1 Functional Habitat Survey

3.1.1 The total number of each species counted within the survey area during each survey from September 2016 to March 2017 (numbered 1-7 respectively) is presented in **Table D1 in Appendix D**, with details of each visit (dates, times and weather conditions) provided in **Table C1 in Appendix C**.

3.1.2 A total of 66 bird species were recorded during the Functional Habitat Survey, including

- One target species, as defined in **Section 2.1**: golden plover;
- Five species listed on Annex I of the Birds Directive: hen harrier, merlin, golden plover, Mediterranean gull and short-eared owl;
- Seven species listed on Schedule 1 of the *Wildlife and Countryside Act 1981 (as amended)*: hen harrier, merlin, Mediterranean gull, fieldfare, redwing, Cetti's warbler and firecrest, of which only Cetti's warbler is known to breed in the local area (Clements *et al*., 2015);
- 17 SPI: brent goose, grey partridge, hen harrier, lapwing, curlew, herring gull, skylark, yellow wagtail, dunnock, song thrush, starling, house sparrow, linnet, twite, lesser redpoll, reed bunting and corn bunting; and
- 20 BoCC Red-listed species: grey partridge, hen harrier, merlin, lapwing, curlew, herring gull, skylark, yellow wagtail, grey wagtail, whinchat, fieldfare, song thrush, redwing, mistle thrush, starling, house sparrow, linnet, twite, lesser redpoll and corn bunting.

3.1.3 Further details on the target and notable species recorded during the survey are provided as follows:

Golden Plover and Lapwing

3.1.4 Golden plover and lapwing are frequently seen in association with each other during winter, often foraging in mixed flocks on farmland, and for this reason, the usage of the survey area by these species has been treated together here. All records of golden plover and lapwing recorded during the Functional Habitat Survey are shown in **Table D2 in Appendix D**, including four records in fields outside but adjacent to the survey area. There were no records of either species within the Site boundary, and approximately 90% of the habitat within the Site was considered largely unsuitable for the species (i.e. long grass at the time of survey, plus hardstanding and buildings). Peak counts across the survey area were 530 golden plover (on 9 November) and 128 lapwing on 9 February. The peak monthly counts of golden plover and lapwing are presented in **Table 3.1** (excluding records of birds flying over the area, and records outside the survey area boundary) and their locations shown on **Figure 3.1**.

Table 3.1 Counts of Golden Plover and Lapwing during each monthly survey

Species	Field ID	1	2	3	4	5	6	7
Golden plover	1A1			6	1			
	1A2			2	1		5	
	5E1			530	2			

Species	Field ID	1	2	3	4	5	6	7
Lapwing	1A1		9					
	2B1				1			
	2B2				6	61	128	
	5E1			14	1			

3.1.5 Lapwing and golden plover were recorded foraging in a variety of habitats and crop types, including short grassland, winter wheat and ploughed, bare ground. No one area held either species for any prolonged period through the survey, though field 2B2 (containing oilseed rape) held lapwing (primarily loafing birds) on three survey dates, and field 5E1 (ploughed, bare ground) supported foraging / loafing golden plover and lapwing on two dates.

Other notable species

3.1.6 Very few species of wildfowl and waders were recorded during the Function Habitat Survey, but did include a flock of 110 dark-bellied race of brent goose, foraging in a field of winter cereal (Field 4C4) on 9 February. Of the bird of prey species, there were regular sightings of kestrel and buzzard hunting over the survey area, and occasional sparrowhawk. Merlin were seen hunting over the area on two dates (26 September and 8 November); a female hen harrier was hunting over field 5C2 on 6 January; and a rough-legged buzzard was flying over field 1A3 on 10 October, after which it headed towards Pegwell Bay. Outside the survey area, a short-eared owl was hunting over grassland within the airfield on 7 March.

3.1.7 Flocks of black-headed gull, common gull and herring gull were regularly seen foraging and loafing in fields across the survey area, with peak counts of 110 black-headed gull (in field 1B3 on 7 December and field 2B3 on 9 February); 300 herring gull (in field 4C4 on 7 March); and 103 common gull (in field 3B3 on 9 February). More unusual were a single Mediterranean gull (foraging in field 4C4 on 7 March) and Caspian gull (loafing in field 3B3 on 9 February).

3.1.8 Flocks of up to 63 redwing and 85 fieldfare were seen foraging in fields and hedgerows throughout much of the survey period, and flocks of up to 136 starling were also recorded feeding in fields. Up to six corn buntings were seen feeding in fields across the survey area from October-December and again in March, though an exceptional count of 20 birds was seen in cereal stubble (field 1D2) on 9 November. Meadow pipit, skylark and linnet were also recorded widely across the survey area, often foraging in cereal stubble, with peak counts of 84 meadow pipit (in field 1A1 on 7 December); 18 linnet (field 1A2 on 10 October); and 135 skylark (field 1A1 on 7 December). Of particular note, was a flock of seven twite (now a rare wintering species in Kent) feeding in oilseed rape (field 2B2) on 8 November. A single firecrest was noted on two dates, in hedgerows surrounding field 2B2 on 10 October, and field 4A3 on 9 November, and a migrant yellow wagtail was recorded on 26 September, and whinchat, stonechat and four wheatear on 10 October.

3.2 Pegwell Bay Distribution Survey

3.2.1 A total of three one-hour counts were recorded on six (once-monthly) survey dates from October 2016 to March 2017 inclusive, with the dates, times, tidal states and weather conditions provided in **Table C2 in Appendix C**. Each one-hour count was undertaken within a part of the tidal cycle, defined here as:

- HT: within approximately one hour either side of high tide;

- MT (E): 'mid-tide' with the water ebbing (going out) after a high tide, approximately 1-4 hours after high tide;
- LT: within approximately one hour either side of low tide; and
- MT (R): 'mid tide' with the water rising after a low tide, approximately 1-4 before high tide.

3.2.2 A total of 25 species of wildfowl and waders and five species of gull were recorded during the Pegwell Bay Distribution Survey. **Table 3.2** shows the peak counts of each species recorded during each one-hour count. The peak numbers of all species of wildfowl and waders excluding gulls (counts combined) within each 500m square on any one-hour count during High Tide, Mid-Tide Ebbing, Low Tide and Mid-Tide Rising are shown on **Figures 3.2a-d** respectively.

Table 3.2 Pegwell Distribution Survey: peaks numbers during each 1-hour count

	Visit 1 (Oct)			Visit 2 (Nov)			Visit 3 (Dec)			Visit 4 (Jan)			Visit 5 (Feb)			Visit 6 (Mar)		
Species	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Brent goose		24	26	27	27	27				13	33		92	2	98	1	13	35
Shelduck	86	91	51	33	4	3	7	9	8	58	78	66	25	6	8	52	49	43
Wigeon	112	83	53	647	568	458	175	253	627	80	697	326	224	316	167	173	134	132
Gadwall												16						
Teal								1		14	66	31	59			12	8	8
Mallard	6			2	40	27	24	11	242	16	126	94	120	48	7		2	2
Pintail			2									4						
Shoveler							6	8		10	21	23	16			11	15	13
Red-throated diver			1		1	1												
Great crested grebe					1				1									
Cormorant							58	65			3		2,500	720	2,000		55	360
Little egret	8	6	5	1					1							1	1	1
Oystercatcher	2,000	317	308	144		56	205	213	261	103	188	55	193	105		74		
Golden plover			**3**	**850**			**454**		**710**				**119**	**132**	**500**			

	Visit 1 (Oct)			Visit 2 (Nov)			Visit 3 (Dec)			Visit 4 (Jan)			Visit 5 (Feb)			Visit 6 (Mar)		
Species	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Grey plover	**22**	**12**		**13**		**3**					**16**	**35**						
Lapwing	12			1,376	3	131	1,303	1,189	1,384		2	17	896	890	506			
Knot	6	3	4	12		47	7		6			5		2		1	19	
Sanderling									**4**			**16**		**2**				
Dunlin	40	88	3	238		37	44	406	438	45	527	162	27	42			52	
Snipe												1	1					
Black-tailed godwit								3						2				
Bar-tailed godwit	6	34	32	4		35					6	1						1
Curlew	19	58	84	55		49	48	25	29	29	105	174	72	178	192	105	108	128
Redshank	86	21	12	28	3	6	12	17	9	9		21	32	21	39	13	28	26
Turnstone	**2**	**54**		**23**	**12**	**3**						**5**		**12**			**20**	**28**
Black-headed gull	7	58	52				58	109	134	157	311	476	22			514		35
Common gull	1	12	2					4			1	180				100		37
Lesser black-backed gull	800		851									3						
Herring gull		17	348							46	25	90				519		

	Visit 1 (Oct)			Visit 2 (Nov)			Visit 3 (Dec)			Visit 4 (Jan)			Visit 5 (Feb)			Visit 6 (Mar)		
Species	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Great black-backed gull		1								11		17				100		

Note: Bold font indicates a non-breeding, qualifying / notified interest species of the Thanet Coast and Sandwich Bay SPA / Ramsar site, and its constituent SSSIs

3.2.3 Of the bird species that form the non-breeding, qualifying / notified interest of the Thanet Coast and Sandwich Bay SPA / Ramsar site, and its constituent SSSIs: turnstone, golden plover, grey plover and sanderling were recorded during the Pegwell Bay Distribution Survey, though no ringed plover were noted. The numbers and use of the survey area by these species is discussed further, as follows:

Turnstone

3.2.4 Relatively low numbers of turnstone were recorded during the Pegwell Bay Distribution Survey, with flocks of roosting and foraging birds primarily seen along the northern and western fringes of Pegwell Bay, near the high-water mark in 500 m grid squares: A, B, I and J. The largest count of foraging birds was of 54 individuals in Square B (on the northern fringe of Pegwell Bay) on 13 October, and of roosting birds, 28 in Square I (on the western fringe) on 14 March. Roosting was also recorded in Squares D, J and I, though the shoreline within Square B was the only regularly used site. **Figure 3.3** shows the location of the peak counts of turnstone recorded in each 500m grid square.

Golden Plover

3.2.5 Golden plover were primarily recorded in November, December and February when 500-850 were counted. No foraging birds were observed, with all records relating to flocks of golden plover resting (roosting or loafing) on intertidal habitat close to the high-water mark along the northern and western fringes of Pegwell Bay in Squares A, D, I, J, O and W (see **Figure 3.4**), during low, mid and the high tide periods. The largest counts included: 850 birds in Square O on 17 November; 710 in Square D on 20 December; and 500 on the sand banks in Square W on 14 February.

Grey Plover

3.2.6 Low numbers of grey plover were recorded on three of the six survey dates (in October, November and January). Flocks of roosting grey plover were confined to Squares D, I and J (near the high-water mark, in the west of Pegwell Bay), with a peak count of 13 birds (in Square D) on 13 October. Loose flocks of up to 19 foraging birds (in each square) were seen widely across the survey area (see **Figure 3.5**).

Sanderling

3.2.7 Low numbers of sanderling were recorded at scattered locations across Pegwell Bay, on three of the six survey dates (in December, January and February). Groups of sanderling were recorded foraging along the shoreline (all during the mid, rising tide period), including: four birds in Square M on 20 December; a total of 16 birds in Squares F and D on 19 January; and two in Square D on 14 February (see **Figure 3.6**). No roosting birds were observed.

Other species of wildfowl and waders

3.2.8 Eight species of waterfowl (geese and ducks) were recorded, of which wigeon were by far the most numerous. Wigeon were present throughout the survey period (mainly foraging and loafing birds, with few seen roosting), with a peak count of 697 birds recorded within the survey area on 19 January, including 666 foraging along the shoreline in Square M (in the east of Pegwell Bay). Brent geese were seen on most survey visits, with a peak count of 98 birds recorded in the survey area on 14 February, including 93 loafing on the water at high tide in Square K (in the centre of Pegwell Bay). Up to 91 loafing and roosting shelduck (very few foraging) were seen throughout the survey period, with the highest numbers in Squares D, I, J and O, near the high-water mark, on the western fringes of Pegwell Bay. Mallard, teal and shoveler were also recorded on a regular basis, and gadwall and pintail were infrequent visitors.

3.2.9 Thirteen species of wader were recorded, of which oystercatcher, curlew, redshank and dunlin were recorded throughout the survey period. Loose groups of 20-50 oystercatchers were foraging widely across the mudflats, with total counts of 100-300 birds across the survey area. The only

notable congregation of roosting oystercatchers, involved 2,000 birds on the sand banks, south of the River Stour (in Square V) on 13 October, at high tide. The saltmarsh and shoreline in Square D (near the high-water mark, on the western fringes of Pegwell Bay) was a favoured site for roosting waders at high tide, with peak counts of 169 curlew and 36 redshank in February, and 44 dunlin in March, otherwise, loose groups of foraging waders were recorded widely across the open mudflats during the mid and low tide periods. Large flocks of loafing and roosting lapwing were seen in Squares D, I, J and O (near the high-water mark, on the western fringes of Pegwell Bay), with peak counts of 1,376 and 1,384 birds in November and December respectively. Of the remaining wader species, up to 35 bar-tailed godwits were foraging on the mudflats in October-November and there were infrequent records of knot, snipe and black-tailed godwit.

3.2.10 A very large flock of cormorant (numbering up to 2,500 birds) was seen loafing along the shoreline in Square S (on the southern shores at the mouth of the River Stour) at low tide on 14 February, after which it moved onto the sand banks in Square W (south of the River Stour) at high tide. During the following survey visit, on 14 March, a flock of 360 cormorant was observed loafing in Square H (in the far north-east of Pegwell Bay), at high tide.

3.2.11 Five species of gull (great black-backed, lesser black-backed, herring, common and black-headed) were recorded on a regular basis, foraging and resting in Pegwell Bay throughout much of the survey period. The largest counts included 850 lesser black-backed gull and 100 herring gull foraging at the mouth of the River Stour (in Square R) at low tide on 13 October, after which they moved to loaf/roost on the sand banks in Square V (south of the River Stour) at high tide. A mixed flock of herring/great black-backed/common and black-headed gulls, totalling 1,200 individuals was seen foraging along the shoreline in Square M (on the northern shores at the mouth of the River Stour) at low tide on 14 March; and a mixed flock of 300 black-headed gull and 180 common gull was roosting/loafing on the water in Square J (near the high water mark in the west of Pegwell Bay) at high tide on 19 January.

Key

Order Limits

Functional habitat survey area

Golden Plover Peak Count

1 - 20 birds

21 - 99 birds

100+ birds

Lapwing Peak Count

1 - 20 birds

21 - 99 birds

100+ birds

0 0.5 1 1.5 km

Scale at A3: 1:30,000

Client

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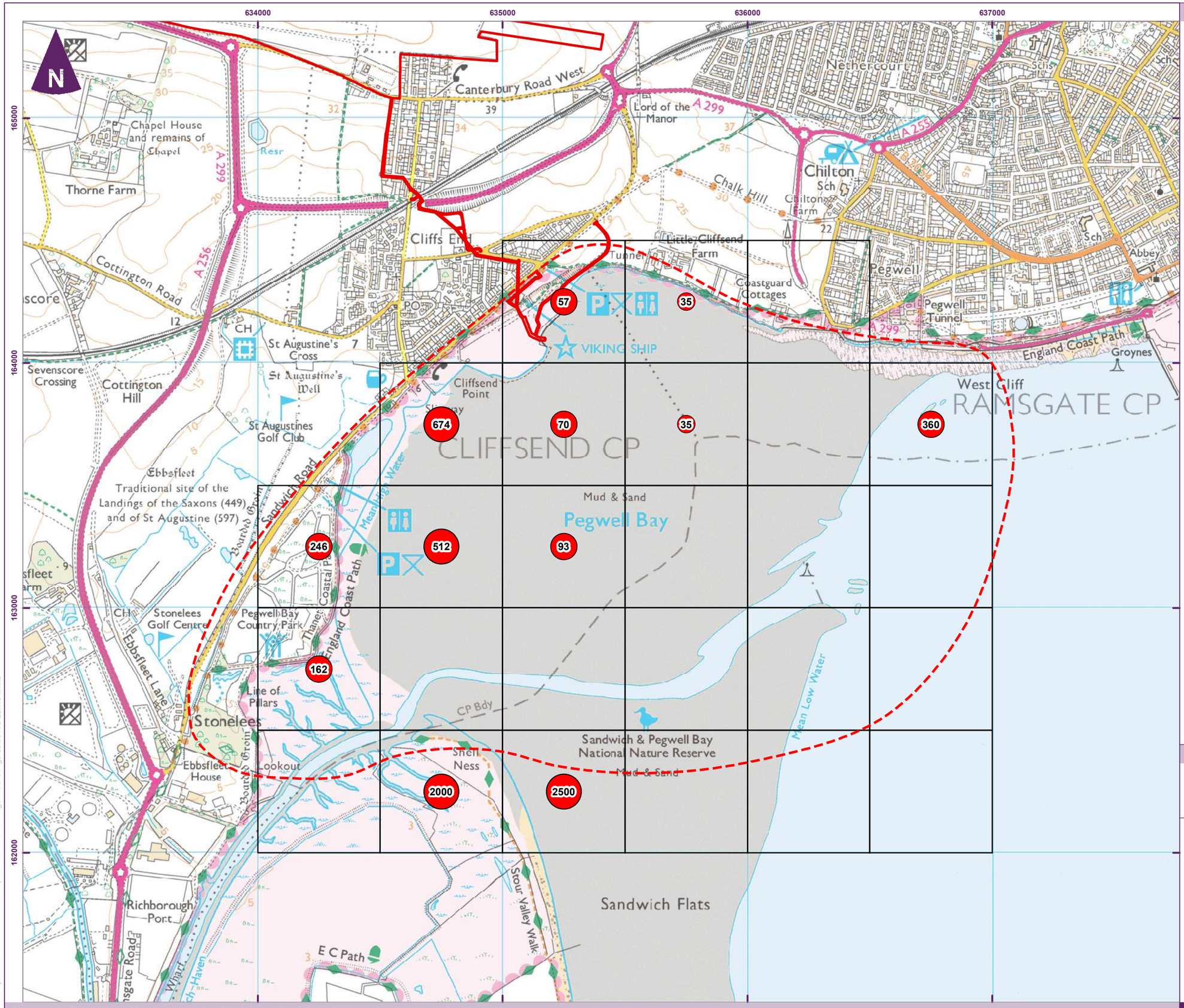
Figure 3.1
Functional Habitat Survey: Peak Counts of Golden Plover and Lapwing in each Field



Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Wildfowl and Wader Peak Count

- 1-49 individuals
- 50-499 individuals
- 500+ individuals

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

Client

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Figure 3.2a
Pegwell Bay Distribution Survey: Peak counts of all Wildfowl and Waders Species in each 500m grid square (during High Tide)

March 2018 38199-Lon454.mxd parkj

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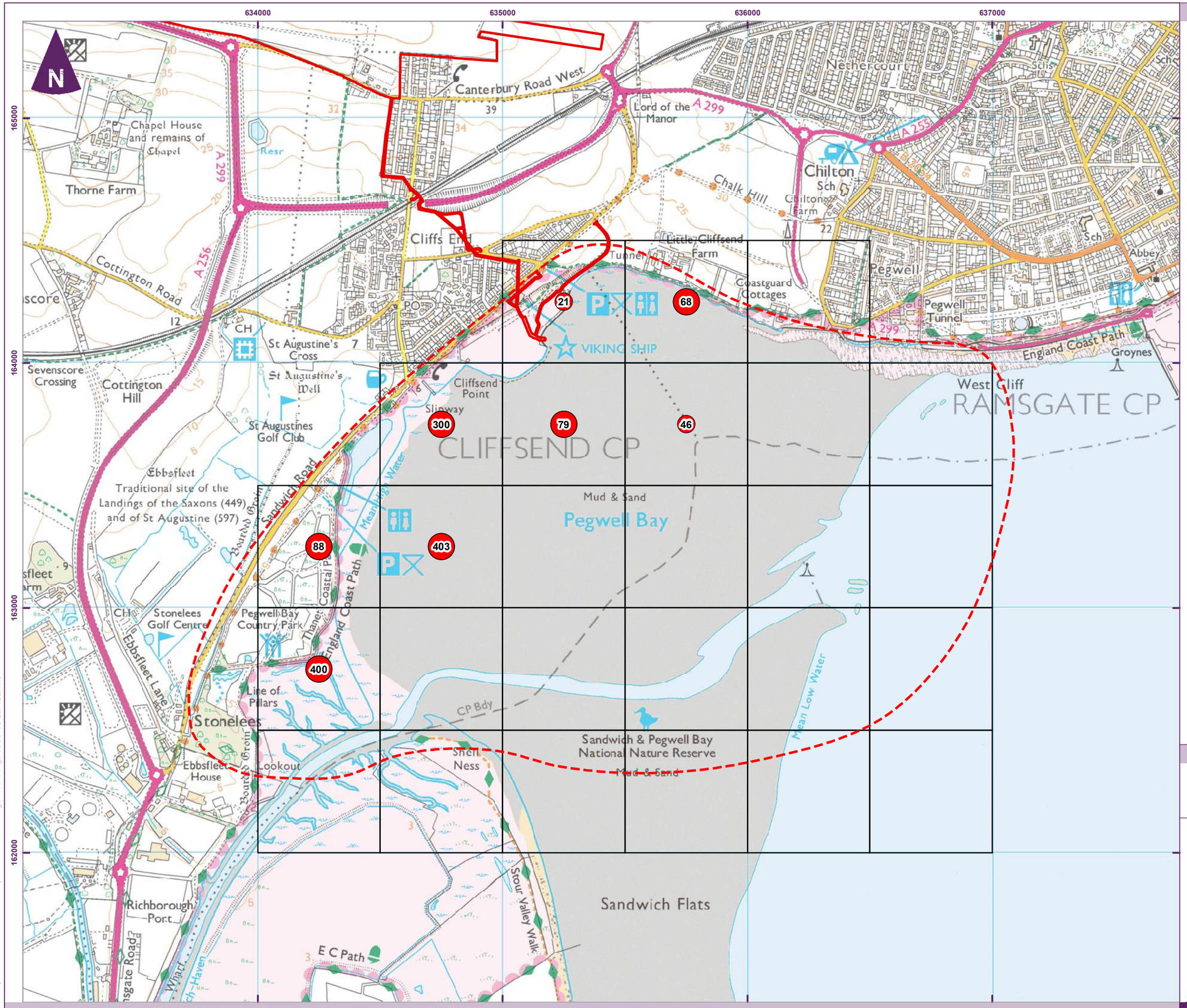

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Wildfowl and Wader Peak Count

- 1-49 individuals
- 50-499 individuals
- 500+ individuals

Client

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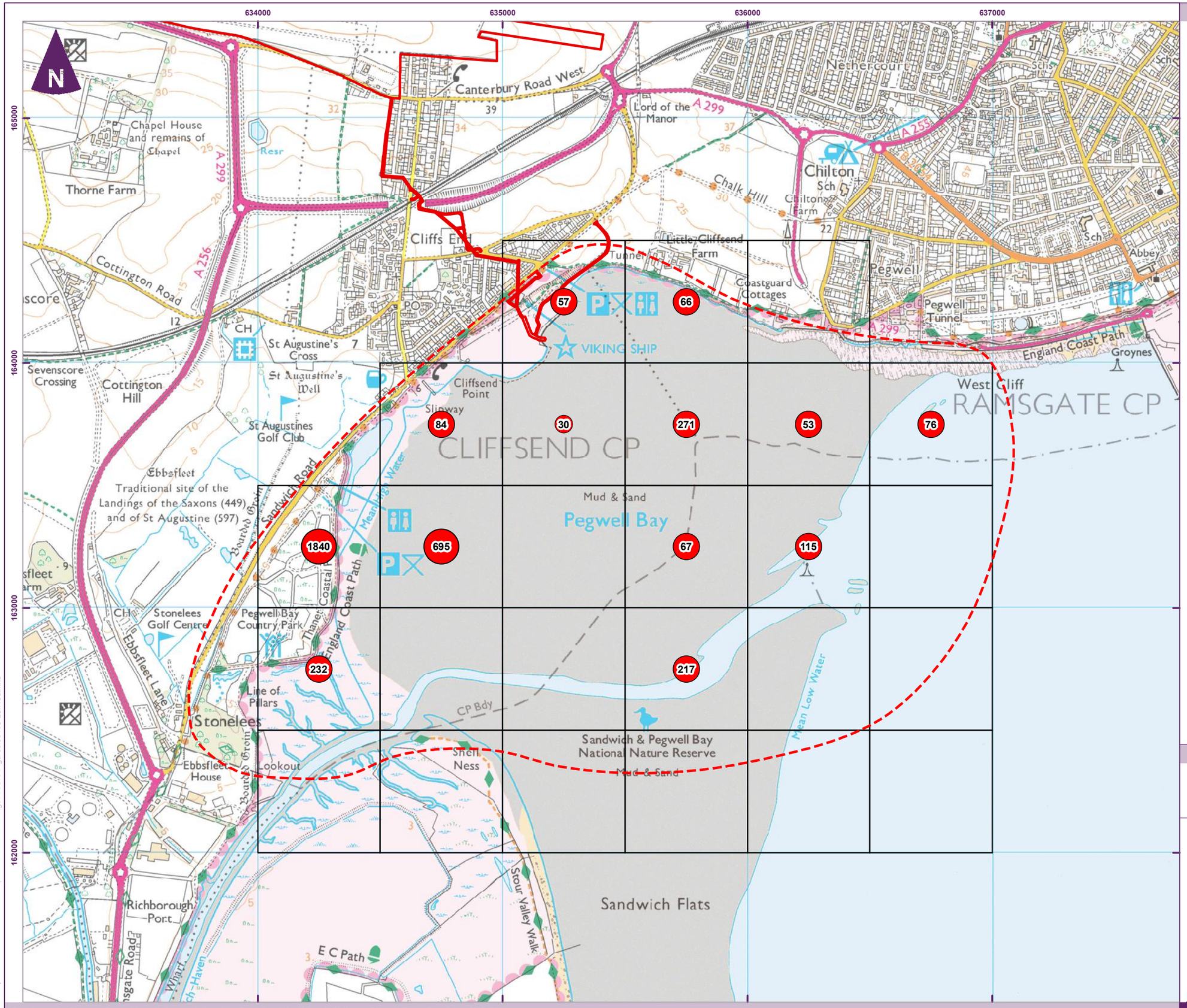
Figure 3.2b
Pegwell Bay Distribution Survey: Peak counts of all Wildfowl and Waders Species in each 500m grid square (during Mid Tide, Ebbing)



Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Wildfowl and Wader Peak Count

- 1-49 individuals
- 50-499 individuals
- 500+ individuals

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

Client

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Figure 3.2c
Pegwell Bay Distribution Survey: Peak counts of all Wildfowl and Waders Species in each 500m grid square (during Low Tide)

March 2018 38199-Lon456.mxd parkj

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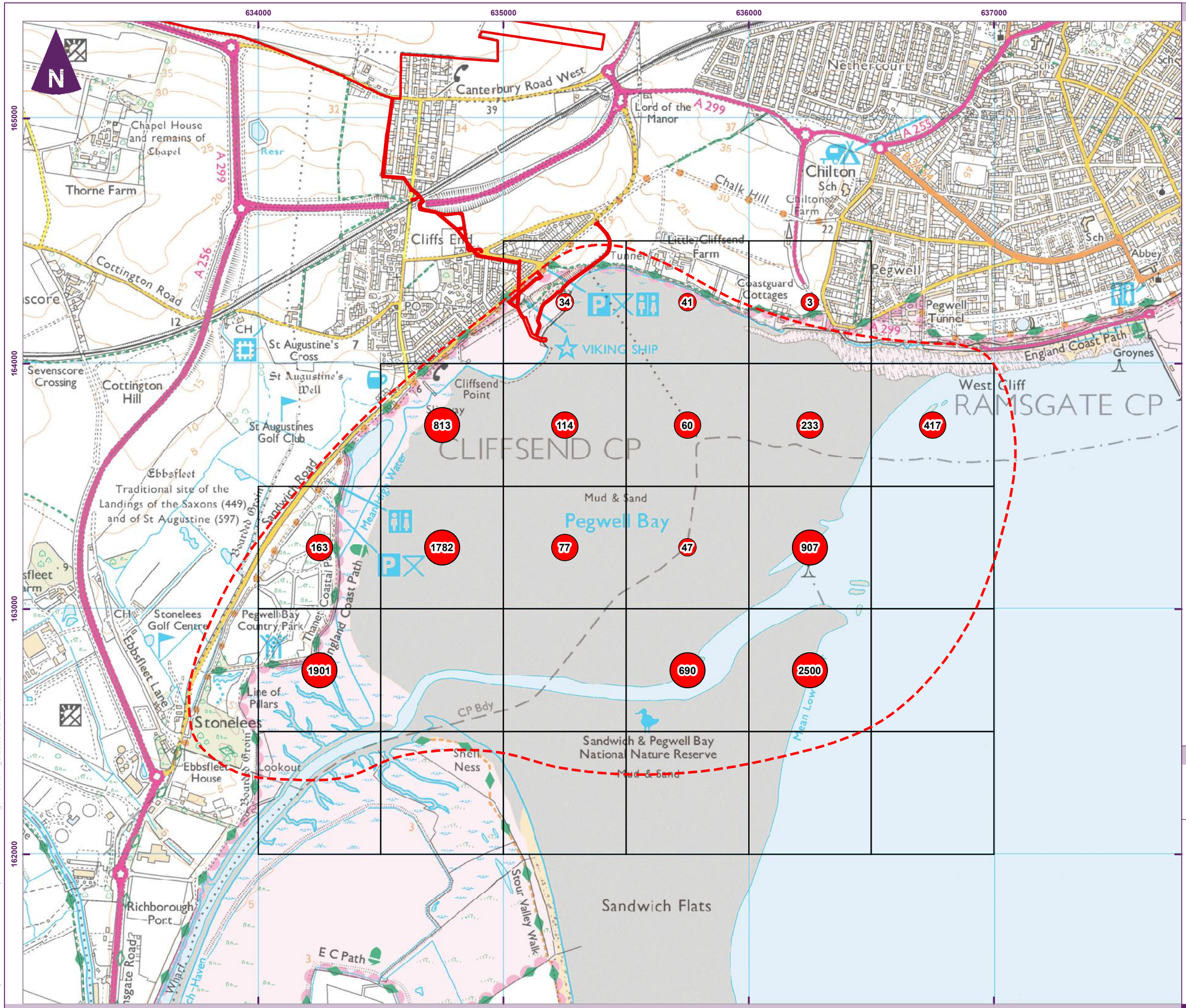

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Wildfowl and Wader Peak Count

- 1-49 individuals
- 50-499 individuals
- 500+ individuals

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

Client

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Figure 3.2d
Pegwell Bay Distribution Survey: Peak counts of all Wildfowl and Waders Species in each 500m grid square (during Mid Tide, Rising)

March 2018 38199-Lon457.mxd parkj

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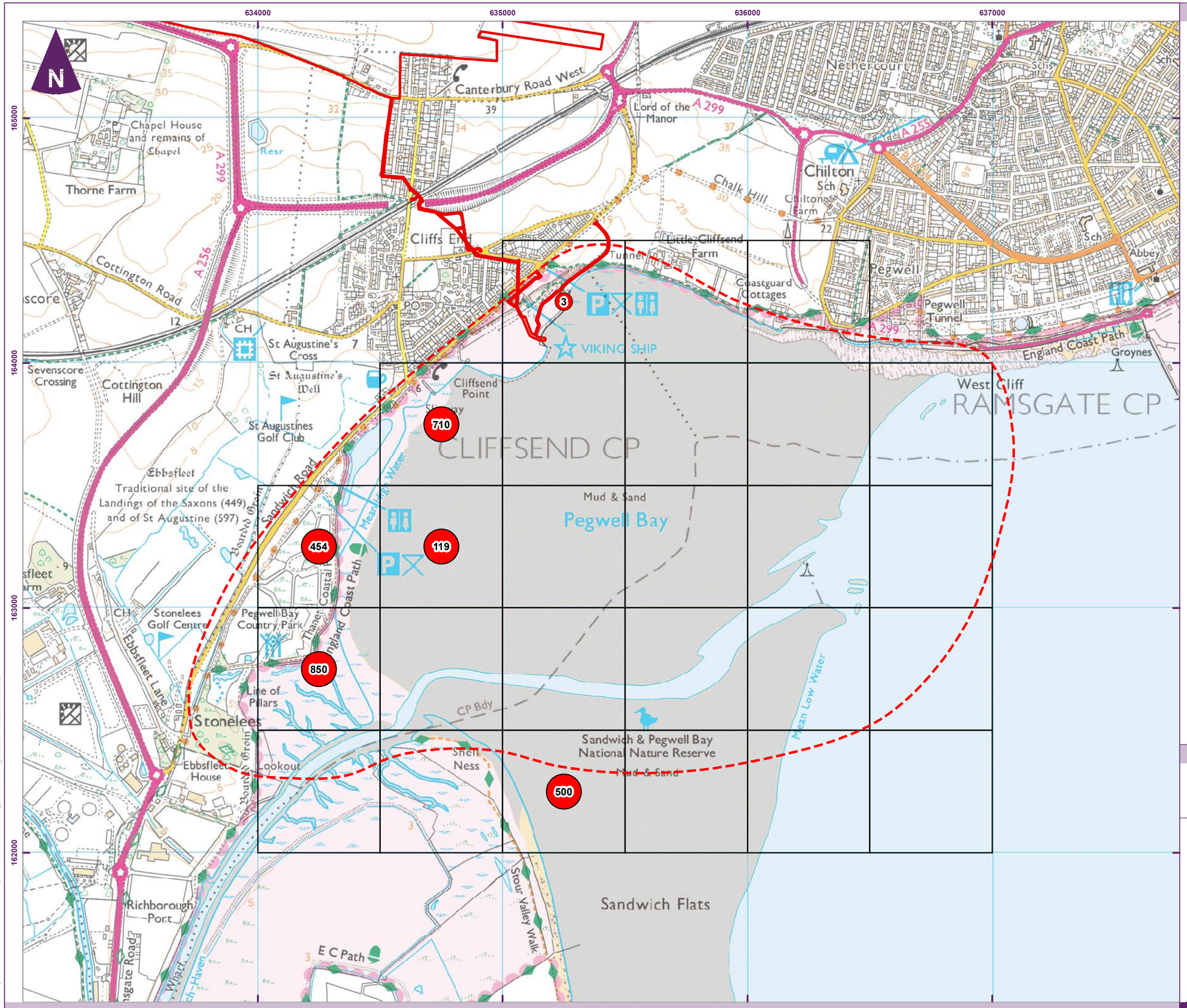

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Golden Plover Peak Count

- 1-20 individuals
- 21-99 individuals
- 100+ individuals

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

Client

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Figure 3.4
Pegwell Bay Distribution Survey: Peak counts of Golden Plover in each 500m grid square

March 2018 38199-Lon459.mxd squij

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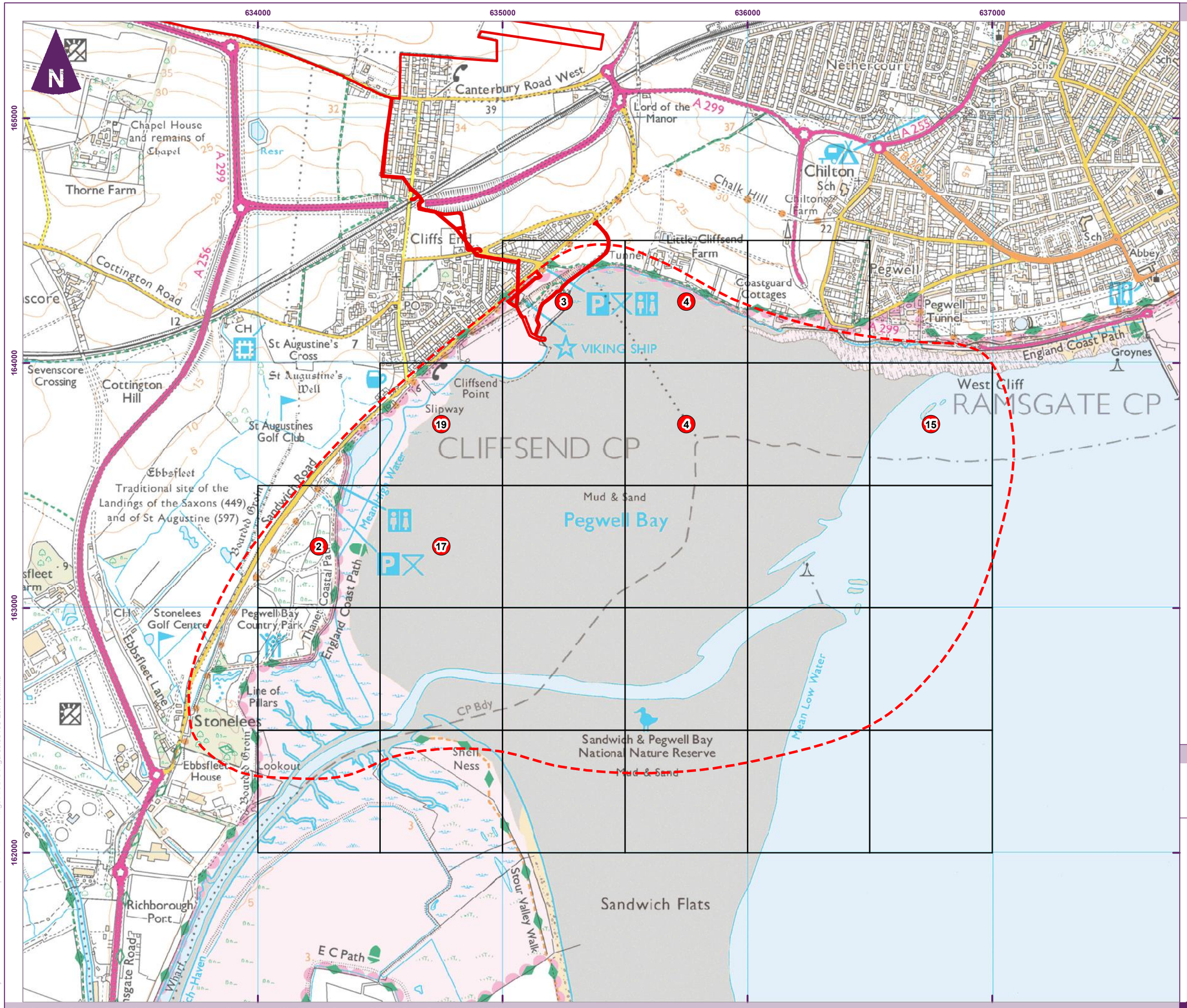

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Grey Plover Peak Count

- 1-20 individuals
- 21-99 individuals
- 100+ individuals

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

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Figure 3.5
Pegwell Bay Distribution Survey: Peak counts of Grey Plover in each 500m grid square

March 2018 38199-Lon460.mxd parkj

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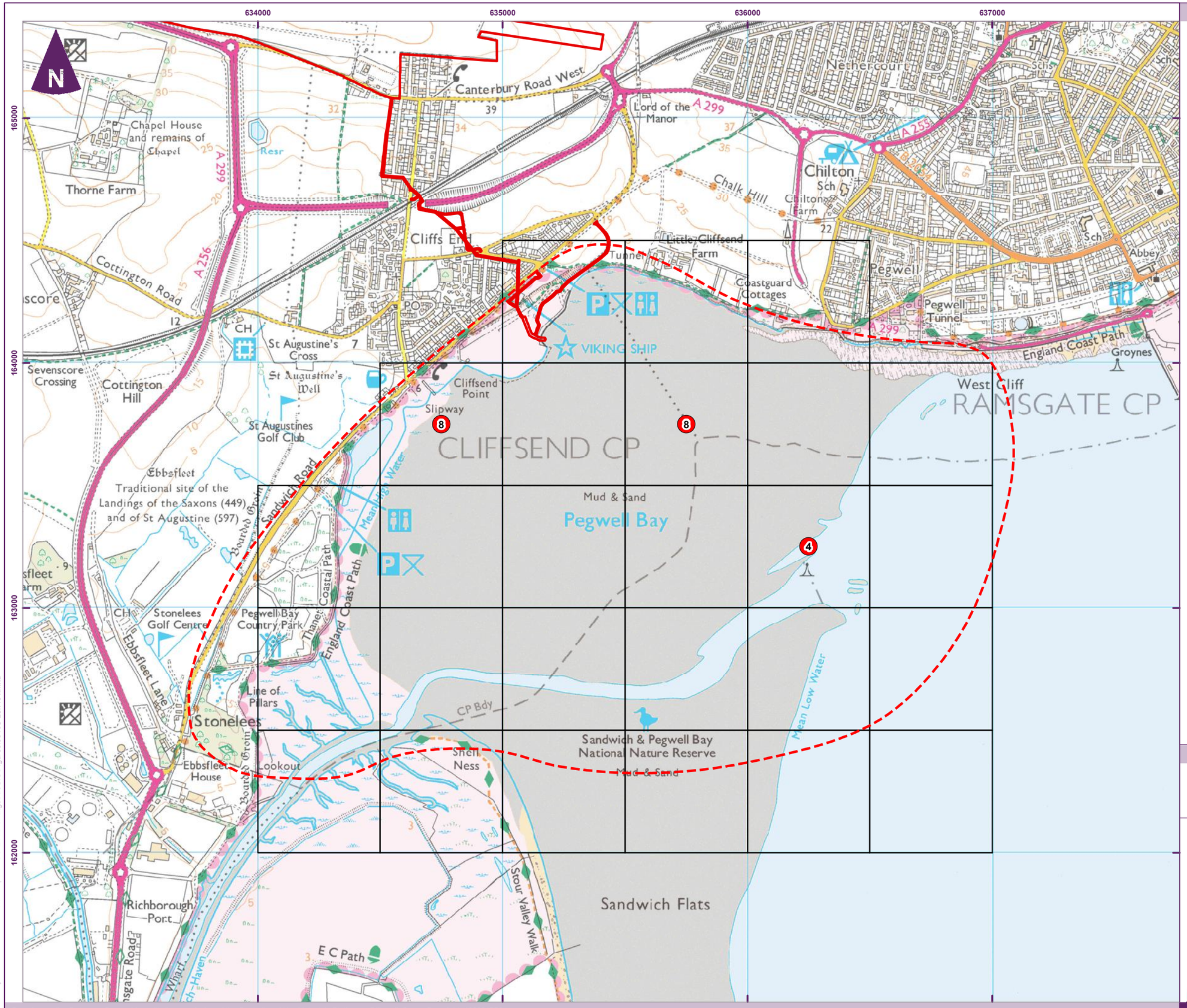

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Sanderling Peak Count

- 1-20 individuals
- 21-99 individuals
- 100+ individuals

0 0.25 0.5 0.75 km

Scale at A3: 1:15,000

Client

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Figure 3.6
Pegwell Bay Distribution Survey: Peak counts of Sanderling in each 500m grid square

March 2018 38199-Lon461.mxd parkj

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4. Discussion

4.1 Functional Habitat Survey

4.1.1 Results from the Functional Habitat Survey indicate that the farmland immediately surrounding the Site is not used on a regular basis by potentially important numbers of foraging or resting golden plover and lapwing. Neither species was recorded within the Site, and the habitat within the Site was considered largely unsuitable. Of the other species which form the non-breeding qualifying interest of the Thanet Coast and Sandwich Bay SPA/Ramsar Site, or notified interest of their constituent SSSIs, ringed plover, grey plover, turnstone and sanderling were not recorded during the survey. The importance of the survey area to golden plover and lapwing is discussed further, as follows:

Golden Plover

4.1.2 The Thanet Coast & Sandwich Bay SPA was originally designated in part for the internationally important non-breeding population of golden plover that it supports. Nationally important numbers of non-breeding golden plover are also notified features of the Sandwich Bay to Hacklinge Marshes SSSI and Thanet Coast SSSI. However, as part of the third JNCC SPA review (Stroud et al., 2016), golden plover was removed as a designated species from the SPA (likely due to declining numbers), although this change is still unratified. The UK population of golden plover was estimated to be 420,000 birds in winter (Musgrove *et al*., 2013).

4.1.3 The original qualifying population for golden plover for the Thanet Coast and Sandwich Bay SPA was 411 individuals (five-year peak mean for 1991/92-95/96). A much larger golden plover population of 4,190 birds (five-year peak mean count for 1998/99-2002/03) is given as being of national importance in the Thanet Coast and Sandwich Bay Ramsar description. More recent data are available from Henderson & Sutherland (2017) who undertook surveys of golden plover (and lapwing) in Pegwell Bay and in the surrounding farmland in winter 2016/17, from which a peak count of 1,536 birds was obtained, in January 2017. During their surveys, which covered a large expanse of potentially suitable farmland for golden plover, stretching from the north coast of Thanet, south to Sandwich Bay, total counts of golden plover ranged from 500-750 birds in November and early December 2016, increasing to 1,200 in January, and 700 in February and March 2017. The most favoured area for the species was the low-lying farmland in the east of the Ash Levels, 3.5 km south of the Site. These numbers contrast with those found during the previous survey of a similar area of farmland in 2002/03 (Griffiths, 2004), when a maximum of 9,578 golden plover was recorded. Henderson & Sutherland (2017) also noted that numbers were relatively low from winter 1978/79 until the late 1990s (averaging 1,853 birds) but then rose sharply to reach 10,000-12,000 birds during 2000/01-2004/05.

4.1.4 The peak count of 530 golden plover recorded during the Functional Habitat Survey in 2016/17 (in a field adjacent to the southwest of the Site) exceeds the SPA qualifying population of 411 birds, and represents 35% of the peak count recorded by Henderson & Sutherland (2017), which covered a much wider area of farmland in the Thanet / Sandwich Bay area. However, the peak count was exceptional during the Functional Habitat Survey, with the next largest flock being of 33 birds, and the remaining records involving just 1-6 birds.

4.1.5 The evidence from the Functional Habitat Survey and previous surveys indicates that the SPA population of golden plover (which utilises both Pegwell Bay and the surrounding farmland) has varied greatly in numbers over the years, and is currently at another low ebb. Potential reasons for this decline include: climate change (the species is tending to winter further north); more local changes to weather conditions both in Kent and abroad, and the loss of suitable foraging habitat, locally and elsewhere.

Lapwing

4.1.6 Lapwing does not form part of the qualifying interest of the Thanet Coast and Sandwich Bay SPA / Ramsar site or its constituent SSSIs. However, lapwing is a species of principal importance to conservation in England as listed on Section 41 of NERC, and is BoCC Red listed (Eaton *et al*., 2015) due to a long-term decline in the breeding population. The UK winter population of lapwing is estimated to be 650,000 birds (Musgrove *et al*., 2013) and a five-year peak mean count of 11,890 lapwing was recorded in Pegwell Bay for the period 2008/09-2012/13, as obtained from Wetland Bird Survey (WeBS)[7] core count data.

4.1.7 Results from the surveys by Henderson & Sutherland (2017) undertaken in 2016/17 indicate that a moderate decline in lapwing numbers has occurred recently in the Thanet area, with a peak count of 6,171 birds recorded in November 2016, and a distribution that corresponded broadly to that of golden plover. The numbers of lapwing recorded by Henderson & Sutherland (2017) during November 2016 to mid-February 2017 were in the range of 2,377 to 6,171 birds, after which they fell sharply to fewer than 400 late in February and 133 in March. The areas holding the largest numbers of lapwing were: Worth Marshes east, 8 km south of the Site (and holding 11% of the total lapwing recorded), Sandwich Marshes, 2.5 km south of the Site (10%); Ash Levels east, 3.5 km south (11%); Goshall Valley, 5 km south (17%); Pegwell Bay, 1 km south-east (12%); and the Wantsum Channel, 5 km west of the Site (11%).

4.1.8 Data obtained from the KOS website (www.kentos.org.uk/) shows that lapwing occur year-round within Pegwell Bay (1.8 km south-east of the Site), with a peak count of 22,000 birds recorded there on the 5 January 2013. The peak count of 128 lapwing recorded during the Functional Habitat Survey in 2016/17 represents 2.1% of the total recorded by Henderson & Sutherland (2017), and only a very small proportion of the national total.

4.2 Pegwell Bay Distribution Survey

4.2.1 Results from the Pegwell Bay Distribution survey indicate that a diverse range of duck and wader species use the mudflats of Pegwell Bay to forage in. The most regular site for roosting wildfowl and waders at high tide was in the saltmarsh in Square D and to a lesser extent in adjacent Square I, which attracted groups of shelduck, oystercatcher, lapwing, golden plover, curlew, redshank and dunlin. However, if disturbed (which was a reasonably frequent event in this area), these birds would fly south onto the less disturbed sand banks in Squares V and W (outside the survey area), where very large congregations of oystercatcher and dunlin were observed roosting. The only regular roost site for turnstone was along the shoreline in Square B along the northern edge of Pegwell Bay. For golden plover and lapwing, the survey data indicates that Pegwell Bay continues to provide an important roosting/resting site, though virtually no foraging was observed within the Pegwell Bay survey area.

4.2.2 Of the peak counts of each species recorded during the survey, only the peak count of cormorant (2,500 birds) exceeds the national threshold of importance for a site[8] (350 birds) and the international threshold (1,200). None of the other peak counts approach or exceed their respective national thresholds. The peak count of 860 golden plover (recorded during the Pegwell Bay Distribution Survey in 2016/17) exceeds the qualifying population for the Thanet Coast & Sandwich Bay SPA (of 411 individuals, five-year peak mean 1991/92-1995/96). The peak count of 54 turnstone represents 5.7% of the SPA qualifying population of turnstone (940 individuals, five-year peak mean 1991/92-1995/96). Evidence from the survey indicates that Pegwell Bay continues to support an important proportion of the SPA population of golden plover, primarily as a roost site. The numbers of turnstone in Pegwell Bay however, form a relatively small proportion of the SPA population. This supports the findings presented in Hodgson (2016) in that much of the SPA

[7] The WeBS core counts survey is a monthly survey of waterbirds (organised by the British Trust for Ornithology) undertaken by primarily volunteer recorders across UK and Ireland.
[8] The national thresholds are provided by the British Trust for Ornithology (BTO) in https://www.bto.org/volunteer-surveys/webs/data/species-threshold-levels, and represent the level beyond which a site is considered to support a nationally important non-breeding population of a species of waterfowl / wader / gull.

population of turnstone occurs along the northern shores of the Thanet coastline, with relatively low numbers utilising Pegwell Bay, for roosting or foraging.

5. References

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Appendix A
Scientific Names of Species Referred to in this Report

Common/ English name	Scientific name
Brent goose	*Branta bernicla*
Shelduck	*Tadorna tadorna*
Wigeon	*Anas penelope*
Gadwall	*Anas strepera*
Teal	*Anas crecca*
Mallard	*Anas platyrhynchos*
Pintail	*Anas acuta*
Shoveler	*Anas clypeata*
Grey partridge	*Perdix perdix*
Red-throated diver	*Gavia stellata*
Great crested grebe	*Podiceps cristatus*
Cormorant	*Phalacrocorax carbo*
Little egret	*Egretta garzetta*
Hen harrier	*Circus cyaneus*
Sparrowhawk	*Accipiter nisus*
Buzzard	*Buteo buteo*
Rough-legged buzzard	*Buteo lagopus*
Kestrel	*Falco tinnunculus*
Merlin	*Falco columbarius*
Peregrine	*Falco peregrinus*
Oystercatcher	*Haematopus ostralegus*
Ringed plover	*Charadrius hiaticula*
Golden plover	*Pluvialis apricaria*
Grey plover	*Pluvialis squatarola*
Lapwing	*Vanellus vanellus*
Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Dunlin	*Calidris alpina*
Snipe	*Gallinago gallinago*
Black-tailed godwit	*Limosa limosa*
Bar-tailed godwit	*Limosa lapponica*
Curlew	*Numenius arquata*

Common/ English name	Scientific name
Redshank	*Tringa totanus*
Turnstone	*Arenaria interpres*
Black-headed gull	*Chroicocephalus ridibundus*
Mediterranean gull	*Larus melanocephalus*
Common gull	*Larus canus*
Lesser black-backed gull	*Larus fuscus*
Herring gull	*Larus argentatus*
Caspian gull	*Larus cachinnans*
Great black-backed gull	*Larus marinus*
Stock dove	*Columba oenas*
Woodpigeon	*Columba palumbus*
Collared dove	*Streptopelia decaocto*
Ring-necked parakeet	*Psittacula krameri*
Short-eared owl	*Asio flammeus*
Green woodpecker	*Picus viridis*
Great spotted woodpecker	*Dendrocopos major*
Skylark	*Alauda arvensis*
Swallow	*Hirundo rustica*
House martin	*Delichon urbicum*
Meadow pipit	*Anthus pratensis*
Yellow wagtail	*Motacilla flava*
Grey wagtail	*Motacilla cinerea*
Pied wagtail	*Motacilla alba*
Wren	*Troglodytes troglodytes*
Dunnock	*Prunella modularis*
Robin	*Erithacus rubecula*
Whinchat	*Saxicola rubetra*
Stonechat	*Saxicola torquatus*
Wheatear	*Oenanthe oenanthe*
Blackbird	*Turdus merula*
Fieldfare	*Turdus pilaris*
Song thrush	*Turdus philomelos*

Common/ English name	Scientific name
Redwing	*Turdus iliacus*
Mistle thrush	*Turdus viscivorus*
Cetti's warbler	*Cettia cetti*
Chiffchaff	*Phylloscopus collybita*
Goldcrest	*Regulus regulus*
Firecrest	*Regulus ignicapilla*
Long-tailed tit	*Aegithalos caudatus*
Blue tit	*Cyanistes caeruleus*
Great tit	*Parus major*
Treecreeper	*Certhia familiaris*
Jay	*Garrulus glandarius*
Magpie	*Pica pica*
Jackdaw	*Corvus monedula*
Rook	*Corvus frugilegus*
Carrion crow	*Corvus corone*
Starling	*Sturnus vulgaris*
House sparrow	*Passer domesticus*
Chaffinch	*Fringilla coelebs*
Greenfinch	*Chloris chloris*
Goldfinch	*Carduelis carduelis*
Siskin	*Carduelis spinus*
Linnet	*Carduelis cannabina*
Twite	*Carduelis flavirostris*
Lesser redpoll	*Carduelis cabaret*
Reed bunting	*Emberiza schoeniclus*
Corn bunting	*Miliaria calandra*

Appendix B
Legislation

Wildlife and Countryside Act 1981

With certain exceptions[9], all wild birds, their nests and eggs are protected by section 1 of the *Wildlife and Countryside Act 1981* (as amended). Therefore, it is an offence, *inter alia*, to:

- intentionally kill, injure or take any wild bird;
- intentionally take, damage or destroy the nest of any wild bird while it is in use or being built; or
- intentionally take or destroy the egg of any wild bird.

These offences do not apply to hunting of birds listed in Schedule 2 of the Act subject to various controls.

Bird species listed on Schedule 1 of the Act receive further protection, thus for these species it is also an offence to:

- intentionally or recklessly disturb any bird while it is nest building, or is at a nest containing eggs or young; or
- intentionally or recklessly disturb the dependent young of any such bird.

For golden eagle, white-tailed eagle and osprey, it is also an offence to:

- take, damage or destroy the nest of these species (this applies at any time, not only when the nest is in use or being built).

Directive 2009/147/EC (The Wild Birds Directive), 2009

Certain bird species receive protection at a European level due to appearing on Annex I of the *Directive 2009/147/EC* of The European Parliament and of The Council of 30 November 2009 on the conservation of wild birds (codified version).

Certain endangered, rare, or vulnerable bird species, which warrant special protection, are included on Annex I of the *Directive 2009/147/EC* of The European Parliament and of The Council of 30 November 2009 on the conservation of wild birds (codified version); also referred to as the *Wild Birds Directive*.

The Wild Birds Directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It therefore places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species. Together with Special Areas of Conservation (SACs) designated under *Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('Habitats Directive')*, SPAs form a network of pan-European protected areas known as Natura 2000.

Ramsar sites

Ramsar sites are wetlands of international importance designated under the Ramsar Convention. Sites proposed for selection are advised by the UK statutory nature conservation agencies, or the relevant administration in the case of Overseas Territories and Crown Dependencies, co-ordinated through JNCC. In selecting sites, the relevant authorities are guided by the Criteria set out in the Convention. The Criteria pertaining specifically to birds are as follows:

- Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds; and
- Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

In the UK, the first Ramsar sites were designated in 1976 since which, many more have been designated. The initial emphasis was on selecting sites of importance to waterbirds within the UK, and consequently

[9] Some species, such as game birds, are exempt in certain circumstances.

many Ramsar sites are also Special Protection Areas (SPAs) classified under the Birds Directive. However, greater attention is now being directed towards non-bird features which are increasingly being taken into account, both in the selection of new sites and when reviewing existing sites.

Natural Environment and Rural Communities Act 2006

Section 40 of the *Natural Environment and Rural Communities (NERC) Act 2006* places duties on public bodies to have regard to the conservation of biodiversity in the exercise of their normal functions. In particular, Section 41 of the NERC Act requires the Secretary of State to publish a list of species which are of Principal Importance for conservation in the UK. This list is largely derived from the 'Priority Species' listed under the former UK Biodiversity Action Plan (BAP), which continue to be regarded as Priority Species under the subsequent country-level biodiversity strategies. The Section 41 list replaces the list published by Defra in 2002 under Section 74 of the *Countryside and Rights of Way (CRoW) Act 2000*.

Birds of Conservation Concern: Red List birds

Red and Amber list bird are those listed as being of high or medium conservation concern (respectively) in Birds of Conservation Concern (BoCC) 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man (Eaton *et al*., 2015). Red list species are those that are Globally Threatened according to IUCN criteria; and/or those whose population or range has declined rapidly in recent years; and/or those that have declined historically and not shown a substantial recent recovery.

Appendix C
Survey Visit Details

Table C1 Functional Habitat Survey, Visit Details

Visit Number	Date	Start time	End time	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temperature (°C)	Precipitation
1	26-Sep-16	07:30	13:00	8	East	2-4	Very good (3km+)	12 to 18	None
1	27-Sep-16	09:00	13:00	5	Southwest	3-4	Very good (3km+)	15 to 20	None
2	10-Oct-16	07:30	13:30	4	North	3-5	Very good (3km+)	10 to 13	None
2	11-Oct-16	08:00	12:00	4	Northeast	2-4	2km	8 to 13	None
3	08-Nov-16	09:00	14:30	8	Northwest	15	Very good (3km+)	3 to 6	None
3	09-Nov-16	10:00	14:00	8	Southeast	10	Very good (3km+)	7 to 8	Light rain
4	07-Dec-16	07:45	14:40	4	Southeast	3-4	Very good (3km+)	9 to 12	None
5	04-Jan-17	09:00	14:30	8	Northeast	3-4	Very good (3km+)	5 to 7	Rain 0900-1100
5	06-Jan-17	09:30	13:00	8	Southeast	2-3	Very good (3km+)	2 to 5	None
6	09-Feb-17	08:00	13:00	8	Northeast	2-3	2km	2 to 3	None
7	07-Mar-17	08:00	16:00	2	West	3-5	Very good (3km+)	5 to 9	None

Table C2 Pegwell Bay Distribution Survey, Visit Details

Date	Visit No.	Count No.	Start time	End time	Nearest High Tide	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temperature (°C)	Precipitation	Tidal state code
13-Oct-16	1	1	09:00	10:00	09:50	5	E	3-4	Good	12	None	HT
13-Oct-16	1	2	11:00	12:00	09:50	4	E	3-4	Good	13	None	MT (E)
13-Oct-16	1	3	13:00	14:00	09:50	3	E	3-4	Good	14	None	LT
17-Nov-16	2	1	10:30	11:30	12:50	4	WSW	1-2	Very good (3km+)	9	None	MT (R)
17-Nov-16	2	2	12:30	13:30	12:50	5	W	2-4	Very good (3km+)	11	None	HT
17-Nov-16	2	3	14:30	15:30	12:50	8	SW	2-4	Very good (3km+)	12-13	Heavy shower at 1530	MT (E)
20-Dec-16	3	1	08:30	09:30	03:32	7	NE	1-2	Very good (3km+)	3-4	None	LT
20-Dec-16	3	2	10:30	11:30	16:02	8	NE	2	Very good (3km+)	4	None	LT
20-Dec-16	3	3	12:30	13:30	16:02	8	NE	2	Very good (3km+)	4-5	None	MT (R)
19-Jan-17	4	1	11:00	12:00	16:18	0	NE	3	Very good (3km+)	4-5	None	LT
19-Jan-17	4	2	13:00	14:00	16:18	0	NE	2-3	Very good (3km+)	4-5	None	MT (R)
19-Jan-17	4	3	15:00	16:00	16:18	0	NE	1-2	Very good (3km+)	3-4	None	HT
14-Feb-17	5	1	09:30	10:30	13:43	7-1	E	1-2	Very good (3km+)	5	None	MT (R)
14-Feb-17	5	2	11:30	12:30	13:43	0	E	2	Very good (3km+)	7	None	MT (R)
14-Feb-17	5	3	13:30	14:30	13:43	2	E	1-2	Very good (3km+)	7	None	HT

Date	Visit No.	Count No.	Start time	End time	Nearest High Tide	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temperature (°C)	Precipitation	Tidal state code
14-Mar-17	6	1	09:20	10:20	12:50	1	W	1-2	Very good (3km+)	9	None	MT (R)
14-Mar-17	6	2	11:20	12:20	12:50	8	W	1-2	Very good (3km+)	10-11	None	MT (R)
14-Mar-17	6	3	13:20	14:20	12:50	8	W	1	Very good (3km+)	11-12	None	HT

NB: HT = High Tide; LT = Low Tide; MT (R) = Mid tide rising; MT (E) = Mid tide, ebbing

Appendix D
Survey Results

Table D1 Functional Habitat Survey: Totals during each monthly (Sept-Mar) visit (1-7)

Species	1	2	3	4	5	6	7
Brent goose						110	
Grey partridge		12	4	7	8		
Hen harrier					1		
Sparrowhawk		1					1
Buzzard	3	4	1	4	2	2	3
Rough-legged buzzard		1					
Kestrel	7	5			2	2	1
Merlin	1		1				
Golden plover			577	6		5	
Lapwing		9	338	14	61	68	
Curlew						12	
Black-headed gull	127	31	P	110	P	146	60
Mediterranean gull							1
Common gull	3	3				103	
Lesser black-backed gull	4						
Caspian Gull						1	
Herring gull	245	111	37	8		63	390
Stock dove	18	10	14		5		6
Woodpigeon	221	98	P	P	14	390	59
Collared dove	2	6	P	P	P	P	4
Ring-necked parakeet		4					
Short-eared owl							1
Green woodpecker	1	1			1		1
Great spotted woodpecker					1		

Species	1	2	3	4	5	6	7
Skylark	6	63	44	141		6	38
Swallow	8	19					
House martin	3						
Meadow pipit	109	32	35	100	10	1	3
Yellow wagtail	1						
Grey wagtail	1						
Pied wagtail	8	5		8	2		
Wren	P	2	2	P	2	3	4
Dunnock	P	8	P	5	1	5	10
Robin	P	5	4	P	4	3	5
Whinchat		1					
Stonechat		1					
Wheatear		4					
Blackbird		6	11	4	5	1	3
Fieldfare		1	38	10		93	16
Song thrush	1	29	4	10	11	7	3
Redwing		49	9	7		64	3
Mistle thrush	2	1					1
Cetti's warbler	1						
Chiffchaff		1					
Goldcrest		4					
Firecrest		1	1				
Long-tailed tit	P	P	P	P	P	P	P
Blue tit	P	6	P	P	3	P	3
Great tit	P	P	P	P	P	P	2

Species	1	2	3	4	5	6	7
Treecreeper		1					
Jay	1	2					
Magpie	5	P	P	P	P	P	P
Jackdaw	47	P	P	P	P	P	P
Rook	19	43	18	34	P	38	P
Carrion crow	59	P	P	7	P	P	P
Starling	82	175	304	20	71	84	78
House sparrow	15	40	20	13	22		26
Chaffinch	P	9	6	3	2	2	6
Greenfinch		4					
Goldfinch	P	19	12	P	P	2	7
Siskin		10	10				
Linnet	13	20	1	5		2	1
Twite			7				
Lesser redpoll			6				
Reed bunting		6					
Corn bunting		24	26	2			7

Table D2 Functional Habitat Survey: Records of golden plover and lapwing

Visit No.	Date	Time	Field code	Count	Comments
Golden plover					
3	08-Nov-16	09:17	1A2	2	Flushed
3	08-Nov-16	09:17	1A2	2	Commuting northwest
3	08-Nov-16	09:17	1A2	1	Heard only
3	08-Nov-16	09:17	1A2	1	Commuting north
3	08-Nov-16	10:10	1B3	4	Commuting south
3	08-Nov-16	10:15	1B3	3	Commuting north
3	08-Nov-16	10:20	1C1	2	Commuting northwest
3	08-Nov-16	10:40	1A1	6	Flushed from stubble
3	08-Nov-16	12:00		33	Foraging in a field of short grass, north of field 2B2
3	09-Nov-16	11:50	5E1	530	Flushed/moved from fields as tidal flats exposed
4	07-Dec-16	07:55	1A1	1	Flight call heard distantly
4	07-Dec-16	08:00	1A2	1	Foraging in winter wheat
4	07-Dec-16	11:52	5E1	2	Foraging on ploughed land
4	07-Dec-16	12:49	1D1	2	Heard only, west of 1D1
4	07-Dec-16	12:52	1D1	1	Heard only, South of 1D1
6	09-Feb-17	08:15	1A2	5	Flushed, then flew low, South
Lapwing					
2	10-Oct-16	07:30	1A1	9	Flushed, then flew northwest, high
3	08-Nov-16	10:10	1B3	14	Commuting south
3	08-Nov-16	12:00		134	Foraging in a field of short grass, north of 2B2
3	09-Nov-16	10:00	1D2	7	Commuting south
3	09-Nov-16	11:50	5E1	14	Foraging on bare soil
3	09-Nov-16	12:00		147	Loafing in field south of 5D4

Visit No.	Date	Time	Field code	Count	Comments
3	09-Nov-16	13:18	3B4	22	Commuting north
4	07-Dec-16	09:37	2B1	1	Flushed
4	07-Dec-16	09:41	2B2	6	Flushed
4	07-Dec-16	11:57	5E1	1	Foraging on ploughed land
4	07-Dec-16	13:40		6	Foraging in winter wheat in a field south of 5D4
5	04-Jan-17	10:30	2B2	61	Loafing in oilseed rape
6	09-Feb-17	09:35	2B2	128	Loafing in oilseed rape

Appendix 7.6
Baseline Ecological Surveys

babec Ltd
Ecological Consultants

Building inspection for bats and barn owls and reptile presence / likely absence survey

Manston Airport, Kent

RiverOak Strategic Partners

November 2017

Report ref: AFW104/R001V1

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V1	N/A	Tim Buckland BSc MSc MCIEEM	17 November 2017

Contents

1. Summary

1.1.1 RiverOak Strategic Partners intends to submit an application for development consent to reopen Manston Airport as a new air freight and cargo hub in the South East. The airport, which is located in the district of Thanet in Kent, ceased operating in 2014.

1.1.2 WSP | Parsons Brinckerhoff undertook a suite of surveys in 2015 and 2016 in order to inform an application for the mixed-use redevelopment of the site (referred to as Stone Hill Park). The surveys identified suitable habitat for common reptiles at the site as well as pipistrelle / brown long-eared summer/transitional bat roosts within four buildings (B16, B33, B41 and B54). A brown long-eared hibernation roost was also identified within one building (B33) and a barn owl roost was recorded within building B52.

1.1.3 Babec Ecological Consultants were commissioned to undertake a reptile survey and an inspection of buildings within the site for bats and barn owls, and provide a report detailing the findings. The objective was to collect up-to-date baseline information on the presence (or otherwise) of these species and determine the scope of any further surveys required to inform an ecological impact assessment.

1.1.4 All surveys were undertaken by suitably qualified, experienced and licensed ecologists between August and October 2017. The surveys were undertaken in-line with the relevant good practice guidelines. Due to access restrictions, it was not possible to survey approximately 3.9ha of suitable reptile habitat within the site boundary. There were also significant limitations to the inspection of 17 buildings for bats as a result of access restrictions, safety concerns and the absence of a loft hatch; and to the inspection of 11 buildings for barn owls as a result of access restrictions and the height of potential roosting and nesting features.

1.1.5 A single adult common lizard was recorded basking along the western site boundary during the deployment of reptile refugia, although no reptiles were recorded during any of the reptile checks. The results of the reptile survey indicate the presence of a transitory individual, or a low population of common lizards along the southernmost section of the western site boundary.

1.1.6 Evidence of bats was recorded within four buildings (B8, B16, B17 and B41) within the site. The results of the inspection indicate the presence of a hibernation roost within building B8, day / transitional roosts within buildings B16 and B41, and a night roost within building B17. No bats or evidence of bats was recorded in buildings B33 or B54, which were previously confirmed as bat roosts in 2015/16. A further 32 buildings were assessed as having the potential to support roosting bats (two buildings with high potential, six with moderate potential and 24 with low potential) as they incorporate potential roosting features.

1.1.7 Evidence of barn owls was recorded in three buildings (B11, B45 and B52) within the site. The results of the inspection indicate the presence of a temporary rest site within building B45, and occasionally used roost sites within buildings B11 and B52. No evidence of nesting barn owls was recorded during the inspection; however, buildings B11 and B52 were assessed as having the potential to support nesting barn owls as they incorporate potential nesting features.

1.1.8 All species of bat and their roosts are protected by the Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981 (as amended). The Wildlife and Countryside Act 1981 also affords common lizards and barn owls protection from killing and injury, and breeding barn owl's protection from reckless disturbance. Common lizard and seven species of bat are also listed as Species of Principal Importance under Section 41 of the

Natural Environment and Rural Communities Act 2006, which places a duty on the competent authorities to have regard for these species when carrying out their duties.

1.1.9 Further surveys are required to determine the presence or likely absence of reptiles in areas of suitable habitat within the site that could not be surveyed in 2017, and access should be sought to undertake detailed inspections of buildings where access restrictions were a significant limitation to the building inspection for bat and barn owl inspections.

1.1.10 Further surveys are also required to characterise the bat roosts present within six buildings (B8, B16, B17, B33, B41 and B54) and determine the presence or likely absence of roosts from a further 32 buildings assessed as having the potential to support roosting bats. A nest verification survey is required to check for the presence of barn owl breeding sites within buildings B11 and B52 and it is also recommended that all trees within the site boundary should be checked for the presence of suitable features to support roosting bats, and roosting / nesting barn owls. Detailed recommendations for further surveys are provided in Section 6.

2. Introduction

2.1 Development background

2.1.1 RiverOak Strategic Partners (hereafter referred to as 'RiverOak') intends to submit an application for development consent to reopen Manston Airport as a new air freight and cargo hub in the South East.

2.1.2 Manston Airport is located west of the village of Manston and north east of the village of Minster, within the district of Thanet in the county of Kent, see Figure 1 in Appendix A. The northern part of the site is bisected by the B2050 (Manston Road), and the site is bounded by the A299 dual carriageway to the south and the B2190 (Spitfire Way) to the west. The site is predominantly surrounded by large arable fields.

2.1.3 Although the airport was closed in May 2014, much of the airport infrastructure, including the runway, taxiways, aprons, cargo facilities and passenger terminal remain. Much of the remainder of the site comprises large expanses of grassland which during previous operation was kept closely mown.

2.1.4 The proposed development comprises the following principal components:

- an area for cargo freight operations able to handle at least 10,000 movements per year,
- facilities for other aviation-related development, including:
  - a passenger terminal and associated facilities,
  - an aircraft teardown and recycling facility,
  - a flight training school,
  - a base for at least one passenger carrier,
  - a fixed base operation for executive travel, and
  - business facilities for aviation related organisations.

2.1.5 The proposed development is considered to be a Nationally Significant Infrastructure Project (NSIP) and requires the grant of development consent by the making of a Development Consent Order (DCO). An Environmental Impact Assessment (EIA), in accordance with the EIA Regulations, is to be prepared to support the DCO application and to ensure that any potentially significant effects of the proposed development on the environment are considered and, where appropriate, mitigated.

2.2 Ecology background

2.2.1 WSP | Parsons Brinckerhoff (WSP|PB) undertook a suite of surveys at the site in 2015 and 2016 in order to inform an application for the mixed-use redevelopment of the site (referred to as Stone Hill Park). Suitable habitat for common reptile species (adder, grass snake, slow worm and common lizard) was identified within the site in June 2015[1], although no reptile survey data has been published to date.

1 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Extended Phase 1 Habitat Survey*. Project number 70009799, Report 001, Revision 2, issued April 2016.

2.2.2 WSP|PB assessed a total of 23 buildings within the site as having the potential to support roosting bats during an external building inspection undertaken in June 2015[2]. Internal inspections for bats were subsequently undertaken of eight of the buildings in October 2015[3]. Low numbers of pipistrelle droppings were recorded within the roof voids of buildings B16, B41 and B54, and up to 20 droppings (suspected to be brown long-eared) and one pipistrelle dropping were recorded within the underground structure of building B33*. Buildings B16, B33, B41 and B54 were subsequently confirmed as summer / transitional bat roosts.

2.2.3 Two buildings (B18 and B33) were also subject to five checks for hibernating bats in January, February and March 2016[4]. A single brown long-eared bat was recorded hibernating in a gap between an internal wall and a section of plaster board within building B33 during each of the five checks. No bats or evidence of bats was recorded in B18 during any of the checks, and this building was subsequently assessed as being unsuitable for hibernating bats due to the interior of the structure being too exposed and due to a lack of suitable crevices.

2.2.4 WSP|PB recorded a barn owl roost within building B52 in June 2015[5]. No fresh evidence of barn owls was recorded during repeat inspections of the building in January and February 2016[6].

2.3 The brief and objectives

2.3.1 Babec Ecological Consultants were commissioned to undertake a reptile survey and an inspection of buildings within the site for bats and barn owls, and provide a report detailing the findings. The objective was to collect up-to-date baseline information on the presence (or otherwise) of these species groups and determine the scope of any further surveys required to inform an ecological impact assessment.

2 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Extended Phase 1 Habitat Survey*. Project number 70009799, Report 001, Revision 2, issued April 2016.
3 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Further Building Inspections for Bats*. Project number 70009799, Report 003, Revision 1, issued April 2016.
* Note that the building numbers used in this report differ from those used by WSP | Parsons Brinckerhoff. For reference, both building numbering systems are provided in Appendix C.
4 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Bat Hibernation Survey*. Project number 70009799, Report 006, First Issue, dated April 2016.
5 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Extended Phase 1 Habitat Survey*. Project number 70009799, Report 001, Revision 2, issued April 2016.
6 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Wintering Bird Survey*. Project number 70009799, Report 005, Revision 1, issued April 2016.

3. Methods

3.1 Personnel

3.1.1 The reptile survey was undertaken by Jon Bannon BSc MSc MCIEEM, Tim Buckland BSc MSc MCIEEM, Shaun Pryor BSc (Hons) GradCIEEM, Jeff Turton BSc (Hons) GradCIEEM and Alexi Lamoon BSc (Hons). Tim and Jon are full members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and have over seven years' experience of undertaking this type of survey, while Shaun and Jeff are graduate members of CIEEM with two years' experience of undertaking reptile surveys. Alexi has one full season of experience in undertaking reptile surveys.

3.1.2 The building inspection for bats and barn owls was undertaken by Jon Bannon and Tim Buckland with some assistance from Jeff Turton. Jon and Tim have approximately six years' experience of conducting these types of surveys and hold Natural England class licences for bats (registration numbers 2015-11543-CLS-CLS and 2015-11006-CLS-CLS, respectively) and barn owls (registration numbers CL29/00212 and CL29/00010, respectively).

3.2 Reptile survey

3.2.1 A total of 1,500 artificial reptile refugia, comprising one thousand 500mmx1000mm felts and five hundred 500mmx500mm tins, were deployed within the site between 21 and 24 August 2017. Artificial refugia were distributed across all suitable reptile habitat within the site, with a higher density of refugia deployed in the most suitable reptile habitats.

3.2.2 The artificial refugia were left in place for at least 14 days before they were checked for the presence of reptiles on seven separate occasions during suitable or optimal weather conditions. All surveys followed standard guidelines[7].

3.2.3 Weather conditions during each reptile check were noted, including the maximum and minimum temperature, humidity, precipitation, wind speed and cloud cover. The dates of the reptile checks and weather conditions recorded during the checks are provided in Appendix B.

3.3 Building inspection for bats

3.3.1 All 71 buildings within the site were inspected by licensed bat ecologists between August and October 2017. Surveyors used high powered torches, close focussing binoculars, ladders and endoscopes in order to systematically search for bats or secondary evidence of bats and record the presence of potential roosting features and potential access points for bats such as missing mortar, gaps under roof tiles and gaps around soffits / fascias. Where possible, an internal inspection was also undertaken of all buildings that incorporate potential access points for bats and have the potential to incorporate potential roosting features internally.

3.3.2 All inspections were undertaken in-line with the methods set out in The Bat Conservation Trusts' (BCT) good practice guidelines[8]. Where bat droppings were found, samples were collected to allow subsequent DNA analysis, if considered necessary. Following the inspection, each building was assessed and placed into a category (negligible, low, moderate, high or confirmed roost) for its level of potential to support roosting bats, as set out in Table 1.

7 Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10. Froglife, Halesworth
8 Collins (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

Table 1. Categories for the level of potential of buildings to support roosting bats.

Level of potential to support roosting bats	Rationale
Negligible	No evidence of use by bats and no potential roosting features recorded.
Low	No evidence of use by bats but building offers one or more potential roosting features, although these are assessed as being of poor quality. Buildings are generally poorly linked to areas of suitable foraging habitat for bats.
Moderate	No evidence of use by bats although building offers one or more potential roosting features, normally with some connectivity to areas of suitable foraging habitat.
High	No evidence of use by bats although building offers multiple high quality potential roosting features, generally with good connectivity to areas of suitable foraging habitat.
Confirmed roost	Presence of bats or evidence of use by bats confirmed.

3.4 Building inspection for barn owls

3.4.1 A detailed building inspection was undertaken to look for evidence of barn owls and to determine the suitability of each building within the site to support roosting and nesting barn owls, in-line with standard survey protocol[9]. This included looking for potential access points, roosting features and nesting features as well as searching for barn owls and secondary evidence of barn owls, such as droppings, pellets, feathers and nest debris.

3.5 Limitations of methods

Reptile survey

3.5.1 A number of refugia deployed north of Manston Road could not be checked during some visits due to public removal (a total of 57 refugia were removed prior to visit one, 10 refugia removed prior to visit two, 25 refugia removed prior to visit three, 12 refugia removed prior to visit six, and 10 refugia removed prior to visit seven). However, as the average number of refugia that could not be checked during each visit was 16 ([57+10+25+0+0+12+10]/7), which equates to 1% of the total number of refugia checked, this is not considered to be a significant limitation to the survey. All reptile refugia were recovered and re-deployed following each visit.

3.5.2 Due to access restrictions, it was not possible to survey approximately 3.9ha of suitable reptile habitat within the site boundary, as illustrated in Figure 2 in Appendix A.

Building inspection for bats

3.5.3 The building inspection for bats was undertaken between 21 August and 17 October 2017. As detailed in Appendix C, there were significant limitations to the inspection of 17 buildings as a result of safety concerns (B1, B33, B34, B56, B61), the absence of a loft hatch (B53) and access restrictions (B5, B14, B15, B21, B22, B23, B37, B38, B43, B46, B47).

9 Shawyer (2011) *Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting*. IEEM, Winchester.

3.5.4 Further surveys have been recommended for buildings where the inspection was subject to a significant limitation as a result of safety concerns or the absence of a loft hatch (buildings B1, B33, B34, B56, B61 and B53). It has also been recommended that access is sought to undertake detailed inspections of the 11 buildings where the inspection was subject to a significant limitation as a result of access restrictions (B5, B14, B15, B21, B22, B23, B37, B38, B43, B46, B47).

Building inspection for barn owls

3.5.5 The building inspection for barn owls was undertaken between 21 August and 17 October 2017. There were significant limitations to the inspection of 11 buildings as result of the height of potential roosting / nesting features (B11, B52) and access restrictions (B14, B15, B21, B22, B23, B37, B38, B46, B47) as set out in Appendix C.

3.5.6 It has been recommended that access is sought to undertake detailed inspections of the nine buildings where the inspection was subject to a significant limitation as a result of access restrictions (B14, B15, B21, B22, B23, B37, B38, B46 and B47). Further surveys have also been recommended for buildings B11 and B52, which were subject to limitations as a result of the height of potential roosting / nesting features.

General

3.5.7 It should be noted that whilst every effort has been made to provide a comprehensive assessment of the site, no investigation can ensure the complete characterisation and prediction of the natural environment.

3.5.8 Habitats and their potential to support protected species changes over time. Therefore, the results of the surveys will become less reliable as time progresses. As a general rule, the survey results should not be relied upon after two years' from the date of the survey.

4. Results and interpretation

4.1 Reptile survey

Results

4.1.1 A single adult common lizard was recorded basking within the site (along the western site boundary, adjacent to Minster Road) during felt/tin placement on 23 August 2017, see Figure 2 in Appendix A. No reptiles were recorded during any of the seven reptile checks.

4.1.2 As set out in Appendix B, the reptile checks were undertaken in optimal or suitable weather conditions in September, which is considered to be an optimal time of year to conduct this type of survey.

Interpretation

4.1.3 Comparing the peak count (1 adult common lizard) with Froglife guidance[10], suggests the presence of a low population of common lizards along the southernmost section of the western site boundary. However, the lack of records during the subsequent checks could also indicate that the record was of a transitory individual.

4.1.4 Whilst the majority of the site comprises suitable habitat for reptiles in the form of semi-natural grassland, there is little variety in the topography or vegetation structure over much of the site and few areas of scrub to provide suitable shelter or cover. At a landscape level the site is surrounded by roads and large arable fields with narrow vegetated margins which are likely to impede connectivity for reptiles significantly.

4.1.5 It is considered likely that the site has become increasingly suitable for reptiles as a result of less intensive management of habitats since the site ceased operating as an airport in 2014, but that the poor connectivity between the site and surrounding areas of suitable reptile habitat has impeded the colonisation of the site by reptiles.

4.2 Building inspection for bats

Results

4.2.1 A total of 71 buildings (building numbers B1 – B71) were identified within the site boundary. All 71 buildings were inspected for bats between 21 August and 17 October 2017. As mentioned in Section 3.5.3 and set out in full in Appendix C, there were significant limitations to the inspection of 17 buildings as a result of safety concerns, the absence of a loft hatch and access restrictions.

4.2.2 A summary of the potential of these buildings to support roosting bats is provided in Table 2 and is illustrated on Figures 3a to 3d in Appendix A.

10 Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10. Froglife, Halesworth

Table 2. Summary of the potential roosting suitability of buildings on site for bats.

Potential to support roosting bats	Building numbers	Total number of buildings in category
Confirmed roost	B8, B16, B17, B33, B41, B54	6
High	B1, B43	2
Moderate	B5, B18, B28, B29, B39, B53	6
Low	B2, B3, B6, B7, B11, B14, B15, B22, B25, B27, B34, B40, B44, B45, B46, B47, B50, B52, B56, B61, B62, B63, B64, B66	24
Negligible	B4, B9, B10, B12, B13, B19, B20, B21, B23, B24, B26, B30, B31, B32, B35, B36, B37, B38, B42, B48, B49, B51, B55, B57, B58, B59, B60, B65, B67, B68, B69, B70, B71	33

4.2.3 A total of six buildings with confirmed bat roosts have been identified at the site. Evidence of bats (in the form of droppings) was recorded in four of these buildings (B8, B16, B17 and B41) during the inspections. No bats or evidence of bats was recorded in buildings B33 or B54; however, these two buildings were confirmed as bat roosts in 2015/16[11,12].

4.2.4 Approximately 25 bat droppings, considered likely to belong to two species of bat (most likely brown long-eared and a Myotis species) were recorded within the interior of building B8. Three bat droppings (most likely species is brown long-eared) were recorded within the roof void of building B16 and approximately 40 mixed age droppings (most likely species is brown long-eared) were recorded within the interior of building B17. Approximately 30 suspected bat droppings (most likely a pipistrelle species) were also recorded within the roof void of building B41.

4.2.5 A further 32 buildings were assessed as having the potential to support roosting bats:

- two buildings with high potential,
- six buildings with moderate potential, and
- twenty-four buildings with low potential to support roosting bats, as they incorporate potential roosting features.

4.2.6 A total of 33 buildings were assessed as having negligible potential to support roosting bats as no potential roosting features were recorded within these buildings.

4.2.7 The full results of the building inspection for bats are provided in Table 3.

11 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Extended Phase 1 Habitat Survey*. Project number 70009799, Report 001, Revision 2, issued April 2016.
12 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Bat Hibernation Survey*. Project number 70009799, Report 006, First Issue, dated April 2016.

Table 3. Results of the building inspection for bats.

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B1	Royal Observer Corps Monitoring post. Of concrete construction, with an open access hatch leading to small underground structure. Two small vents are also present above ground.	None	Y	No potential roosting features were noted externally, although an open entrance provides unimpeded access into the underground structure, which is considered likely to support conditions suitable for hibernating bats.	L	N	H	N	H
B2	Single storey brick sub-station building with a flat roof clad with bitumen felt. There is a small lean-to on the eastern elevation.	None	N	Putlog holes and an area of missing mortar provide potential access into the wall cavity. There is also an area of lifted felt between the main building and the lean-to on the eastern elevation.	L	N	L	N	L
B3	Single storey brick sub-station building with a flat roof clad with bitumen felt.	None	N	Putlog holes on the northern and southern elevations provide potential access points into the wall cavity.	L	N	L	N	L
B4	Small disused brick sub-station with a flat roof clad with bitumen felt.	None	N	The building is in a poor state of repair and a missing window on the northern elevation provides a potential access point for bats to the interior of the building. However, no potential roosting features were recorded within the interior of the building and no gaps are present in the brickwork or under the bitumen felt roof on the exterior. As no potential roosting features were recorded, this building is assessed as having negligible potential to support roosting bats.	N	N	N	N	N
B5	Single storey brick building with a pitched roof clad with interlocking aggregate tiles. The building is used to house communications equipment.	None	Y	There are several gaps beneath the ridge tiles, which could potentially provide access into the ridge, the cavity between the roof tiles and roof lining and/or access into the roof void (if present). There are also several gaps under the soffit which provide access to the soffit box and potentially also into the roof void (if present).	M	L	L	N	M
B6	Single storey former cargo reception building. The building, which is in a poor state of repair, is clad with wooden paneling throughout, with a wooden fascia and a flat roof. There is a small pre-fabricated extension on the eastern elevation.	None	N	Gaps under the wooden fascia provide access into the cavity behind the fascia, and potentially also into the wall cavity (if present).	L	L	L	N	L
B7	Single storey pre-fabricated portakabin, sections of which are clad with wooden paneling.	None	N	Gaps under sections of wooden paneling could provide a potential roosting feature for individual or low numbers of bats.	L	N	N	N	L
B8	A single storey brick building with a flat concrete roof clad with bitumen felt. The interior of the building is cool and dark, with evidence of damp ingress.	Approx' 25 old bat droppings (possibly from brown long eared (BLE) and a Myotis spp.) found adjacent to the northern internal wall.	N	There are vents on the eastern and western elevations, which could provide access into the wall cavity. A small gap above the door provides access to the interior of the building, where bats could roost on the interior walls, or in missing mortar on internal walls.	M	N	C	L	C
B9	A metal framed workshop building with a pitched roof. The roof and external walls are clad with corrugated metal sheeting.	None	N	The building is in a good state of repair with no potential access points or potential roosting features recorded. Furthermore, the thermal properties of the corrugated metal sheeting, which clads the building throughout, are likely to make this building unsuitable for roosting bats.	N	N	N	N	N
B10	A small storage building of breeze block construction with a flat roof clad with bitumen felt.	None	N	The building is well sealed with no potential access points for bats recorded. There are small gaps under the weather boarding on the north-western and south-eastern elevations; however, they are considered to be too shallow and exposed to provide a potential roosting feature for bats.	N	N	N	N	N
B11	A large metal framed building with a pitched roof. Both the roof and external walls are clad with corrugated metal sheeting. There are large hangar doors on the southern and northern elevations and a small lean-to on the south-west elevation. No roof void is present.	None	N	There is a potential roosting feature for crevice dwelling bats between the block walls and corrugated metal roof of the lean-to, which could be accessed via gaps in a louvered door. Gaps around the hanger doors provide potential access into the interior of the building, which could potentially be used as a night perch or feeding roost.	L	N	N	L	L

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B12	A large metal framed warehouse with a double-pitched roof. The roof and external walls are clad with corrugated metal sheeting. No roof void is present.	None	N	No potential roosting features or access points were recorded and the building is in a good state of repair. The interior of the building is light as a result of several transparent sheets in the roof.	N	N	N	N	N
B13	A small metal framed security hut with a flat roof.	None	N	No potential roosting features or access points were recorded and the building is tightly sealed and in a good state of repair.	N	N	N	N	N
B14	Large steel/breeze block warehouse with a pitched roof clad with corrugated metal sheeting.	None	Y	Putlog holes on the southern and northern elevations provide potential access into the wall cavity.	L	N	L	L	L
B15	Ancillary building with a flat roof clad with corrugated asbestos.	None	Y	A missing soffit on the southern elevation of the building provides access to a cavity between the roof and internal ceiling.	L	N	N	L	L
B16	A single storey former engineering support unit. The building has a pitched roof which is lined with bitumen felt and clad with interlocking concrete tiles. There are extensions on the north and east elevations which have flat roofs clad with bitumen felt. The main section of the building incorporates a shallow roof void (approx. 1m from floor to apex). No ridge beam is present within the roof void, and the floor is insulated with fiberglass insulation.	Three bat droppings were recorded scattered within the roof void (most likely from BLE).	N	There are several gaps beneath the ridge tiles, which could potentially provide access into the ridge and the cavity between the roof tiles and the bitumen felt lining. Bats could potentially go on to access the roof void via gaps in the bitumen felt lining. Gaps under roof tiles are likely to provide access to the cavity between the roof tiles and the bitumen felt lining. Bats could potentially go onto access the roof void via gaps in the bitumen felt lining. While no ridge beam is present within the roof void, bats could potentially roost between the rafters and bitumen felt.	C	M	L	N	C
B17	A large warehouse with a pitched roof clad with metal sheeting. There are two sections of brick wall and a large entrance on the front elevation. The side and rear walls comprise corrugated metal sheeting on a breeze block base. There is also a small flat-roofed extension on the northern elevation.	Approx' 40 mixed age droppings (most likely from BLE) mainly scattered alongside the eastern and western walls. The absence of feeding remains, and restricted roosting features above most of the droppings indicates the most likely use of this building as a night roost.	N	Gaps around the main entrance provide access to the interior of the building. Narrow gaps in the concrete beams, and gaps between concrete beams and brick walls provide potential day roosting opportunities for low number of bats. A gap under a fascia provides access to the interior of the extension on the norther elevation.	M	N	L	C	C
B18	A brick/concrete bunker with three open entrances. Externally, the structure is clad with dense ivy, which has grown over the entrances on the northern and western elevations.	None	N	Hibernating bats could roost on interior walls, or in small crevices in the concrete walls.	N	N	M	N	M
B19	Small wooden framed building with a flat roof. The walls and roof are clad with corrugated metal sheets.	None	N	The building is in a poor state of repair and several gaps under corrugated metal sheets provide potential access points to the interior of the building. However, no potential roosting features were recorded on the exterior of the building or within its interior. Furthermore, no wall cavity is present and the thermal properties of the corrugated metal sheeting, which clads the building throughout, are likely to make this building unsuitable for roosting bats.	N	N	N	N	N

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B20	A small wooden shed with a flat roof clad with bitumen felt. The building is also clad with dense ivy.	None	N	The building is in a poor state of repair and an open door and small vent provide potential access points to the interior of the building. However, no potential roosting features were recorded within the interior of the building which is very small (approximately 2m x 2m x 2.5m). Furthermore, no wall cavity is present and no suitable gaps were recorded under the ivy which clads the exterior of the building.	N	N	N	N	N
B21	A large warehouse with a pitched roof clad with corrugated metal sheeting. The walls are also clad with corrugated metal sheeting.	None	Y	The building is in a good state of repair and no potential access points or roosting features were noted on the exterior of the building. While it was not possible to access the interior of the building, the thermal properties of the corrugated metal sheeting, which clads the building throughout, are likely to make this building unsuitable for roosting bats.	N	N	N	N	N
B22	Two Nissen huts adjoined by a makeshift wooden framed extension with a flat roof. Each Nissen hut has brick walls and base, and is clad with corrugated metal sheeting.	None	Y	Gaps around the doors and wall on the south-eastern elevation provide access to the interior of the building, which could incorporate potential roosting features for bats.	L	N	L	L	L
B23	A single storey wooden storage building with a flat roof clad with corrugated metal.	None	Y	While no potential roosting features or access points were recorded, there was only a very limited view of this building due to access restrictions.	N	N	N	N	N
B24	A small single storey building with a flat roof clad with bitumen felt. Radar equipment is present on the roof.	None	N	While a missing vent on the northern elevation provides a potential access point to the interior of the building, no potential roosting features were recorded within the interior of the building which is small and cluttered with machinery. Furthermore, no potential roosting features were recorded on the exterior of the building, which is rendered with cement and has no soffit / fascia.	N	N	N	N	N
B25	The RAF Manston History Museum. The building has a triple pitched roof which is clad with corrugated metal. The building is of breeze block construction and has wooden soffits. No roof void is present.	None	N	Gaps under soffits could provide access to suitable cavities for crevice dwelling bats.	L	N	N	N	L
B26	A small brick building with a flat roof clad with bitumen felt. The building incorporates a uPVC soffit and fascia.	None	N	No potential access points or potential roosting features were recorded on the exterior of this building, which is very small (2m x 2m x 2.5m) and in a good state of repair. No gaps were noted around the soffit box or fascia.	N	N	N	N	N
B27	Spitfire and Hurricane Memorial building. The building is of brick construction with a flat roof clad with metal sheeting. There are various flat roofed extensions on the south and west elevations of the building. No roof void is present.	None	N	There are gaps under a wooden fascia on a small section of the building, which could provide roosting opportunities for low numbers of crevice dwelling bats.	L	N	N	N	L
B28	A three storey former control tower. The building is clad with concrete cladding and has a flat roof clad with bitumen felt. There is a flat roofed pre-fabricated extension on the northern elevation.	None	N	There are several gaps in the concrete cladding, which provide access to a lined cavity between the external walls and the cladding.	M	L	L	N	M
B29	Former Air Traffic Engineering building. The building is of brick construction with a pitched roof clad with interlocking aggregate tiles. The roof void is internally partitioned into two sections; each is lined with bitumen felt (which is torn in places) with fiberglass insulation on the floor. No ridge beams are present and the roof voids are relatively uncluttered.	None	N	There are several gaps beneath the ridge tiles, which are likely to provide access into the ridge as well as the cavity between the roof tiles and the bitumen felt lining. Bats could potentially go on to access the roof void via gaps in the bitumen felt lining. Gaps under roof tiles provide access to the cavity between the roof tiles and the bitumen felt lining. Bats could potentially go on to access the roof void via gaps in the bitumen felt lining. Gaps in the fascias provide access to the soffit box and the roof void. While no ridge beam is present within the roof void, bats could potentially roost alongside the rafters and bitumen felt and/or in crevices between the gable walls and the roof. An area of missing mortar on the western elevation provides potential access into the wall cavity.	M	M	L	N	M

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B30	A single storey prefabricated portakabin with a flat roof clad with bitumen felt.	None	N	No potential roosting features or access points for bats were recorded and the building is in a good state of repair throughout. No gaps were noted around the soffit box or fascia.	N	N	N	N	N
B31	A single storey prefabricated portakabin with a flat roof.	None	N	The building is in a poor state of repair and an open door and smashed window provide potential access points to the interior of the building. However, no potential roosting features were recorded within the interior or on the exterior of the building.	N	N	N	N	N
B32	A single storey building rendered in pebbledash. The building has a pitched roof which is clad with corrugated metal sheeting.	None	N	No potential roosting features or access points were recorded on the exterior of the building and the thermal properties of the corrugated metal roof are likely to make this building unsuitable for roosting bats.	N	N	N	N	N
B33	A brick built structure comprising a small above ground tower and a staircase leading to a series of underground rooms. Some of the interior walls are rendered or clad with plaster boarding (which is in a poor state of repair) whilst others are bare brick. There is evidence of damp ingress throughout the below-ground structure.	None	Y	Bats can access the underground structure via a missing manhole cover on the roof of the tower and via an open stairway. Non-crevice dwelling bats could potentially roost on open surfaces throughout the underground structure. There are also suitable roosting features for crevice dwelling species, including gaps between brickwork, and cavities between plaster boarding and internal walls.	C*	N	C+	L	C*
B34	A small electrical sub-station building, which is rendered with pebble dash and has a shallow sloped roof clad with corrugated asbestos.	None	Y	Bats could access the interior of the building via two vents, which are present on the northern elevation.	L	N	L	N	L
B35	A small disused ancillary building of brick construction, with a flat roof clad with bitumen felt.	None	N	No potential roosting features were recorded on the exterior or within the interior of the building.	N	N	N	N	N
B36	A large metal tower with adjoining pre-fabricated metal building at base.	None	N	No potential roosting features were recorded on the exterior of the tower, which is of metal construction and is open and exposed. The adjoining metal building is in a good state of repair with no potential access points or roosting locations.	N	N	N	N	N
B37	A single storey brick electrical sub-station building with a flat roof.	None	Y	While it was only possible to view the southern and eastern elevations of this building, it appears to be in a good state of repair, with no gaps around the brickwork or under the flat roof. No potential roosting features were recorded during the inspection.	N	N	N	N	N
B38	A small single storey brick electrical substation building with a flat roof.	None	Y	While it was only possible to view the southern and eastern elevations of this building, it appears to be in a good state of repair, with no gaps around the brickwork or under the flat roof. No potential roosting features were recorded during the inspection.	N	N	N	N	N
B39	A single storey brick building rendered with pebbledash with a sloping roof clad with corrugated asbestos. The building is surrounded by dense scrub and sycamore trees.	None	N	An open entrance on the western elevation provides access to the interior of the building, where non-crevice dwelling bats could potentially roost on open surfaces throughout. There are also day roosting opportunities above a false ceiling.	L	N	M	L	M
B40	A single storey brick building rendered with cement with a flat roof clad with bitumen felt.	None	N	Areas of missing mortar and gaps under the fascia provide potential day roosting opportunities for crevice dwelling species of bat.	L	N	N	N	L

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B41	A single storey wooden framed building with a simple pitched roof lined with bitumen felt and clad with interlocking aggregate tiles. A long and shallow (approximately 1.2m floor to apex) roof void is present. The roof void is relatively uncluttered with fiberglass insulation on the floor. No ridge beam is present within the roof void.	Approx. 30 suspected bat droppings (most likely pipistrellus species) scattered under the roof apex within the roof void.	N	There are several gaps beneath the ridge tiles, which are likely to provide access into the ridge as well as the cavity between the roof tiles and the bitumen felt lining. Bats could potentially go on to access the roof void via gaps in the bitumen felt lining. Gaps under roof tiles provide access to the cavity between the roof tiles and the bitumen felt lining. Bats could potentially go on to access the roof void via gaps in the bitumen felt lining. Gaps under the fascia on the eastern and western elevations provide potential roosting opportunities for crevice dwelling species of bat, and also potential access to the roof void. While no ridge beam is present within the roof void, bats could potentially roost alongside the rafters and bitumen felt.	C*	L	L	N	C*
B42	A single storey pre-fabricated building on a brick base. The building has a flat roof clad with bitumen felt, and external walls clad with wooden panels.	None	N	No potential roosting features or access points were recorded on the exterior of the building.	N	N	N	N	N
B43	A single storey brick building with a pitched and hipped roof clad with clay tiles. There is a small extension on the western elevation, which has a flat roof clad with bitumen felt. The building has wooden soffits and fascias.	None	Y	Gaps underneath ridge and hip tiles are likely to provide access into the ridge/hip tiles and potentially also to a roof void (if present). Gaps under clay roof tiles are likely to provide access to a cavity between the tiles and the roof lining, and may also provide access to a roof void (if present). A gap under the soffit on the southern elevation could provide access to the soffit box and potentially also to a roof void (if present).	H	M	L	N	H
B44	The former passenger terminal, comprising a single storey building of breeze block and timber construction with a flat roof clad with bitumen felt. The southern section of the building incorporates a pitched roof clad with corrugated metal sheeting.	None	N	Gaps under the fascia on the northern, eastern and western elevations of the building lead into a suitable cavity for crevice dwelling bats. There is also a potential roosting opportunity for crevice dwelling bats underneath some lifted plywood sheeting on the eastern elevation.	L	L	N	N	L
B45	A steel framed Nissen hut clad with corrugated metal sheeting with breeze block walls on the eastern and western elevations.	None	N	Bats can access the interior of the building via gaps above the doors on the eastern and western elevations, and via large gaps in the corrugated metal sheeting. There is potential for crevice dwelling species of bat to roost between the metal roof and the breeze block walls on the eastern and western elevations.	L	N	N	L	L
B46	A large warehouse with a pitched roof clad with corrugated asbestos. There are extensions on the northern, eastern, southern and western elevations.	None	Y	Bats could access the interior of the building via gaps under corrugated asbestos sheeting, and via a louvered grille and a gap around an entrance on the northern elevation. It is not known whether the interior of the building incorporates any potential roosting features.	L	L	L	L	L
B47	A single storey building of breeze block construction with a flat roof clad with bitumen felt. There is a wooden fascia on the eastern, southern and western elevations.	None	Y	Gaps under the wooden fascia could provide roosting opportunities for crevice dwelling bats. Bats could potentially access the interior of the building via gaps around a door on the southern elevation of the building. It is not known whether the interior of the building incorporates any potential roosting features.	L	N	N	L	L
B48	A single storey metal framed portakabin with a flat roof clad with metal sheeting.	None	N	While the building is generally in a poor state of repair, no potential access points for bats to the interior of the building were recorded and no potential roosting features were recorded on the exterior of the building.	N	N	N	N	N
B49	A small single storey brick building with a flat roof clad with bitumen felt. There is a large metal beacon on top of the roof.	None	N	The building is in a good state of repair, and no potential access points or potential roosting features were recorded on the exterior of the building.	N	N	N	N	N
B50	A single storey building of concrete construction with a flat roof clad with bitumen felt. There is a metal lookout tower on top of the roof.	None	N	Gaps under fascias could provide roosting opportunities for crevice dwelling bats.	L	N	N	N	L

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B51	A small metal framed ancillary building with a simple pitched roof clad with corrugated metal. The walls are also clad with corrugated metal.	None	N	No potential roosting features or access points were recorded on the exterior of the building. Furthermore, the thermal properties of the corrugated metal sheeting, which clads the building throughout, are likely to make this building unsuitable for roosting bats.	N	N	N	N	N
B52	The former fire and rescue building; of breeze block construction with corrugated metal cladding on the walls and a flat roof. There is an observation tower on the western section of the building and four large entrances on the southern elevation, which were formerly used for vehicular access. There is a large brick chimney on the northern elevation and remnants of a suspended ceiling present within the building.	None	N	Numerous gaps under the fascias and missing mortar on the chimney could provide potential roosting opportunities for crevice dwelling bats. While there is access to the interior of the building via open entrances on the southern elevation, smashed windows on the northern and eastern elevations and a louvered grill on the western elevation, no potential roosting features were recorded within the building.	L	N	N	L	L
B53	A small brick building with a pitched roof clad with interlocking concrete tiles. The building incorporates uPVC fascias and soffits.	None	Y	Gaps under the fascia on the eastern and western elevations provide access to a cavity between the roof tiles and the roof lining, and may also provide access to a roof void.	M	L	L	N	M
B54	A single storey building of brick construction with a Dutch gable roof clad with interlocking concrete tiles. Gable walls on the eastern and western elevations are clad with corrugated metal sheeting. There is a small hexagonal and flat roofed extension on the western elevation. The roof is of modern truss construction and incorporates a large but cluttered roof void. The roof is lined with bitumen felt with fiberglass insulation between the floor joists. No ridge beam is present.	None	N	Gaps under roof tiles provide access to the cavity between the roof tiles and the bitumen felt lining. There are large gaps under the fascia on the gable walls which provide access into the roof void where bats could roost alongside the rafters and bitumen felt lining. There are several gaps under the lead flashing on the hexagonal extension, which could provide access to a cavity between the roof tiles and the roof lining. There is a small section of missing mortar on the north-eastern corner of the building that could a provide roosting opportunity for crevice dwelling species.	C*	L	L	N	C*
B55	A large steel framed aircraft hangar with a shallow pitched roof. The walls and roof are clad with corrugated metal and there are large hangar doors on the southern elevation.	None	N	No potential roosting features were recorded on the exterior of the building. While there are some small gaps on the exterior of the building that could provide potential access to bats to the interior, no potential roosting features were recorded within the interior of the building which is well lit as a result of several transparent sheets in the roof.	N	N	N	N	N
B56	A single storey brick building with a flat roof clad with bitumen felt. There is a small extension on the eastern elevation which has a sloping roof clad with asbestos sheeting.	None recorded	Y	Gaps under the fascia on the southern elevation could provide roosting opportunities for crevice dwelling bats. Bats could potentially access the interior of the building via gaps under the corrugated asbestos sheeting and a small area of missing mortar on the south-eastern corner of the building.	L	N	L	N	L
B57	A small outbuilding clad of uPVC construction.	None	N	No potential roosting features or access points were recorded on the exterior of the building.	N	N	N	N	N
B58	A metal water storage tank.	None	N	No potential roosting features were recorded.	N	N	N	N	N
B59	A prefabricated concrete garage with a pitched roof clad with bitumen felt.	None	N	No potential roosting features were recorded on the exterior of the building. While there is a small gap above the entrance on the western elevation that could provide potential access for bats to the interior, no potential roosting features were recorded within the interior of the building.	N	N	N	N	N
B60	A single storey building of breeze block construction with a half-pitched roof clad with corrugated metal sheeting. The eastern section of this building has recently been demolished and replaced with a small wooden extension.	None	N	No potential roosting features were recorded on the exterior of the building. While there are several small gaps providing potential access for bats to the interior, no potential roosting features were recorded within the interior of the building.	N	N	N	N	N

Building number	Description	Evidence of bats recorded	Significant limitations to inspection^	Potential roosting features and access points	Potential to support roost				
					Day / trans	Mat.	Hib.	Night / feeding	Overall
B61	A single storey workshop with a pitched roof. The walls and roof are clad with corrugated asbestos and there is a flat-roofed extension on the northern elevation. A large plastic sheet has been installed at eaves height, creating a roof void. Several large holes were noted within the plastic sheeting.	None	Y	Bats could access the interior of the building via gaps under ridge tiles and gaps under corrugated asbestos sheeting. The ridge tiles provide a potential roosting opportunity for non-crevice dwelling species, and a gap under some chipboard sheeting on the western elevation provides roosting opportunities for crevice dwelling bats.	L	N	N	L	L
B62	A single storey brick building with a Dutch gable roof lined with bitumen felt and clad with interlocking aggregate tiles. The gable ends are clad with corrugated metal sheeting. The building incorporates a cluttered roof void (approximately 1.2m floor to apex). No ridge beam is present and there is fiberglass insulation between the floor joists.	None	N	Gaps under the soffit on the eastern, southern and western elevations, and gaps under the corrugated metal sheeting on the gable ends provide access to the roof void, where bats could potentially roost alongside the rafters and bitumen felt. Missing mortar on the hip starter on the north-eastern extent of the building could provide access into the hip tile, and potentially also to the cavity between the roof tiles and the bitumen felt. A gap under a roof tile on the western elevation also potentially provides access to the cavity between the roof tiles and the bitumen felt.	L	N	L	N	L
B63	A single storey building with a flat roof clad with bitumen felt. The exterior of the building has been rendered with cement.	None	N	A gap under the fascia and a gap between the bitumen felt on the northern elevation provide potential roosting opportunities for crevice dwelling bats.	L	N	N	N	L
B64	A single storey building of breeze block construction with a flat roof clad with bitumen felt. There are fascias on the eastern and western elevations.	None	N	Gaps under the fascias on the eastern and western elevations provide access to small crevices between the walls and the roof.	L	N	N	N	L
B65	A small wooden shed with a flat roof clad with bitumen felt.	None	N	No potential roosting features were recorded.	N	N	N	N	N
B66	A single storey building of breeze block construction with a flat roof clad with corrugated asbestos sheeting. The building is in a poor state of repair.	None	N	Crevice dwelling bats could potentially roost between the corrugated asbestos sheeting and the walls. There is access to the interior of the building via open doors, an open window and a hole in the blockwork.	L	N	N	L	L
B67	A large metal storage tank.	None	N	No potential roosting features were recorded.	N	N	N	N	N
B68	A large metal storage tank.	None	N	No potential roosting features were recorded.	N	N	N	N	N
B69	A small portakabin with a flat roof clad with bitumen felt.	None	N	While the building is in a poor state of repair, no potential roosting features or access points were recorded on the exterior of the building.	N	N	N	N	N
B70	A small wooden shed with a flat roof clad with bitumen felt.	None	N	No potential roosting features were recorded.	N	N	N	N	N
B71	A small storage building of breeze block / shiplap boarding construction, with a flat roof clad with bitumen felt.	None	N	No potential roosting features were recorded.	N	N	N	N	N

^ = further details of limitations are provided in Appendix C
Trans. = transitional roost | Hib. = hibernation | Mat. = maternity
C= confirmed roost | H = high potential to support roost | M= moderate potential to support roost | L = low potential to support roost | N = negligible potential to support roost
* Previously confirmed as a roost by WSP | PB[13]
+ Previously confirmed as a roost by WSP | PB[14]

13 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Further Building Inspections for Bats*. Project number 70009799, Report 003, Revision 1, issued April 2016.
14 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Bat Hibernation Survey*. Project number 70009799, Report 006, First Issue, dated April 2016.

Interpretation

4.2.8 A summary of the roosts recorded within the site to date are provided in Table 4. While further surveys are required in order to accurately characterise the types of roosts present (no emergence or return to roost survey have been undertaken of these buildings to date), Table 4 also includes our preliminary interpretation of the likely roost types have also been provided, which comprise:

- one night roost,
- two hibernation roosts, and
- four day / summer / transitional roosts.

Table 4. Summary of roosts recorded to date and interpretation of roost types.

Building number	Previous survey information*	Evidence of bats recorded during 2017 building inspection	Preliminary interpretation of roost type(s)
B8	No evidence of bats was recorded within this building, which was assessed as having low potential to support summer / transitional and hibernation roosts.	Approximately 25 old bat droppings (likely from two species of bat) were recorded adjacent to an internal wall.	Given that the interior of the building is cool and undisturbed with evidence of damp ingress, the droppings are considered most likely to indicate the presence of a **hibernation roost**. The most likely species considered to be brown long-eared and myotis. The building also has the potential to support day / transitional and night / feeding roosts.
B16	Low numbers of pipistrelle droppings were recorded in the roof void in June 2015, and the building was subsequently confirmed as a summer / transitional roost. The building was also assessed as having the potential to support a maternity roost.	Three bat droppings were recorded scattered within the roof void (most likely species is brown long-eared bat).	The results of the survey confirm the presence of a **day / transitionary roost** within the roof void. The most likely species is considered to be brown long-eared and/or a pipistrelle species. The building is also assessed as having the potential to support maternity and hibernation roosts.
B17	No evidence of bats was recorded within this building, which was assessed as having negligible potential to support roosting bats.	Approximately 40 mixed age droppings (most likely species is brown long-eared bat) were recorded within the building, with droppings predominantly scattered alongside the eastern and western walls.	The absence of feeding remains and restricted day roosting features above most of the droppings indicates that this building is most likely used as a **night roost**. The most likely species is considered to be brown long-eared bat. The building is also assessed as having the potential to support day / transitionary and hibernation roosts.

Building number	Previous survey information*	Evidence of bats recorded during 2017 building inspection	Preliminary interpretation of roost type(s)
B33	Up to 20 droppings (suspected to be brown long-eared) and one pipistrelle dropping were recorded in the underground structure in June 2015, and this building was subsequently confirmed as a summer / transitional bat roost. An individual brown long-eared bat was recorded in the underground structure during each of the five hibernation checks undertaken in January, February and March 2016, confirming this building as a hibernation roost.	No evidence of bats was recorded. The building was also assessed as having the potential to support a night / feeding roost.	The results of previous surveys have confirmed the presence of a brown long-eared **hibernation roost**, and a **summer / transitional roost** within this building. The building also has the potential to support a night / feeding roost.
B41	Low numbers of pipistrelle droppings were recorded in the roof void in June 2015 and this building was subsequently confirmed as a summer / transitional bat roost.	Approximately 30 suspected bat droppings (most likely pipistrellus species) were recorded scattered under the roof apex within the roof void.	The building was confirmed as a **summer / transitional roost**, with the most likely species comprising a pipistrelle. The building is also assessed as having the potential to support maternity and hibernation roosts.
B54	Low numbers of pipistrelle droppings were recorded in the roof void in June 2015 and this building was subsequently confirmed as a summer / transitional bat roost.	No evidence of bats was recorded. The building was also assessed as having the potential to support maternity and hibernation roosts.	The building was previously confirmed as a **summer / transitional roost,** with the most likely species comprising a pipistrelle. The building is also assessed as having the potential to support maternity and hibernation roosts.

* Previous survey information recorded by WSP | Parsons Brinckerhoff and detailed in separate reports[15, 16, 17].

15 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Extended Phase 1 Habitat Survey*. Project number 70009799, Report 001, Revision 2, issued April 2016.
16 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Further Building Inspections for Bats*. Project number 70009799, Report 003, Revision 1, issued April 2016.
17 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Bat Hibernation Survey*. Project number 70009799, Report 006, First Issue, dated April 2016.

4.3 Building inspection for barn owls

Results

4.3.1 Evidence of barn owls was recorded in three buildings (B11, B45 and B52) within the site, comprising:

- a total of ten mixed-age pellets within building B11,
- two old pellets within building B45, and
- approximately 25 mixed-age pellets within building B52.

4.3.2 No evidence of nesting barn owls was recorded during the inspection; however, buildings B11 and B52 were assessed as having the potential to support nesting barn owls as they incorporate potential nesting features.

4.3.3 All other buildings within the site were assessed as having negligible potential to support barn owls as they do not incorporate potential access points and/or potential roosting or nesting features.

4.3.4 The results of the building inspection for barn owls are provided in Table 5 and are illustrated on Figures 4a to 4d in Appendix A.

Interpretation

4.3.5 The results of the surveys confirm the presence of barn owl roosts within buildings B11, B45 and B52. The low number of pellets recorded within building B45 indicate the presence of a temporary rest site (as defined by Shawyer, 2011[18]) within this building, while the number of pellets recorded within B11 and B52 are consistent with the presence of occasionally used roost sites. Barn owls are known to have roosted within building B52 since at least 2015[19], and the absence of fresh evidence of barn owls during January and February 2016 suggests that the roost is likely to be inactive during the winter period[20].

18 Shawyer (2011) *Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting*. IEEM, Winchester.
19 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Extended Phase 1 Habitat Survey*. Project number 70009799, Report 001, Revision 2, issued April 2016.
20 WSP | Parsons Brinckerhoff (2016) *Stone Hill Park – Wintering Bird Survey*. Project number 70009799, Report 005, Revision 1, issued April 2016.

Table 5. Results of the building inspection for barn owls.

Building number	Evidence of barn owls recorded	Potential access points	Potential roosting features	Potential nesting features	Potential to support	
					Roosts	Nests
B1	None	An open entrance provides access into the underground structure.	None	None	N	N
B2	None	None	N/A	N/A	N	N
B3	None	None	N/A	N/A	N	N
B4	None	A gap in the wall on the northern elevation provides access to the interior of the building.	None	None	N	N
B5	None	None	N/A	N/A	N	N
B6	None	None	N/A	N/A	N	N
B7	None	None	N/A	N/A	N	N
B8	None	None	N/A	N/A	N	N
B9	None	None	N/A	N/A	N	N
B10	None	None	N/A	N/A	N	N
B11	Nine mixed-age barn owl pellets were recorded within a small lean-to (which houses a boiler room) on the south-west elevation of the building. This confirms the presence of a barn owl roost within this section of the building, with the roost located above a boiler flue. A single barn owl pellet was also recorded within the main building.	An open door provides access to the lean-to. Large gaps around the hangar doors on the southern and northern elevations provide access into the main building.	Barn owls could roost on the steel frame and ventilation housing inside the main building.	Barn owls could potentially nest above the boiler flues in the lean-to, as well as on top of the ventilation housing in the main building.	C	P
B12	None	None	N/A	N/A	N	N
B13	None	None	N/A	N/A	N	N
B14	None	There is a large open entrance on the eastern elevation which provides access to the interior of the building.	None identified	None identified	N	N
B15	None	None identified	N/A	N/A	N	N
B16	None	None	N/A	N/A	N	N
B17	None	None	N/A	N/A	N	N
B18	None	Three open entrances provide access to the interior of the structure.	None	None	N	N
B19	None	None	N/A	N/A	N	N
B20	None	None	N/A	N/A	N	N
B21	None	None identified	N/A	N/A	N	N
B22	None	None identified	N/A	N/A	N	N
B23	None	None identified	N/A	N/A	N	N
B24	None	None	N/A	N/A	N	N
B25	None	None	N/A	N/A	N	N
B26	None	None	N/A	N/A	N	N
B27	None	None	N/A	N/A	N	N

Building number	Evidence of barn owls recorded	Potential access points	Potential roosting features	Potential nesting features	Potential to support	
					Roosts	Nests
B28	None	None	N/A	N/A	N	N
B29	None	None	N/A	N/A	N	N
B30	None	None	N/A	N/A	N	N
B31	None	An open entrance on the southern elevation provides access to the interior of the structure.	None	None	N	N
B32	None	None	N/A	N/A	N	N
B33	None	There is access to the interior of an above ground tower and the underground structure via a missing manhole cover.	None	None	N	N
B34	None	None	N/A	N/A	N	N
B35	None	None	N/A	N/A	N	N
B36	None	There is open access to the metal tower. No access points were noted on the adjoining building.	None	None	N	N
B37	None	None identified	N/A	N/A	N	N
B38	None	None identified	N/A	N/A	N	N
B39	None	An open entrance on the western elevation provides access to the interior of the building.	None	None	N	N
B40	None	None	N/A	N/A	N	N
B41	None	None	N/A	N/A	N	N
B42	None	None	N/A	N/A	N	N
B43	None	None	N/A	N/A	N	N
B44	None	None	N/A	N/A	N	N
B45	Two old barn owl pellets were recorded below an interior wall on the western elevation of the building, confirming the presence of a barn owl roost in this location.	Barn owls could access the interior of the building via gaps above doors on the eastern and western elevations, and via large gaps in the corrugated metal sheeting.	Barn owls could also potentially roost on top of the interior wall on the eastern elevation of the building.	None	C	N
B46	None	None identified	N/A	N/A	N	N
B47	None	None identified	N/A	N/A	N	N
B48	None	None	N/A	N/A	N	N
B49	None	None	N/A	N/A	N	N
B50	None	None	N/A	N/A	N	N
B51	None	None	N/A	N/A	N	N
B52	Approximately 25 mixed age pellets were recorded scattered beneath the exposed runners of the suspended ceiling, confirming the presence of a barn owl roost in this location.	Barn owls could access the interior of the building via open entrances on the southern elevation and smashed windows on the northern and eastern elevations	No further potential roosting locations were identified.	Barn owls could potentially nest on ceiling tiles, wall plates and on top of an exposed water tank.	C	P
B53	None	None	N/A	N/A	N	N
B54	None	None	N/A	N/A	N	N

Building number	Evidence of barn owls recorded	Potential access points	Potential roosting features	Potential nesting features	Potential to support	
					Roosts	Nests
B55	None	None	N/A	N/A	N	N
B56	None	None	N/A	N/A	N	N
B57	None	None	N/A	N/A	N	N
B58	None	None	N/A	N/A	N	N
B59	None	None	N/A	N/A	N	N
B60	None	None	N/A	N/A	N	N
B61	None	Barn owls could potentially access the interior of the building via gaps around the entrance on the western elevation.	None identified	None identified	N	N
B62	None	None	N/A	N/A	N	N
B63	None	None	N/A	N/A	N	N
B64	None	None	N/A	N/A	N	N
B65	None	None	N/A	N/A	N	N
B66	None	Barn owls could potentially access the interior of the building via an open door on the northern elevation.	None	None	N	N
B67	None	None	N/A	N/A	N	N
B68	None	None	N/A	N/A	N	N
B69	None	None	N/A	N/A	N	N
B70	None	None	N/A	N/A	N	N
B71	None	None	N/A	N/A	N	N

C= confirmed | P = potential | N= negligible

5. Legislation and planning policy

5.1 Reptiles

5.1.1 Common lizards are afforded protection from killing and injury under the Wildlife and Countryside Act 1981 (as amended)[21]. Common lizard is also listed as a Species of Principal Importance under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006[22] and is a priority species in the Kent Biodiversity Action Plan[23]. This places a duty on the competent authorities to have regard for this species when carrying out their duties.

5.1.2 In addition to the above, the government circular 06/2005[24] states that the presence of protected species is a material consideration in the planning process and the National Planning Policy Framework (NPPF) 2012[25] states that "*The planning system should contribute to and enhance the natural and local environment by…. minimising impacts on biodiversity and providing net gain in biodiversity*."

5.1.3 Further survey is required to determine the presence or likely absence of reptiles in areas of suitable habitat within the site that could not be surveyed in 2017 (see Figure 2 in Appendix A). Our recommendations for further survey for reptiles are detailed in Section 6.1.

5.2 Bats

5.2.1 All species of bat and their roosts are protected by the Conservation of Habitats and Species Regulations 2010 (as amended)[26], and the Wildlife and Countryside Act 1981 (as amended). Taken together, these make it an offence to:

- Deliberately capture, injure or kill a bat.
- Deliberately disturb a bat in such a way as to be likely to:
  - Impair its ability to survive, to breed or reproduce, or to rear or nurture its young.
  - Impair its ability to hibernate or migrate.
  - Affect significantly the local distribution or abundance of the species to which they belong.
- Damage or destroy a breeding site or resting place of a bat.
- Keep, transport, sell or exchange, or offer for sale or exchange, any live or dead bat, or any part of, or anything derived from a bat.
- Disturb a roosting bat or obstruct access to a roost or place of shelter.

5.2.2 Seven species of bat, including soprano pipistrelle and brown long-eared, are listed as Species of Principal Importance under the NERC Act 2006 and three species of bat, including soprano pipistrelle and brown long-eared, are also listed as priority species in the Kent Biodiversity Action

21 Her Majesty's Stationary Office (1981). *Wildlife and Countryside Act.*
22 Natural Environment and Rural Communities (NERC). *Natural Environment and Rural Communities (NERC) Act 2006*. March 2006
23 Kent County Council (2017). *Biodiversity – Action for Kent's Wildlife*. http://www.kentbap.org.uk, accessed 31 October 2017.
24 Office of the Deputy Prime Minister (2005). *Government circular 06/2005: Biodiversity and geological conservation statutory obligations and their impact within the planning system.*
25 Department for Communities and Local Government (2012) *National Planning Policy Framework.*
26 Her Majesty's Stationary Office (2010). *The Conservation of Habitats and Species Regulations.*

Plan. This places a duty on the competent authorities to have regard for these species when carrying out their duties.

5.2.3 In addition to the above, the government circular 06/2005 states that the presence of a protected species is a material consideration in the planning process and paragraph 118 of the NPPF states that "*... if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused*."

5.2.4 Further survey is required to characterise the roosts present within six buildings (B8, B16, B17, B33, B41 and B54), determine the presence or likely absence of roosts from a further 32 buildings assessed as having the potential to support roosting bats, and to check for the presence of roosts within trees within the site boundary. Our recommendations for further surveys for bats are detailed in Section 6.2.

5.2.5 Further surveys will be not be required of the 33 buildings assessed as having negligible potential to support roosting bats, in-line with BCT guidelines[27].

5.3 Barn owls

5.3.1 Barn owls are afforded protection against killing, injury and capture under the Wildlife and Countryside Act 1981 (as amended). Barn owl nests and eggs are also afforded protection and breeding barn owls are protected against reckless disturbance while at or near the nest.

5.3.2 In addition to the above legislation, the government circular 06/2005 states that the presence of protected species is a material consideration in the planning process and the NPPF states that "*The planning system should contribute to and enhance the natural and local environment by.... minimising impacts on biodiversity and providing net gain in biodiversity*."

5.3.3 In the first instance, a nest verification survey should be undertaken to check for the presence of breeding sites within buildings B11 and B52. It is also recommended that all trees within the site boundary should be checked for the presence of suitable features to support roosting and/or nesting barn owls. Our recommendations for further surveys for barn owls are detailed in Section 6.3.

27 Collins (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

6. Recommendations for further survey

6.1 Reptiles

6.1.1 Further survey should be undertaken to determine the presence or likely absence of reptiles from the 3.9ha of suitable reptile habitat within the site boundary that could not be surveyed in 2017. This will comprise deploying a sufficient density of artificial refugia across all areas of suitable reptile habitat not previously surveyed and checking them on seven separate occasions for the presence of reptiles during suitable weather conditions, in-line with good practice guidelines[28]. The optimal months for conducting reptile surveys are April, May and September.

6.2 Bats

6.2.1 Access should be sought to 11 buildings (B5, B14, B15, B21, B22, B23, B37, B38, B43, B46 and B47) to undertake detailed inspections, as access restrictions were a significant limitation to the inspection of these buildings.

6.2.2 DNA analysis should be carried out on the samples of bat droppings collected from four buildings (B8, B16, B17 and B41) to determine the species of bat(s) present.

6.2.3 A ground level assessment should also be undertaken of each tree within the site to look for evidence of bats and the presence of potential roosting features. Ground level tree assessments are best undertaken in winter when trees are not in leaf.

6.2.4 A suite of further surveys should then be undertaken of the six buildings confirmed as roosts (B8, B16, B17, B33, B41 and B54) and the 32 buildings assessed as having the potential to support roosting bats following BCT guidelines[29]. Detailed recommendations for further survey are provided in Table 6 and a summary is provided below:

- One emergence or return to roost survey of buildings with low potential to support roosting bats, undertaken between May and August (inclusive). For buildings with the potential to support a maternity roost, the survey visit should be undertaken during June or July.
- One emergence and one return to roost survey of buildings with moderate potential to support roosting bats, undertaken between May and August (inclusive). For buildings with the potential to support a maternity roost, at least one of the survey visits should be undertaken during June or July.
- Three survey visits of confirmed roosts and buildings with high potential to support roosting bats, undertaken between May and August (inclusive). For buildings with the potential to support a maternity roost, at least one of the survey visits should be undertaken during June or July.
- For buildings with low or moderate potential to support hibernation roosts, two checks for hibernating bats between December and February.
- For buildings with high potential to support hibernation roosts or confirmed hibernation roosts, three checks for hibernating bats between December and February.

28 Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10. Froglife, Halesworth
29 Collins (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

- For buildings with confirmed hibernation roosts or those assessed as having moderate or high potential to support hibernation roosts, three static monitoring deployments should be undertaken, each for a minimum of 14 days, between December and February.

6.2.5 Emergence surveys should start 15 minutes before sunset and end between 1.5 and 2 hours after sunset. Return to roost surveys should start 1.5 to 2 hours before sunrise and end 15 minutes after sunrise. Each survey visit should be spaced at least two weeks apart.

6.2.6 It should be noted that these are the minimum number of surveys required, and the level of survey of some buildings may need to be increased if new roosts are recorded or if the surveys are unable to confidently determine the likely absence of roosts.

Table 6. Recommended further surveys for bats.

Building number	Potential to support roost type*				Recommended further survey
	D	M	H	N	
B1	L	N	H	N	One emergence or return to roost survey between May and August, inclusive. Due to safety concerns it is considered unlikely that it will be possible to check the underground structure for the presence of hibernating bats. However, it should be possible to deploy a static monitoring device within the underground structure for a minimum of two weeks in each month from December to February.
B2	L	N	L	N	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B3	L	N	L	N	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B5	M	L	L	N	One emergence and one return to roost survey between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B6	L	L	L	N	One emergence or one return to roost survey undertaken during June or July (to coincide with the bat maternity season). It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B7	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.
B8	M	N	C	L	One emergence and one return to roost survey between May and August (inclusive). Three checks for hibernating bats between December and February and the deployment of a static monitoring device within the interior of the building for a minimum of two weeks in each month from December to February.
B11	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.
B14	L	N	L	L	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B15	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.

Building number	Potential to support roost type*				Recommended further survey
	D	M	H	N	
B16	C	M	L	N	Three survey visits between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). The three survey visits should comprise a mixture of emergence and return to roost surveys. Two checks for hibernating bats between December and February, ideally one in mid-January and one in mid-February.
B17	M	N	L	C	Three survey visits between May and August (inclusive) comprising a mixture of emergence and return to roost surveys. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B18	N	N	M	N	Two checks for hibernating bats between December and February, ideally one in mid-January and one in mid-February. and the deployment of a static monitoring device within the interior of the building for a minimum of two weeks in each month from December to February.
B22	L	N	L	L	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B25	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.
B27	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.
B28	M	L	L	N	One emergence and one return to roost survey between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B29	M	M	L	N	One emergence and one return to roost survey between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B33	C	N	C	L	Three survey visits between May and August (inclusive) comprising a mixture of emergence and return to roost surveys. Three checks for hibernating bats between December and February and the deployment of a static monitoring device within the underground structure for a minimum of two weeks in each month from December to February.
B34	L	N	L	N	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B39	L	N	M	L	One emergence or return to roost survey between May and August, inclusive. Two checks for the presence of hibernating bats between December and February, inclusive.
B40	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.

Building number	Potential to support roost type*				Recommended further survey
	D	M	H	N	
B41	C	L	L	N	Three survey visits between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). The three survey visits should comprise a mixture of emergence and return to roost surveys. Two checks for hibernating bats within the roof void between December and February, ideally one in mid-January and one in mid-February.
B43	H	M	L	N	Three survey visits between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). The three survey visits should comprise a mixture of emergence and return to roost surveys. Two checks for hibernating bats within the roof void between December and February, ideally one in mid-January and one in mid-February.
B44	L	L	N	N	One emergence or return to roost survey during June or July (to coincide with the bat maternity season).
B45	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.
B46	L	L	L	L	One emergence or return to roost survey during June or July (to coincide with the bat maternity season). It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B47	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.
B50	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.
B52	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.
B53	M	L	L	N	One emergence and one return to roost survey between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B54	C	L	L	N	Three survey visits between May and August (inclusive) with at least one of the visits undertaken during June or July (to coincide with the bat maternity season). The three survey visits should comprise a mixture of emergence and return to roost surveys. Two checks for hibernating bats within the roof void between December and February, ideally one in mid-January and one in mid-February.
B56	L	N	L	N	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B61	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.
B62	L	N	L	N	One emergence or return to roost survey between May and August, inclusive. It is not considered possible to comprehensively check suitable features within this building for hibernating bats.
B63	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.

Building number	Potential to support roost type*				Recommended further survey
	D	M	H	N	
B64	L	N	N	N	One emergence or return to roost survey between May and August, inclusive.
B66	L	N	N	L	One emergence or return to roost survey between May and August, inclusive.

* D = day / transitional roost | M = maternity roost | H = hibernation roost | N = night / feeding roost
C= confirmed roost | H = high potential to support roost | M= moderate potential to support roost | L = low potential to support roost | N = negligible potential to support roost

6.3 Barn owl

6.3.1 In the first instance, access should be sought to undertake detailed inspections of buildings B14, B15, B21, B22, B23, B37, B38, B46 and B47), as access restrictions were a significant limitation to the inspection of these buildings.

6.3.2 A nest verification survey should also be conducted to check for the presence of breeding sites within buildings B11 and B52. This should comprise checking for the presence of adult barn owls, their moulted features, pellets, egg shells, chicks or down, which, due to the height of potential nesting features within these buildings will require the use of a mobile elevated working platform. Should it not be considered safe to conduct this type of survey, then alternatively a suite of observations surveys should be conducted at dusk and dawn. Nest verification surveys are best undertaken during the breeding season (between mid-June and early August), although visual checks can also be conducted during late autumn and the winter months. All surveys should follow standard protocol[30].

6.3.3 It is also recommended that all trees within the site should be checked for the presence of suitable features to support roosting and nesting barn owls.

30 Shawyer (2011) *Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting*. IEEM, Winchester.

7. Conclusion

7.1.1 The results of the surveys indicate the presence of a transitory individual or a low population of common lizards within the south-western section of the site, the presence of bat roosts in six buildings and the presence of barn owl roosts in three buildings. The results of the surveys also indicate that there the potential for bat roosts to be present in a further 32 buildings and for barn owls to breed within two buildings within the site.

7.1.2 Further survey is required to determine the presence or likely absence of reptiles in areas of suitable habitat within the site that could not be surveyed in 2017. It is also recommended that full access is sought to inspect buildings where access restrictions were a significant limitation to the building inspection for bats and barn owls.

7.1.3 Further surveys are also required to characterise the confirmed bat roosts and to determine the presence or likely absence of roosts from buildings assessed as having the potential to support roosting bats. A nest verification survey is required to check for the presence of barn owl breeding sites within buildings B11 and B52 and it is also recommended that all trees within the site boundary should be checked for the presence of suitable features to support roosting bats, and roosting / nesting barn owls.

Appendix A | Figures

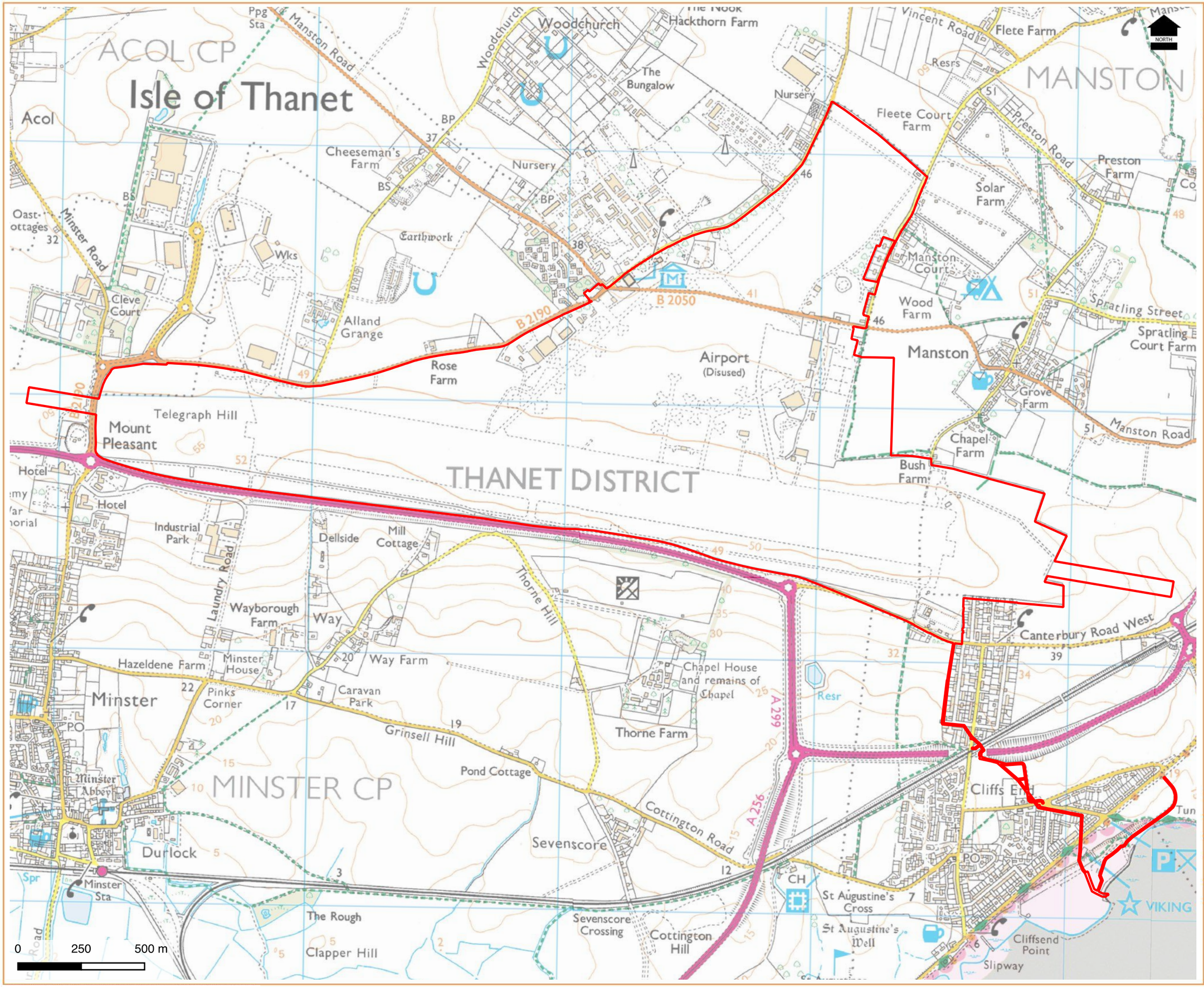

Figure 1.

Site location

Legend

Site boundary

Date of survey	N/A		
Date of issue	17 November 2017		
Job reference	AFW104		
Drawn by	JB	Checked by	TB
Status	FINAL		

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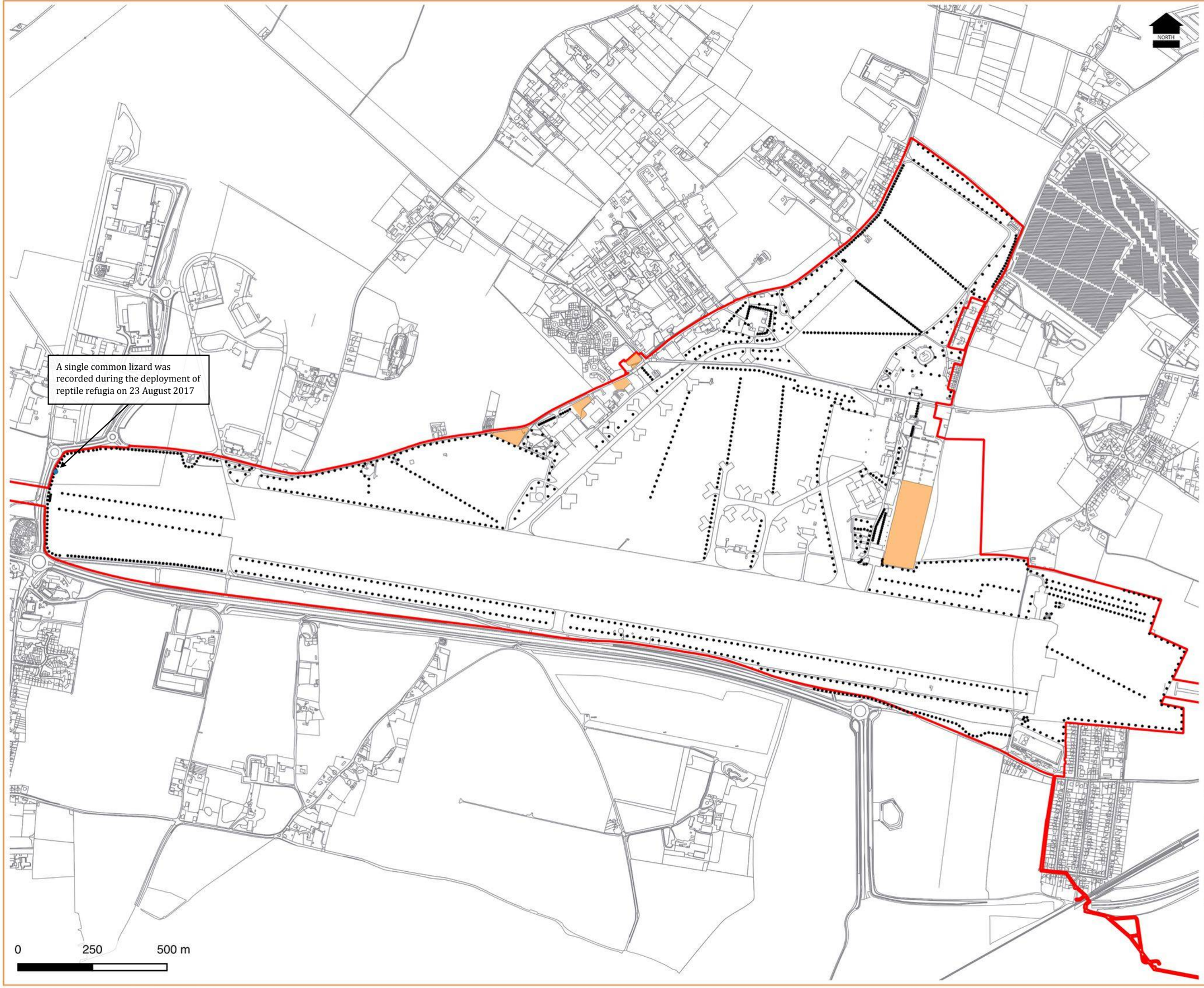

Figure 2.

Results of the reptile survey

Legend

Site boundary

Results of the reptile survey

- Common lizard
- Location of reptile refugia

Limitations

Areas of suitable reptile habitat not surveyed

Date of survey	7 Sept to 29 Sept 2017		
Date of issue	17 November 2017		
Job reference	AFW104		
Drawn by	JB	Checked by	TB
Status	FINAL		

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Figure 3a.

Results of the building inspection for bats

Legend

Site boundary

Potential of buildings to support roosting bats

- Confirmed roost
- High
- Moderate
- Low
- Negligible

Significant limitation to inspection

- Significant limitation

Date of survey	21 Aug to 17 Oct 2017
Date of issue	17 November 2017
Job reference	AFW104
Drawn by	JB
Checked by	TB
Status	FINAL

babec Ltd
Ecological Consultants

Figure 3b.

Results of the building inspection for bats

Legend

Site boundary

Potential of buildings to support roosting bats

- Confirmed roost
- High
- Moderate
- Low
- Negligible

Significant limitation to inspection

- Significant limitation

Date of survey	21 Aug to 17 Oct 2017
Date of issue	17 November 2017
Job reference	AFW104
Drawn by	JB
Checked by	TB
Status	FINAL

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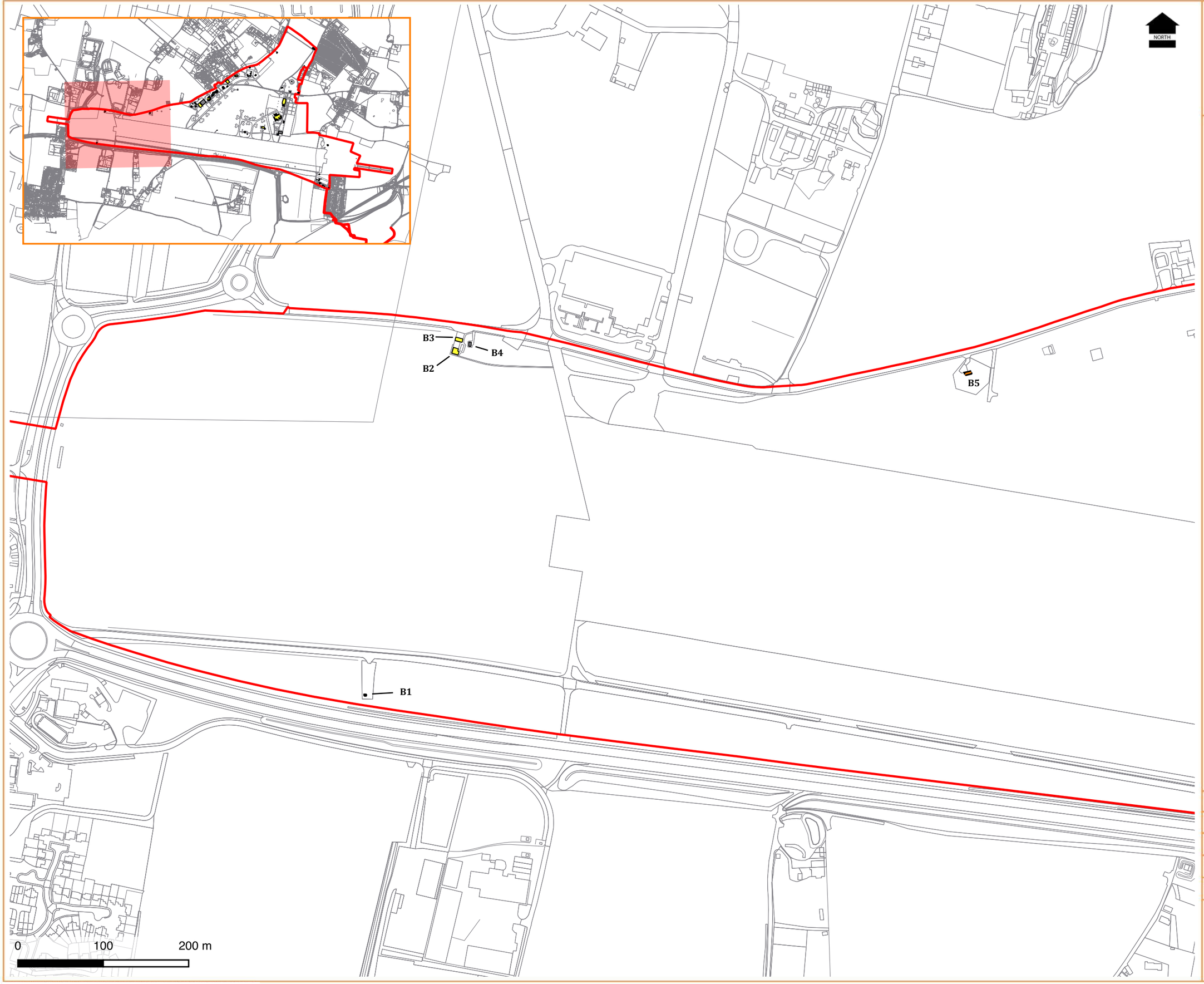

Figure 3c.

Results of the building inspection for bats

Legend

Site boundary

Potential of buildings to support roosting bats

- Confirmed roost
- High
- Moderate
- Low
- Negligible

Significant limitation to inspection

- Significant limitation

Date of survey	21 Aug to 17 Oct 2017		
Date of issue	17 November 2017		
Job reference	AFW104		
Drawn by	JB	Checked by	TB
Status	FINAL		

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Figure 3d.

Results of the building inspection for bats

Legend

Site boundary

Potential of buildings to support roosting bats

- Confirmed roost
- High
- Moderate
- Low
- Negligible

Significant limitation to inspection

- Significant limitation

Date of survey	21 Aug to 17 Oct 2017		
Date of issue	17 November 2017		
Job reference	AFW104		
Drawn by	JB	Checked by	TB
Status	FINAL		

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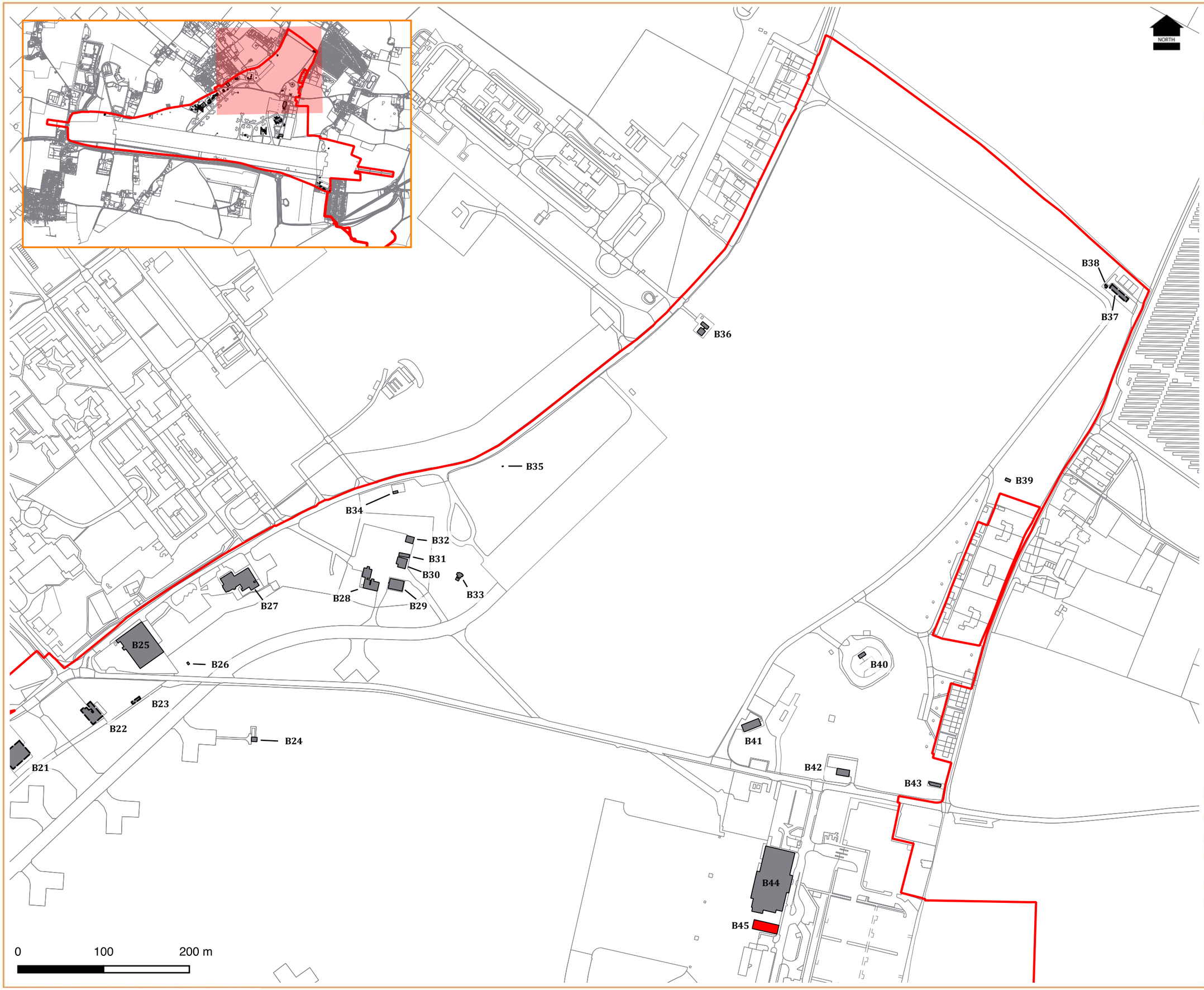

Figure 4a.

Results of the building inspection for barn owls

Legend

Site boundary

Potential of buildings to support barn owls

Confirmed roost

N Potential for nesting

Negligible potential for roosting / nesting

Significant limitation to inspection

Significant limitation

Date of survey	21 Aug to 17 Oct 2017
Date of issue	17 November 2017
Job reference	AFW104
Drawn by	JB
Checked by	TB
Status	FINAL

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Ecological Consultants

Figure 4b.

Results of the building inspection for barn owls

Legend

Site boundary

Potential of buildings to support barn owls

- Confirmed roost
- N — Potential for nesting
- Negligible potential for roosting / nesting

Significant limitation to inspection

- Significant limitation

Date of survey	21 Aug to 17 Oct 2017
Date of issue	17 November 2017
Job reference	AFW104
Drawn by	JB
Checked by	TB
Status	FINAL

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Figure 4c.

Results of the building inspection for barn owls

Legend

Site boundary

Potential of buildings to support barn owls

Confirmed roost

N Potential for nesting

Negligible potential for roosting / nesting

Significant limitation to inspection

Significant limitation

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Figure 4d.

Results of the building inspection for barn owls

Legend

Site boundary

Potential of buildings to support barn owls

Confirmed roost

N Potential for nesting

Negligible potential for roosting / nesting

Significant limitation to inspection

Significant limitation

B54 B55 B56 B57 B58 B59 B60 B61 B62 B63 B64 B65 B66 B67 B68 B69 B70 B71

NORTH

0 100 200 m

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Figure 5a.

Photographs of buildings

Photo 1. Building B1

Photo 2. View into underground section of Building B1

Photo 3. Buildings B2, B3 and B4

Photo 4. Building B5

Photo 5. Building B6

Photo 6. Building B7

Photo 7. Building B8

Photo 8. Interior of Building B8

Photo 9. Building B9

Photo 10. Building B10

Photo 11. Building B11

Photo 12. Interior of Building B11

Photo 13. Building B12

Photo 14. Building B13

Photo 15. Building B14

Photo 16. Building B15

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Figure 5b.

Photographs of buildings

Photo 1. Building B16

Photo 2. Roof void of Building B16

Photo 3. Building B17

Photo 4. Interior of Building B17

Photo 5. Building B18

Photo 6. Interior of Building B18

Photo 7. Building B19

Photo 8. Building B20

Photo 9. Building B21

Photo 10. Building B22

Photo 11. Building B23

Photo 12. Building B24

Photo 13. Building B25

Photo 14. Building B26

Photo 15. Building B27

Photo 16. Building B28

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Figure 5c.

Photographs of buildings

Photo 1. Building B29

Photo 2. Building B30

Photo 3. Building B31

Photo 4. Building B32

Photo 5. Building B33

Photo 6. Interior of Building B33

Photo 7. Building B34

Photo 8. Building B35

Photo 9. Building B36

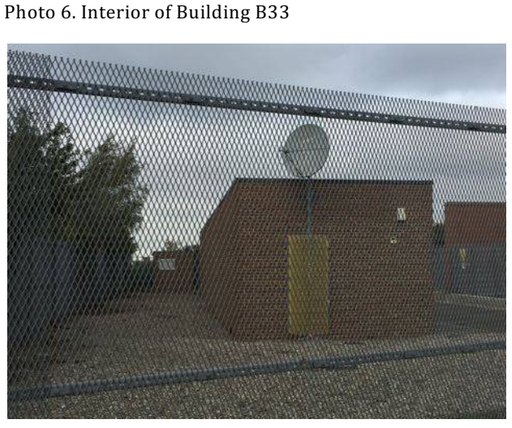

Photo 10. Buildings B37 and B38

Photo 11. Building B39

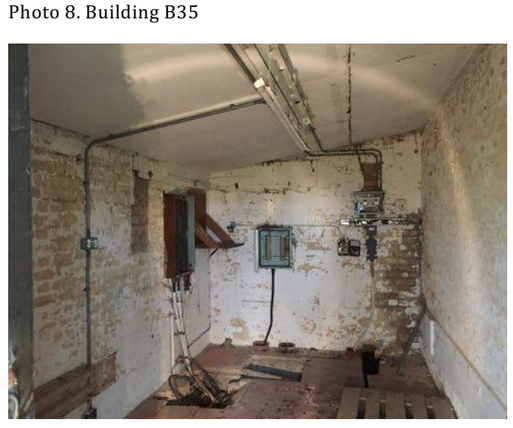

Photo 12. Interior of Building B39

Photo 13. Building B40

Photo 14. Building B41

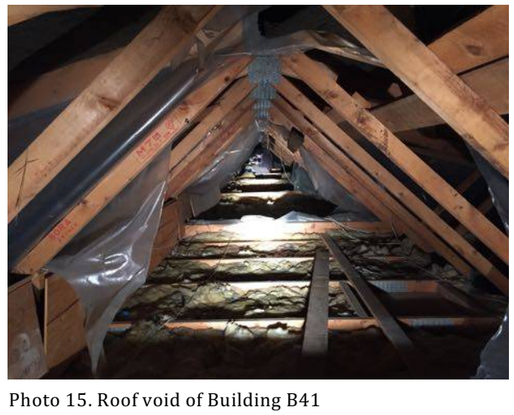

Photo 15. Roof void of Building B41

Photo 16. Building B42

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Figure 5d.

Photographs of buildings

Photo 1. Building B43

Photo 2. Building B44

Photo 3. Building B45

Photo 4. Interior of Building B45

Photo 5. Building B46

Photo 6. Building B47

Photo 7. Building B48

Photo 8. Building B49

Photo 9. Building B50

Photo 10. Building B51

Photo 11. Building B52

Photo 12. Interior of Building B52

Photo 13. Building B53

Photo 14. Building B54

Photo 15. Roof void of Building B54

Photo 16. Building B55

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Figure 5e.

Photographs of buildings

Photo 1. Building B56

Photo 2. Building B57

Photo 3. Building B58

Photo 4. Building B59

Photo 5. Building B60

Photo 6. Building B61

Photo 7. Building B62

Photo 8. Building B63

Photo 9. Building B64

Photo 10. Building B65

Photo 11. Building B66

Photo 12. Buildings B67 and B68

Photo 13. Building B69

Photo 14. Building B70

Photo 15. Building B71

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Appendix B | Dates of reptile checks and weather conditions

Visit no.	Date	Time		Temp (˚C)		Humidity (%)		Rain	Wind speed*	Cloud cover (oktas)	Comment	Overall suitability for reptile survey
		Start	End	Min	Max	Min	Max					
1	07/09/17	07:10	11:15	11.6	18.0	59	88	None	2	2-6	Overcast for first 40 minutes, then sunny until the end of the survey.	Optimal
2	15/09/17	08:15	13:15	9.5	16.0	52	89	None	2	3-4	Intermittent sunshine throughout survey.	Optimal
3	18/09/17	9:20	12:50	12.3	15.9	66	86	None	2	5-8	Overcast for first hour, then intermittent sunshine until the end of the survey. Occasional gusts of wind to BF4.	Optimal
4	22/09/17	11:25	14:45	15.1	17.0	55	68	None	2	1-3	Sunny with a light breeze.	Optimal
5	25/09/17	9:30	14:00	17.1	18.3	65	73	None	3	4-7	Intermittent sunshine with a gentle breeze.	Suitable
6	27/09/17	8:30	11:45	15.1	17.5	70	81	None	2-3	4-8	Initially overcast, slowly clearing to sunny intervals.	Optimal
7	29/09/17	7:10	10:00	16.4	18.2	85	96	+	3	5-7	Gentle breeze with occasional sunshine.	Suitable

* Measured on the beaufort scale

+ Brief rain shower 20 minutes into survey

Appendix C | Building numbers, dates of building inspections and limitations

Building number	WSP | PB building number	Date of building inspection		Limitations of bat inspection		Limitations of barn owl inspection	
		External	Internal	Detail	Considered significant? (Y, N, N/A)	Detail	Considered significant? (Y, N, N/A)
B1	-	10/10/17	-	The underground structure could not be accessed due to safety concerns.	Y	The underground structure could not be accessed due to safety concerns. However, the underground structure is considered unlikely to provide suitable roosting or nesting opportunities for barn owls, and therefore this is not considered to be a significant limitation.	N
B2	B56a	10/10/17	-	It was not possible to access the interior of the building due to the presence of high voltage equipment, although as no roof void is present this is not considered to be a significant limitation.	N	It was not possible to access the interior of the building due to the presence of high voltage equipment, although as no access points were recorded this is not considered to be a significant limitation.	N
B3	B56b	10/10/17	-	It was not possible to access the interior of the building due to the presence of high voltage equipment, although as no roof void is present this is not considered to be a significant limitation.	N	It was not possible to access the interior of the building due to the presence of high voltage equipment, although as no access points were recorded this is not considered to be a significant limitation.	N
B4	B56c	10/10/17	10/10/17	None	N/A	None	N/A
B5	B69	10/10/17	-	It was not possible to access the interior of the building due to access restrictions.	Y	It was not possible to access the interior of the building due to access restrictions. However, as no access points were recorded this is not considered to be a significant limitation.	N
B6	B16	04/10/17	-	None. An internal inspection was not considered necessary due to the absence of a roof void.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B7	B17	04/10/17	-	None. An internal inspection was not considered necessary due to the absence of a roof void.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B8	B32	04/10/17	05/10/17	None	N/A	None	N/A
B9	B4	04/10/17	-	It was not possible to access the interior of the building due to access restrictions. However, this is not considered to be a significant limitation as no roof void is present and the thermal properties of the building are likely to be unsuitable for roosting bats.	N	It was not possible to access the interior of the building due to access restrictions. However, as no access points were recorded this is not considered to be a significant limitation.	N
B10	B63	04/10/17	-	None. An internal inspection was not considered necessary as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B11	B3	04/10/17	04/10/17	The presence of large quantities of pigeon droppings and feathers made searching for evidence of bats within the building problematic. However, this is not considered to be a significant limitation.	N	Due to the height of the building, it was not possible to search of evidence of barn owl nests above the ventilation housing.	Y
B12	B2b	04/10/17	04/10/17	None	N/A	None	N/A
B13	B62	04/10/17	-	None. An internal inspection was not considered necessary as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B14	B2a	04/10/17	-	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. It was not possible to undertake an internal inspection of the building.	Y	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. It was not possible to access the interior of the building.	Y
B15	B65	04/10/17	-	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. No internal inspection could be undertaken and it was not possible to view the northern elevation of the building.	Y	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. No internal inspection could be undertaken and it was not possible to view the northern elevation of the building.	Y
B16	B23	04/10/17	05/10/17	None	N/A	None	N/A

Building number	WSP | PB building number	Date of building inspection		Limitations of bat inspection		Limitations of barn owl inspection	
		External	Internal	Detail	Considered significant? (Y, N, N/A)	Detail	Considered significant? (Y, N, N/A)
B17	B21	05/10/17	05/10/17	There was no internal access to the extension on the northern elevation. However, given the small size of this section of the building, this is not considered to be a significant limitation.	N	None	N/A
B18	B61	05/10/17	05/10/17	None	N/A	None	N/A
B19	B34	05/10/17	05/10/17	None	N/A	None	N/A
B20	B18b	05/10/17	05/10/17	None	N/A	None	N/A
B21	B18a	05/10/17	-	Due to access restrictions, it was not possible to undertake an internal inspection of the building and there was a limited view of the northern and eastern elevations of the building.	Y	Due to access restrictions, it was not possible to undertake an internal inspection of the building and there was a limited view of the northern and eastern elevations of the building.	Y
B22	B25	05/10/17	-	Due to access restrictions, it was not possible to undertake an internal inspection of the building, and there was a limited view of the northern and eastern elevations during the external inspection	Y	Due to access restrictions, it was not possible to undertake an internal inspection of the building, and there was a limited view of the northern and eastern elevations during the external inspection.	Y
B23	-	10/10/17	-	Due to access restrictions, it was only possible to undertake an external inspection of the south-eastern elevation of this building.	Y	Due to access restrictions, it was only possible to undertake an external inspection of the south-eastern elevation of this building.	Y
B24	B35	09/10/17	09/10/17	None	N/A	None	N/A
B25	B24	05/10/17	05/10/17	None	N/A	None	N/A
B26	B64	10/10/17	-	None. An internal inspection was not considered necessary as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B27	B27	05/10/17	05/10/17	None	N/A	None	N/A
B28	B14a, B14b	09/10/17	-	None. It was not considered necessary to inspect the interior of the building as no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B29	B20	09/10/17	09/10/17	None	N/A	None	N/A
B30	B19b	09/10/17	-	None. An internal inspection was not considered necessary as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B31	B19a	09/10/17	09/10/17	None	N/A	None	N/A
B32	B22	09/10/17	-	Due to access restrictions, it was not possible to access the interior of the building. However, as no potential access points were recorded, this is not considered to be a significant limitation.	N	It was not possible to access the interior of the building due to access restrictions. However, as no access points were recorded this is not considered to be a significant limitation.	N
B33	B36	09/10/17	09/10/17	Access to the above ground tower was not possible due to safety concerns.	Y	Access to the above ground tower was not possible due to safety concerns. However, this part of the structure is considered unlikely to provide suitable roosting or nesting opportunities for barn owls, and therefore this is not considered to be a significant limitation.	N
B34	B37	10/10/17	-	It was not possible to access the interior of the building due to safety concerns.	Y	It was not possible to access the interior of the building due to safety concerns. However, as no access points were recorded this is not considered to be a significant limitation.	N
B35	B38	10/10/17	10/10/17	None	N/A	None	N/A
B36	B39	10/10/17	-	None. It was not considered necessary to inspect the interior of the building as no access points were identified and no roof void is present.	N/A	None. An internal inspection of the adjoining building was not considered necessary due to the absence of suitable access points.	N/A

Building number	WSP | PB building number	Date of building inspection		Limitations of bat inspection		Limitations of barn owl inspection	
		External	Internal	Detail	Considered significant? (Y, N, N/A)	Detail	Considered significant? (Y, N, N/A)
B37	B40	10/10/17	-	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. No internal inspection could be undertaken and it was not possible to view the northern or western elevations of the building.	Y	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. No internal inspection could be undertaken and it was not possible to view the northern or western elevations of the building.	Y
B38	-	10/10/17	-	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. As such, it was only possible to view the eastern elevation of the building. No internal inspection could be undertaken.	Y	Due to access restrictions, it was only possible to conduct an external inspection of the building from outside a security fence. As such, it was only possible to view the eastern elevation of the building. No internal inspection could be undertaken.	Y
B39	B41	10/10/17	10/10/17	None	N/A	None	N/A
B40	B13	10/10/17	10/10/17	None	N/A	None	N/A
B41	B31	09/10/17	09/10/17	None	N/A	None	N/A
B42	B26	10/10/17	-	None. It was not considered necessary to inspect the interior of the building as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B43	B43	10/10/17	-	Due to access restrictions, it was not possible to undertake an internal inspection of the building.	Y	Due to access restrictions, it was not possible to undertake an internal inspection of the building. However, as no access points were recorded this is not considered to be a significant limitation.	N
B44	B6	14/09/17	-	It was not possible to access the roof void within the pitched roof section of the building due to the presence of a hanging ceiling. However, due to the thermal properties of this section of the building, the roof void is considered unlikely to provide potential roosting opportunities for bats and therefore this is not considered to be a significant limitation.	N	It was not possible to access the roof void within the pitched roof section of the building due to the presence of a hanging ceiling. However, as no access points were recorded this is not considered to be a significant limitation.	N
B45	B12	14/09/17	14/09/17	None	N/A	None	N/A
B46	B1	09/10/17	-	Due to access restrictions, it was not possible to access the interior of the building, and there was only limited access to the exterior of the building.	Y	Due to access restrictions, it was not possible to access the interior of the building, and there was only limited access to the exterior of the building.	Y
B47	B45	09/10/17	-	Due to access restrictions, it was not possible to access the interior of the building and there was only limited access to the exterior of the building. It was not possible to view the northern elevation of the building.	Y	Due to access restrictions, it was not possible to access the interior of the building and there was only limited access to the exterior of the building. It was not possible to view the northern elevation of the building.	Y
B48	B10	14/09/17	-	None. It was not considered necessary to inspect the interior of the building as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B49	B52	21/08/17	-	None. It was not considered necessary to inspect the interior of the building as no access points were identified and no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B50	B9	21/08/17	-	None. It was not considered necessary to inspect the interior of the building as no roof void is present.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B51	B48	21/08/17	-	None. It was not considered necessary to inspect the interior of the building as no potential access points for bats were recorded.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B52	B8	21/08/17	21/08/17	The presence of large quantities of pigeon droppings and feathers made searching for evidence of bats problematic, although this is not considered to be a significant limitation.	N	Due to the height of the building, it was not possible to search of evidence of barn owl nests.	Y
B53	B47	21/08/17	21/08/17	There was no access to the roof void, as no loft hatch is present.	Y	There was no access to the roof void, as no loft hatch is present. However, as no access points were recorded this is not considered to be a significant limitation.	N

Building number	WSP | PB building number	Date of building inspection		Limitations of bat inspection		Limitations of barn owl inspection	
		External	Internal	Detail	Considered significant? (Y, N, N/A)	Detail	Considered significant? (Y, N, N/A)
B54	B46	14/09/17	14/09/17	None	N/A	None	N/A
B55	B30	14/09/17	09/10/17	None	N/A	None	N/A
B56	B49	10/10/17	-	It was not possible to inspect the interior of the building due to the presence of high voltage equipment.	Y	It was not possible to inspect the interior of the building due to the presence of high voltage equipment. However, as no access points were recorded this is not considered to be a significant limitation.	N
B57	-	10/10/17	-	It was not considered necessary to inspect the interior of the building as no potential access points for bats were recorded.	N/A	None. An internal inspection was not considered necessary due to the absence of suitable access points.	N/A
B58	B67	10/10/17	-	None	N/A	None	N/A
B59	-	17/10/17	17/10/17	None	N/A	None	N/A
B60	-	17/10/17	17/10/17	None	N/A	None	N/A
B61	-	17/10/17	-	It was not possible to access the roof void due to safety concerns.	Y	While it was not possible to access the roof void due to safety concerns, it was possible to view a sufficient amount of the roof void from ground level to determine a likely absence of potential roosting or nesting features.	N
B62	-	17/10/17	17/10/17	None	N/A	None	N/A
B63	-	17/10/17	17/10/17	None	N/A	None	N/A
B64	-	17/10/17	17/10/17	None	N/A	None	N/A
B65	-	17/10/17	17/10/17	None	N/A	None	N/A
B66	-	17/10/17	17/10/17	None	N/A	None	N/A
B67	-	17/10/17	-	None	N/A	None	N/A
B68	-	17/10/17	-	None	N/A	None	N/A
B69	-	17/10/17	17/10/17	None	N/A	None	N/A
B70	-	17/10/17	17/10/17	None	N/A	None	N/A
B71	-	17/10/17	17/10/17	None	N/A	None	N/A