Identification of wintering waterbird high tide roosts on the Severn Estuary SSSI/SPA (Brean Down to Clevedon)

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This report has been prepared for:

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This study would have been impossible without the help and knowledge of the four WeBS counters for the study area. The Project Team is extremely grateful to these dedicated volunteers for their time and expertise in supplying information on high tide waterbird roost sites during a series of interviews and site visits.

1. Executive Summary

Project Aims & Scope

1.1 Natural England commissioned James Latham (an independent Ecological Consultant) to carry out a study to: (a) identify the locations of any waterbird high tide roost sites between Brean Down and Clevedon; and (b) characterise the habitat(s), waterbird composition and any existing sources of human disturbance associated with each roost site.

1.2 The study was carried out between October 2014 and March 2015. The area was sub-divided into four sectors: Brean Down to Anchor Head (Sector 1); Anchor Head to Sand Point (Sector 2); Sand Point to the River Yeo confluence (Sector 3); and The River Yeo confluence to Clevedon (Sector 4).

1.3 The study focussed primarily upon the Severn Estuary SPA Qualifying Species (ie, Bewick's swan, European white-fronted goose, shelduck, gadwall, dunlin and redshank) and the SPA Qualifying Assemblage (see Chapter 4 for further details).

Methods

1.4 Information pertaining to the presence of waterbirds and their roost site characteristics was collected for each sector from the following sources: (i) WeBS core count (ie, high tide) data supplied by the BTO; (ii) interviews with the relevant WeBS counter; and (iii) site visits. Based upon the findings of the data collection exercise (which used data from 2008/2009 to 2012/2013) a series of assessments were carried out in an attempt to identify and characterise the roost sites.

Results & Conclusions

1.5 A total of 35 high tide waterbird roost sites were identified within the study area. As shown on Figure 1, 20 (57%) support mixed flocks of waterbirds, nine (26%) support waders only, three (8.5%) support wildfowl only, and three (8.5%) support gulls only. The key findings of the study in relation to the roost site characteristics are as follows (Roost numbers (eg, 1A, 2B, etc) correspond to Maps 1 to 4):

Roost Locations

1.6 The roost sites are distributed throughout the study area, although the following appear to be associated with the confluence of rivers flow into the Severn Estuary: all Sector 1 roost sites (River Axe); Roosts 3C, 3D, 3E, 3F, 3I and 3K (River Banwell); and Roosts 3H, 4J and 4K (River Yeo).

Roost Habitats

1.7 The roost sites within the study area are associated with a range of habitat types, including: saltmarsh; rocky shore; sandflats; grassland; artificial

structures (eg, rock armour, sea defences, etc), and shingle shore. No particular trends or habitat associations have been identified, although many of the wildfowl and gulls roost sites are associated with areas of open water, whereas waders are confined to terrestrial habitats. All of the roost sites afford waterbirds with extensive sightlines across a range of aspects.

Roost Composition

1.8 The study area was found to support three SPA Qualifying Species during the winter months and passage periods: shelduck, dunlin and redshank. Sixteen roost sites were identified as being of particular nature conservation importance for at least one of these SPA Qualifying Species. Of these, six related to redshank (Roosts 1C, 1D, 1F, 3C, 4B and 4J), five related to shelduck (Roosts 1B, 2B, 2C, 3F and 4L), and a further four related to dunlin (2A, 4B, 4H and 4J). A further 12 roost sites *could* be of particular nature conservation importance for at least one of these SPA Qualifying Species, although due to uncertainties within the baseline information the status of these roost sites was not confirmed.

1.9 The entire study area (but particularly Sectors 4 and 1) was considered to be of nature conservation importance in relation to the overall number and diversity of SPA Qualifying Assemblage waterbird species that they support. The roost sites which, in their own right, appeared to be of particular nature conservation importance to the SPA Qualifying Assemblage were: Roosts 1B, 1C, 2A, 2B, 2C, 4B, 4H and 4J. It is likely that other roost sites would also be of particular importance in this regard, although due to uncertainties within the baseline information the status of these roost sites was not confirmed.

Roost Disturbance

1.10 The forms of human activity most frequently encountered by the WeBS counters were walkers and dog walkers. Other human activities that were reported included: boating/jet skiing, shooting, fishing, horse riding and agricultural operations. The study was not able to make a definitive assessment of existing human disturbance upon waterbird roost sites. The WeBS counters reported instances of waterbirds being displaced from roost sites due to nearby disturbance events. Generally, birds relocated to an alternative nearby roost site, although instances of waterbirds being displaced altogether were also identified, notably at Roosts 1A to 1F as a result of passing powered watercraft and dog walkers.

1.11 Few practical measures to reduce the effects of existing disturbance were also identified, although consideration could be given to an exclusion of power boats, jet skiers and water skiers along the lower reaches of the River Axe (ie in the vicinity of Roosts 1A to 1F). Notwithstanding this, the study identified that waterbird roost site between Brean Down and Clevedon would be susceptible to adverse effects of disturbance-related impacts which could arise

as a result of future increases in human presence and activity along the coastline.

2. Introduction

2.1 Natural England commissioned James Latham (an independent Ecological Consultant) to carry out a study in relation to wintering waterbird high tide roost sites within the Severn Estuary, between Brean Down and Clevedon (hereafter referred to as the study area).

2.2 The overall aim of the study is to define the locations of any waterbird high tide roost sites within the study area, and (where possible) to characterise the habitat(s), waterbird composition and any existing sources of human disturbance associated with each roost site.

Background to the Project

The Severn Estuary Special Protection Area (SPA)

2.3 The Severn Estuary is designated as a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site, since it supports a range of habitats and species of national and international nature conservation importance.

2.4 The SPA designation is based upon the presence of over-wintering and migratory water bird populations of international and national nature conservation importance. The estuary qualifies as a SPA under Article 4.1 of Directive 2009/147/EC on the conservation of Wild Birds (the EC Wild Birds Directive) as it supports internationally important populations of Bewick's swan (*Cygnus columbianus bewickii*). The estuary also qualifies under Article 4.2 of the EC Wild Birds Directive, as it supports:

- internationally important populations of the following migratory species: European white-fronted goose (*Anser albifrons albifrons*); shelduck (*Tadorna tadorna*); gadwall; (*Anas strepera*); dunlin (*Calidris alpina*); and redshank (*Tringa totanus*).

- an internationally important assemblage of waterbirds (wildfowl and waders) during the winter and migratory periods.

2.5 Further details regarding the water bird species and assemblage that underpin the SPA designation are provided in Chapter 4.

Monitoring Waterbird Populations on the Severn Estuary - The Wetland Bird Survey (WeBS)

2.6 The Severn Estuary is subject to high tide waterbird counts, which take place annually as part of the British Trust for Ornithology's (BTO) on-going Wetland Bird Survey (WeBS). WeBS is the monitoring scheme for non-breeding waterbirds in the UK, which aims to provide the principle data for the conservation of their populations and wetland habitats. The data collected are used to assess the size of waterbird populations, determine trends in numbers and distribution and assess the importance of individual sites for waterbirds, in

line with the requirements of international conservation Conventions and Directives (Holt, et al, 2012).

2.7 Large wetland sites, such as the Severn Estuary, are divided into smaller pre-defined count 'sectors'. Wherever possible, each of these sectors is subject to monthly coordinated counts by teams of volunteers (usually referred to as WeBS counters), ideally on predetermined priority dates to ensure synchronisation of volunteer counts. Typically these monthly counts take place between September and March (to coincide with the period when peak numbers of non-breeding waterbirds are present at the UK's wetland sites), with fewer observations during the summer months. With the exception of naturalised species (eg, Canada goose and ruddy duck), all species of waterbird are included within the counts, although counts of gulls and terns are optional.

The Application of WeBS Data Within Habitat Regulation Assessment (HRA): Approach & Limitations

2.8 As described previously, WeBS aims to monitor non-breeding waterbirds in the UK in order to provide the principal data upon which the conservation of their populations is based. These results also form the basis for informed decision-making by conservation bodies, planners and developers, and contribute to the sustainable use and management of wetlands and their dependent waterbirds (Holt *et al*, 2015).

2.9 Natural England frequently makes use of WeBS data to determine whether a proposed development plan or project could result in impacts upon nearby waterbird populations which result in a significant adverse effect upon the integrity of the SPA (a statutory process known as Habitat Regulation Assessment (HRA) that is required under Article 6.3 of the Habitats Directive). In this context, Natural England uses the WeBS data as a 'proxy' for wintering and/or passage waterbird population estimates, where these counts represent the best and reasonably available evidence upon which to base an impact assessment. Typically, waterbird population trends for the SPA as a whole are compared with those of the WeBS sector(s), which lie within/adjacent to the area which could be affected by the proposed plan or project. In doing so, Natural England seeks to identify any differences in population change for given waterbird species and/or assemblages at an estuary scale, in comparison to the sector level. This approach enables Natural England to determine whether the activities associated with a proposed plan or project could lead to impacts which have a significant adverse effect upon any given species or assemblage of waterbird(s). For example, through the loss of roosting sites/feeding areas, or increased levels of disturbance.

2.10 Natural England also recognises, however, that there are certain limitations with the application of WeBS data in this way. One of the main limitations of the WeBS data relates to its level of spatial resolution, which only permits count data to be assigned to sectors as a whole, and not to the individual roost

site. This limitation has become particularly evident on the Severn Estuary, as Natural England undertakes increasing numbers of waterbird-related HRAs associated with increasing development pressures within and adjacent to the estuary. In the absence of baseline information pertaining to individual roost sites, Natural England frequently lacks critical information in determining whether potentially significant impacts could arise upon waterbirds, and what the effects of these impacts could be in the context of the SPA.

2.11 This study aims to use the local knowledge of individual WeBS counters, in order to identify and characterise high tide waterbird roost sites between Brean Down and Clevedon. It is hoped that this work will enable more accurate decision-making. However, it is acknowledged that the scope of this study relies upon local knowledge information and judgements which will inevitably incorporate a certain degree of anecdotal information.

Project Scope & Aims

2.12 Natural England has commissioned a project to undertake desk- and field-based studies to identify:

1. The locations of any waterbird high-tide roost sites within the study area, which are used during the winter months and passage periods.
2. The composition of waterbird species which make up each roost site.
3. The physical habitat, feature and/or substrate-type upon which each roost site is located.
4. Any (potential) sources of disturbance within the study area, which could result in the displacement of waterbirds from roost sites, and the possible existing effects upon nearby waterbirds of any disturbance.

Objectives of this Document

2.13 The remainder of this document provides further details regarding: the nature and extent of the study area (Chapter 3); the waterbird species and assemblage upon which the Severn Estuary SPA designation is based (Chapter 4); the methodology upon which the study is based (Chapter 5); the findings of the study (Chapter 6); the study's conclusions (Chapter 7); a discussion of the study limitations (Chapter 8) and the recommendations regarding further work which may follow on from this study (Chapter 9).

3. The Study Area

3.1 The study area for the project encompasses the coastal and estuarine habitats between Brean Down and Clevedon, plus adjacent areas of terrestrial habitat (where relevant). The approximate extent of the study area is shown on Figure 1.

3.2 The study area supports a range of habitat types and land uses. The foreshore within the southern half of the study area is dominated by extensive strips of sandy beach within Weston Bay and Sand Bay. These are sub-divided by a series of steep rocky headlands (Brean Down, Worlebury Hill and Sand Point), which also afford shelter to several discrete pockets of saltmarsh.

3.3 The northern half of the study area comprises a mosaic of saltmarsh, sandflat, mudflat, and rocky shore habitat. Coastal flood protection measures have been installed within the northern half of the study area. These include the construction of a concrete sea wall and a flood defence bund, as well as the installation of rock armour in places

3.4 Several rivers discharge into the Severn Estuary within the study area, namely the River Axe, the River Banwell, the River Yeo, and the Blind Yeo (see Figure 1). The lower reaches of all four of these rivers are included within the study area.

3.5 The study area encompasses varying levels of public access. The majority of the coastline within the southern half of the study area is accessible to the general public via areas of Open Access land and Public Rights of Way. Brean Down represents the southern boundary of the study area, and comprises a National Trust Nature Reserve, with Open Access rights to the general public. Further to the north, the sandy beaches within Weston Bay and Sand Bay are well-used by recreational visitors. Middle Hope Nature Reserve lies at the mid-point of the study area. Like Brean Down, it is also a National Trust Nature Reserve, with Open Access Rights to the general public.

3.6 By comparison, the coastal areas within the northern half of the study area are less well-served by Public Rights of Way. In particular, much of the coastline in Woodspring Bay from Middle Hope to the River Yeo is inaccessible to the general public, largely as a result of the Ministry of Defence land-holding at St Thomas' Head. Informal car parking opportunities and public access onto an area of saltmarsh on the lower reaches of the River Banwell are available from Woodspring Priory. According to Ordnance Survey mapping, there are no Public Rights of Way from the River Banwell until the vicinity of Dowlais Farm (towards the northern end of the study area). Notwithstanding this, informal public access is known to occur along much of this coastline. At Dowlais Farm a permissive footpath joins the coast and facilitates access along the coast to West End, which represents the northern boundary of the study area.

3.7 For the purposes of this project, the study area has been sub-divided into four sectors. These correspond with the BTO's WeBS count sectors, and are shown on Figure 1. They comprise:

- Sector 1 – Brean Down to Anchor Head, incorporating Weston Bay and also including the lower reaches of the River Axe (BTO WeBS Sector 14401).
- Sector 2 – Anchor Head to Sand Point, incorporating Sand Bay (BTO WeBS Sector 14402).
- Sector 3 – Sand Point to the River Yeo confluence, including the lower reaches of the River Banwell (BTO WeBS Sector 14403).
- Sector 4 – The River Yeo confluence to Clevedon, including the lower reaches of the River Yeo (BTO WeBS Sector 14404).

4. The Severn Estuary SPA Qualifying Species & SPA Qualifying Assemblage

4.1 The Severn Estuary is designated as a SPA since it supports internationally important populations of waterbirds during the winter months and migratory periods. The SPA designation is based upon the presence of a number of key waterbird species, as well as the overall assemblage of waterbirds, which are present during the winter months and migratory periods. Further details regarding the waterbird species and assemblage which underpin the SPA designation are provided in the following paragraphs.

SPA Qualifying Species

4.2 The Severn Estuary qualifies as a SPA under Article 4.1 of the EC Wild Birds Directive as it supports internationally important populations of the Annex 1 species, Bewick's swan. The estuary also qualifies under Article 4.2 of the EC Wild Birds Directive, as it supports internationally important populations of the following migratory species: European white-fronted goose; shelduck; gadwall; dunlin; and redshank.

4.3 For the purposes of this study, each of these species is referred to as a '**SPA Qualifying Species**' throughout the remainder of this document.

SPA Qualifying Assemblage

4.4 In addition to the SPA Qualifying Species listed above, the Severn Estuary also qualifies as a SPA since it regularly supports an assemblage of waterfowl that exceeds 20,000 individuals (hereafter referred to as the '**SPA Qualifying Assemblage**'). At the time of designation the SPA Qualifying Assemblage was identified as 68,026 individual birds (Natural England & Countryside Council for Wales, 2009).

4.5 Natural England has provided advice specifically in relation to this project regarding the composition of bird species which make up the SPA Qualifying Assemblage. This advice indicates that, with certain exceptions (see paragraph 4.8), the SPA Qualifying Assemblage comprises all regularly occurring waterfowl species. In general, any water bird species which forms part of the SPA Qualifying Assemblage is hereafter referred to as a '**SPA Qualifying Assemblage species**'. Further to this, Natural England has advised that the SPA Qualifying Assemblage species are categorised further into two component parts:

- Species that are 'listed' components of the SPA Qualifying Assemblage; and
- Species that are 'non-listed' components of the SPA Qualifying Assemblage.

Listed Components of the SPA Qualifying Assemblage

4.6 The waterbird species that are 'listed' components of the SPA Qualifying Assemblage are specifically named within the Regulation 33 Advice for the Severn Estuary SPA (Natural England and the Countryside Council for Wales, 2009). They include all of the SPA Qualifying Species (i.e. Bewick's swan, European white-fronted goose, shelduck, gadwall, dunlin, and redshank). In addition, each of the following waterbird species is also named as a listed component of SPA Qualifying Assemblage since they are either present on the Severn Estuary in nationally important numbers, or in numbers which exceed 2000 individuals:

- Wigeon (*Anas penelope*)
- Teal (*Anas crecca*)
- Pintail (*Anas acuta*)
- Pochard (*Aythya ferina*)
- Tufted duck (*Aythya fuligula*)
- Ringed plover (*Charadrius hiaticula*)
- Grey plover (*Pluvialis squatarola*)
- Curlew (*Numenius arquata*)
- Whimbrel (*Numenius phaeopus*)
- Spotted redshank (*Tringa erythropus*)

4.7 In light of the 2014 update on the treatment of 2001 UK SPA Review features, mallard (*Anas platyrhynchos*), lapwing (*Vanellus vanellus*) and shoveler (*Anas clypeata*) have been removed from the listed components of the SPA Qualifying Assemblage. These species do, however, form part of the non-listed components of the SPA Qualifying Assemblage (see below).

Non-listed Components of the SPA Qualifying Assemblage

4.8 Species that qualify as 'non-listed' components of the SPA Qualifying Assemblage include all regularly occurring waterbirds, not listed in paragraph 4.6 above. Naturalised species (e.g. Canada goose (*Branta canadensis*) and ruddy duck (*Oxyura jamaicensis*)) are excluded from the assemblage totals by the BTO's WeBS office. Gulls and terns are also excluded since the recording of them during WeBS counts is optional and thus they are inconsistently included in totals (Holt *et al*, 2015).

5. Methods

5.1 Information pertaining to the presence of waterbirds and their roost site characteristics was collected from the following sources:

- WeBS core count (ie, high tide) data supplied by the BTO;
- interviews with the WeBS counters for the study area; and
- site visits to each of the sectors within the study area.

5.2 Based upon the findings of this data collection exercise, a series of assessments were carried out in relation to each of the study aims. Further details regarding the methodologies employed during the data collection and assessment stages of the study are provided in the following paragraphs.

The Collection of WeBS Data

5.3 The latest high tide WeBS data were obtained from the BTO WeBS office. These data comprised a summary of the high tide counts for each of the count sectors within the study area, as well as the Severn Estuary as a whole, for the period from 2008/09 to 2012/13.

WeBS Interviews

5.4 In November 2014 a series of interviews took place with the WeBS counters for the study area (hereafter referred to as the 'WeBS interviews'). The purpose of the WeBS interviews was to collect information on roost site locations and characteristics, based upon the counters' own knowledge and survey experience gathered from carrying out WeBS counts. An interview form (see Appendix 1) and accompanying 1:25,000 Ordnance Survey maps were used to help facilitate the discussions, and to enable the following information to be captured for each roost site (where known):

- The approximate geographic location and extent of the roost site.
- The habitat/feature/substrate associated with the roost site.
- the physical characteristics of the roost site (such as the presence of freshwater creeks/pills for bathing, habitats/features providing high tide feeding opportunities, features which provide roosting birds with shelter from prevailing weather conditions, etc).
- The waterbird species, the flock sizes in which they occur, and the frequency with which they are recorded at the roost site.
- The behaviours of waterbird species at the roost site (e.g. roosting, bathing, preening, feeding, etc).
- Any tide- or weather-related patterns of roost site usage by waterbirds.

- Any sources of human disturbance which occur in the vicinity of the roost site, and the observed effects (if any) upon any roosting waterbirds.

5.5 During the WeBS interviews, the WeBS counters were provided with the following guidance to try and assist them in making these judgements:

- For each roost site, the WeBS counters were asked to list any waterbird species which has typically been recorded on at least one WeBS visit during the winter/passage months over each of the previous five years (or the number of years in which they had been undertaking WeBS counts, if this was fewer than five years).

- For each waterbird species at a roost site, the WeBS counters were asked to estimate the typical count (expressed either as a whole number or, if more appropriate, a range of values). Where appropriate, any particularly large waterbird counts were also noted, although this information was not used within the study if, in the opinion of the WeBS counters, it was not representative of normal baseline conditions.

- For each roost site, the WeBS counters were asked to estimate the proportion of WeBS visits during the winter/passage periods that each species was present (expressed as a percentage or, if more appropriate, as a range of percentages).

5.6 The interviews also sought to identify:

- The access routes and survey locations for undertaking WeBS counts at each roost site.

- Any areas of estuarine habitat which are not normally subject to WeBS counts (for example, due to constraints associated with health and safety or land access), which could support additional roost sites that have gone undetected to date.

Site Visits

5.7 The WeBS interviews were followed by a site visit to each of the sectors within the study area. These were undertaken to ground-truth the information collected during the WeBS interviews. The site visits were carried out by the report author and the respective WeBS counter. Natural England's Project Officer (Colin Leppard) and a representative from Clevedon Wildfowling Association also took part in the site visit to Sector 3.

5.8 A site visit recording form and accompanying 1:25,000 Ordnance Survey maps were used to facilitate the ground-truthing exercise, and to enable any additional information to be recorded (see Appendix 2). Where possible, the site visits took place within a two-hour period either side of high water, to coincide with the period when waterbirds would be present at the roost sites.

5.9 In a number of cases, certain site-specific factors constrained aspects of the site visits. These were as follows:

- Due to land access and/or health a safety restrictions, it was not possible to gain access onto some of the roost sites (eg those situated on areas of saltmarsh or within open water). In these cases, most roost sites could be viewed (where necessary using binoculars/telescope) from an accessible/safe vantage point. However, due to access restrictions associated with a clay pigeon shoot taking place over Wick Warth on 7th March, it was not possible to access the central part of Sector 3. As a result, Roosts 3I and 3K (see Map 3) were not viewed in the field due to an absence of alternative vantage points.

- The site visit to Sector 1 (see Map 1) was carried in parallel with the WeBS count on 8th February 2015. Unfortunately, the weather conditions at the time of the site visit comprised dense fog, which reduced the visibility to less than 100m. In view of this, the site visit was suspended and resumed later in the day once the fog had cleared. As a result, the vast majority of the roost sites within Sector 1 were viewed outside of the high tide period.

Assessment of Desk- and Field-based Information

5.10 Assessment methodologies were developed in relation to each of the four study objectives, as described in the following paragraphs.

Roost Locations

5.11 The WeBS counters provided information relating to the locations of roost sites during the WeBS interviews. This information was subsequently ground-truthed during the site visits, where possible. Following the collation of this desk- and field-based information, all roost site locations were digitised using MapInfo GIS software. The maps were then reviewed with the aim of identifying any apparent patterns in the locations of the roost sites. This could include associations between roost sites and, for example, particular geographical aspects, or landscape features such as rivers or headlands.

Roost Composition

5.12 As part of the WeBS interviews, the WeBS counters provided the following information relating to the waterbird species composition at each of the roost sites during the winter months and passage periods over the preceding five years (where known/possible): (a) the waterbird species that have typically been recorded; (b) the frequency with which each waterbird species has typically been recorded; and (c), the number of birds that are typically recorded for each species (when present).

5.13 Depending upon the range of waterbird species identified by the WeBS counters, each roost site was assigned to one of the following categories:

- Mixed waterbird high tide roost site (ie, typically supports a mixed assemblage of water birds from two or more of the following groups: wildfowl (ducks, geese, swans); waders; gulls; and other water bird families such as herons and cormorants.
- Wildfowl high tide roost site (ie, typically supports wildfowl only).
- Wader high tide roost site (ie, typically supports waders only).
- Gull high tide roost site (ie, typically supports gulls only).

5.14 As described previously, the locations of the roost sites were mapped, and a system of colour-coding was used to denote the category of waterbirds at each roost site (see Maps 1 to 4).

5.15 Using a combination of the WeBS data and the information collected during the WeBS interviews, the study then attempted to identify those roost sites which appeared to be of particular nature conservation importance in the context of the study area, as well as the wider Severn Estuary SPA. To do this, the study focussed primarily upon the waterbirds for which the Severn Estuary is designated as a SPA, ie: the SPA Qualifying Species; and the SPA Qualifying Assemblage. Consideration was also given to gulls within the study area, albeit to a lesser extent.

1. SPA Qualifying Species

5.16 An assessment was carried out to determine the likely nature conservation importance of each sector and (where possible) each roost site in relation to the SPA Qualifying Species.

5.17 In the first instance, the BTO WeBS count data were reviewed in relation to the SPA Qualifying Species. This involved undertaking a comparison between the WeBS count data for each sector, and those for the entire Severn Estuary on a species-by-species basis. This was done as a means of identifying the proportion of each SPA Qualifying Species' population that occurs within each of the sectors during the autumn passage (July to October), winter (November to March) and spring passage (April to June) periods. This was taken as a relative measure of each study sector's nature conservation importance for a given SPA Qualifying Species, in the context of their wider Severn Estuary populations.

5.18 A review of the roost sites' waterbird species composition at the roost sites was then carried out on a sector-by-sector basis. This was primarily based upon the information collated during the WeBS interviews. Those roost sites which were identified as supporting at least one SPA Qualifying Species were selected for further assessment to try and determine their relative nature conservation importance for the SPA Qualifying Species which they support. This was a two-stage process which involved:

(a) comparing the estimated numbers of each SPA Qualifying Species at the roost site[1] with the relevant wintering/passage population for the entire Severn Estuary[2].

(b) reviewing the estimated frequency with which each SPA Qualifying Species is estimated to be recorded at the roost site[1].

5.19 For the purposes of this study, it was proposed that a roost site be considered to be of particular nature conservation importance for a SPA Qualifying Species if it supports numbers of birds which exceed 1% of the entire Severn Estuary population (for that species), on more than 50% of the WeBS visits during the winter and/or passage periods. Roost sites which meet these criteria have been termed 'SPA Primary Roosts' for a given SPA Qualifying Species.

5.20 In some cases, the WeBS counter did not necessarily feel confident to provide estimates regarding the numbers of waterbirds that are present at a roost site, or the frequency with which they are recorded. This was typically due to high fluctuations in either bird numbers or the frequency with which species are presence between monthly WeBS counts. In such cases, the term 'possible SPA roost site' was used to denote roost sites which support at least one SPA Qualifying Species in numbers which could exceed 1% of the entire SPA population (for that species), on more than 50% of the WeBS visits during the winter and/or passage periods.

5.21 In this way the study aimed to identify those roost sites which, in their own right, appear likely to support significant numbers of a particular SPA Qualifying Species (ie, in excess of 1% of the Severn Estuary's total waterbird count) on the majority of the WeBS visits.

2. SPA Qualifying Assemblage

5.22 An assessment was also carried out to determine the likely nature conservation importance of each sector and (where possible) each roost site in relation to the SPA Qualifying Assemblage.

5.23 In the first instance, the WeBS count data were reviewed in relation the 'listed' component species of the SPA Qualifying Assemblage. This involved undertaking a comparison between the WeBS count data for each sector, and those for the entire Severn Estuary, specifically in relation to the 'listed' component species of the SPA Qualifying Assemblage. This was done to provide an indication of the relative proportion of the Severn Estuary's waterbirds that occur within each of the sectors during the autumn passage (July to October), winter (November to March) and spring passage (April to

[1] Taken from the information supplied during the WeBS interviews.

[2] WeBS count data (2008/09 to 2012/13) were used to derive wintering/passage populations of SPA Qualifying Species for the entire Severn Estuary.

June) periods. This was taken as a relative measure of each study sector's nature conservation importance for the SPA Qualifying Assemblage, in the context of the Severn Estuary's total waterbird populations.

5.24 The study was not able to make an assessment of the likely nature conservation importance of each roost site in relation to the SPA Qualifying Assemblage in the same way as was done for the SPA Qualifying Species. This was due to problems encountered dealing with multiple species within an assemblage, and how this magnifies uncertainties surrounding the estimated bird numbers and frequencies with which birds are present. As a result it was not possible to identify 'SPA Primary Roosts' for the SPA Qualifying Assemblage in the same way as was carried out for the SPA Qualifying Species. Instead, a semi-quantitative assessment was carried out at the roost level. This was based primarily upon the findings of the WeBS interviews.

5.25 In the first instance, the roost sites were reviewed in relation to the diversity of SPA Qualifying Assemblage waterbird species that they support. For the purposes of this study, roost sites which support three or more SPA Qualifying Assemblage waterbird species (and particularly those which are 'components of the SPA Qualifying Assemblage) were considered to be species diverse.

5.26 Where possible, the roost sites were also reviewed in relation to the estimated number of each waterbird species that is present, and the estimated frequency with which they occur. Those roost sites which appear to support the greatest number of water birds on the most frequent basis were identified; however, due to uncertainties within these data, the extent to which this was feasible varied.

5.27 In this way the study aimed to identify those roost sites which, in their own right, appear: (a) to support the greatest diversity of waterbird species; and (b) likely to support significant numbers of waterbirds (ie, in excess of 1% of the Severn Estuary's total waterbird count) on the majority of the WeBS visits.

3. Gulls

5.28 Whilst gulls do not form part of the reasons for which the Severn Estuary SPA is designated during the winter months and passage periods, the study did take some account of this group of waterbirds. This was due to: (a) gulls occurring regularly and in large numbers within parts of the Severn Estuary; and (b) the inclusion of herring gull (*Larus argentatus*) on the RSPB's 'red list', and black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*) and lesser black-backed gull (*Larus fuscus*) on the RSPB's 'amber list' as species of nature conservation concern (Eaton *et al*, 2009).

5.29 A review of the WeBS interview findings was carried out in relation to gulls. Specifically this focused upon the estimated number of birds and the estimated frequency with which they are recorded at each roost site by the WeBS counter. Those roost sites where gulls are recorded in the greatest numbers and with the greatest degree of frequency during the WeBS visits were highlighted.

Roost Habitats

5.30 Information pertaining to the habitat type(s) at each of the roost site locations was collated during the interviews (where known), and was subsequently ground-truthed (where possible) during the site visits. Following this, a review of the roost site habitats was carried out in an attempt to identify any particular associations between waterbird species/groups and habitat/substrate types within the study area.

Roost Disturbance

5.31 Information regarding sources of potential human disturbance in the vicinity of the roost sites was collated during the WeBS interviews, based upon the WeBS counters' local knowledge of human activities taking place in the vicinity of roost sites. Where possible, the WeBS interviews sought to characterise any potential sources of human disturbance in terms of their timing, frequency and durations, based upon their own observations and experience from undertaking the WeBS counts. As part of this exercise, the WeBS counters were also asked to describe how any sources of human disturbance appear to affect birds using nearby roost sites. This included, for example, whether birds are typically flushed from the roost site in question and, if so, whether they tend to return to the roost or if they are displaced altogether.

5.32 Depending upon the birds' apparent response(s) to nearby human activities, the WeBS counters were also asked to make a subjective assessment as to whether: (a) any of the identified sources of human disturbance appear to be having a potentially significant adverse effect upon the roost site itself (ie, could threaten the viability of the roost site in the long-term); and (b) any measures that could reasonably be taken to minimise or eradicate the effects of any potentially significant human disturbance.

6. Results & Assessment: Characterisation of High Tide Waterbird Roost Sites

6.1 The findings of the WeBS interviews and site visits, along with the various assessments, are presented on a sector-by-sector basis within this chapter of the report. The approximate location and extent of each roost site identified by this study is also shown on Maps 1 to 4, which should be viewed in conjunction with the roost descriptions.

Sector 1 - Brean Down to Anchor Head

6.2 The section of coastline between Brean Down and Anchor Head (including the lower reaches of the River Axe) supports a total of eight waterbird roost sites (Roosts 1A to 1H on Map 1). The characteristics and waterbird species/assemblages associated with each of these roost sites are described in the following paragraphs, and summarised in Table 1c (see page 26).

Roost Locations

6.3 All eight waterbird high tide roost sites are situated at the southern end of Sector 1, and are associated with the River Axe estuary and adjacent terrestrial habitats (see Roosts 1A to 1H on Map 1). Further details regarding the habitats associated with these roost concentrations are presented in paragraphs 6.21 to 6.22.

6.4 No further high tide roost sites are considered to be present within the remainder of the sector. Whilst the underlying reasons remain uncertain, it is possible that the following factors could be linked: (a) the high levels of human disturbance along the beach in Weston Bay; and (b) an apparent absence of suitable locations for roosting birds on Brean Down and Anchor Head (which comprise rocky headlands with steep-sided cliffs).

Roost Composition

6.5 A breakdown of the waterbird species which are typically present at each roost site, along with an estimate of the number of birds and the frequency with which they are recorded during the WeBS visits (where possible), is presented for each roost site within Table 1c on pages 26 to 29. However, in general terms, the roost sites in Sector 1 can be categorised as follows:

- Roost 1A – a mixed waterbird roost site which predominantly supports relatively large numbers of oystercatcher and shelduck and small numbers of gulls. Small to moderate numbers of dunlin, redshank and lapwing are also present on a less frequent basis.

- Roost 1B – a mixed waterbird roost site which supports moderate to large numbers of shelduck, wigeon, teal, oystercatcher, lapwing and curlew on the majority of WeBS visits. Small numbers of golden plover are also present on a less frequent basis.

- Roost 1C – A mixed waterbird roost site which supports moderate to large numbers of shelduck, wigeon, teal, dunlin and redshank on the majority of WeBS visits. Smaller numbers of knot, black-tailed godwit and bar-tailed godwit are also present on a less frequent basis.
- Roost 1D – A mixed waterbird roost site which supports small to moderate numbers of mallard on all WeBS survey visits, with small to moderate numbers of dunlin and redshank also present on a less frequent basis.
- Roost 1E – A wader roost site which typically supports small to moderate numbers of dunlin and ringed plover on the majority of WeBS visits, as well as small numbers of sanderling on a more variable basis.
- Roost 1F – A mixed waterbird roost which supports small to moderate numbers of shelduck and teal on all WeBS visits, as well as small numbers of dunlin and large numbers of redshank on most of the WeBS visits.
- Roost 1G – A wildfowl roost which supports relatively small numbers of wigeon and mallard on all WeBS visits. Small numbers of teal are also recorded on a less frequent basis.
- Roost 1H – A mixed waterbird roost which supports relatively small numbers of wigeon and mallard on all WeBS visits. Small numbers of teal and common snipe are also recorded on a less frequent basis.

1. SPA Qualifying Species

6.6 The latest five-year summary WeBS data indicate that Sector 1 supports three SPA Qualifying Species during the high tide period: shelduck; dunlin; and redshank. According to the WeBS data (as shown in Table 1a, below), the number of redshank within the sector tends to peak during the autumn period (ie July to October), albeit that this species is also present in high numbers during the winter period (ie November to March). The numbers of shelduck and dunlin typically present within the sector tend to peak during the winter period.

Table 1a: Sector 1 SPA Qualifying Species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	94.25	**99.6 (4.4%)**	36.3
Dunlin	10	**320 (1.7%)**	2.7
Redshank	**249 (13%)**	186.8 (7%)	90

Note: the **bold** figures denote the peak seasonal mean count for each species. The percentage figures in brackets provide an indication of the relative proportion of the Severn Estuary's entire population for each species in a given season within Sector 1.

6.7 The WeBS data indicate that Sector 1 is of particular importance for all three of these SPA Qualifying Species. As shown in Table 1a, Sector 1 typically

supports, on average, between 1.7% and 7% of these species' wintering populations for the Severn Estuary. Sector 1 also typically supports, on average, 13% of the Severn Estuary's autumn passage population of redshank.

6.8 The findings of the WeBS interviews concur with the WeBS data, in that shelduck, dunlin and redshank were identified as the only SPA Qualifying Species associated with the high tide roost sites in Sector 1.

6.9 With the exception of Roosts 1G and 1H, all of the roost sites in Sector 1 support at least one SPA Qualifying Species. Of these, Roosts 1B, 1C 1D and 1F meet the criteria for classification as a 'SPA Primary Roost' as follows:

- Roost 1B is classified as a 'SPA Primary Roost' for shelduck, since it typically supports approximately 100 to 150 wintering birds during the high tide period. This equates to between approximately 4.5% and 6.7% of the Severn Estuary's wintering shelduck population.

- Roost 1C is classified as a 'SPA Primary Roost' for redshank, since it typically supports approximately 100 to 200 wintering birds during the high tide period. This equates to between approximately 3.7% and 7.4% of the Severn Estuary's wintering redshank population.

- Roost 1D is classified as a 'SPA Primary Roost' for redshank, since it typically supports approximately 100 to 200 wintering birds during the high tide period. This equates to between approximately 3.7% and 7.4% of the Severn Estuary's wintering redshank population.

- Roost 1F is classified as a 'SPA Primary Roost' for redshank, since it also typically supports approximately 100 to 200 wintering birds during the high tide period. This equates to between approximately 3.7% and 7.4% of the Severn Estuary's wintering redshank population.

6.10 The following high tide roosts are classified as 'possible SPA Primary Roosts'. This is because they <u>may</u> support numbers of a SPA Qualifying Species that exceed 1% of the entire SPA population for that species, on more than 50% of the counts during the winter months and/or passage periods. The frequency with which waterbird numbers exceed 1% of the of the Severn Estuary's wintering population for that species, however, remains uncertain

- Roost 1A is classified as a 'possible SPA Primary Roost' for redshank, since it has been found to support between 10 and 50 wintering birds during the high tide period during previous WeBS surveys. This equates to up to 1.9% of the Severn Estuary's wintering redshank population.

- Roost 1C is classified as a 'possible SPA Primary Roost' for shelduck, since it has been found to support between 20 and 50 wintering birds during the high tide period. This equates to up to 2.2% of the Severn Estuary's wintering shelduck population.

- Roost 1C is also classified as a 'possible SPA Primary Roost' for dunlin, since it has been found to support between 10 and 200 wintering birds during the high tide period. This equates to up to 1.1% of the Severn Estuary's wintering dunlin population.

- Roost 1D is classified as a 'possible SPA Primary Roost' for dunlin, since it has been found to support between 10 and 200 wintering birds during the high tide period. This equates to up to 1.1% of the Severn Estuary's wintering dunlin population.

2. SPA Qualifying Assemblage

6.11 The latest five year summary WeBS data indicate that the section of coastline between Brean Down and Anchor Head supports a range of 'listed' waterbird species from the SPA Qualifying Assemblage. According to the WeBS data, the number of these waterbirds tends to peak during the winter months, as shown by Table 1b, below.

Table 1b: Sector 1 SPA Qualifying Assemblage 'listed' species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	94	100	36
Wigeon	13	47	0
Gadwall	1	11	0
Teal	28	295	11
Pochard	7	20	0
Tufted duck	4	16	7
Ringed plover	6	11	0
Dunlin	10	320	3
Whimbrel	0	0	2
Curlew	14	36	3
Redshank	249	187	90
TOTAL	426.3	**1043.2 (2.8%)**	151.3

Note: the **bold** figure denotes the peak seasonal mean total count for the SPA Qualifying Assemblage species in Sector 1. The **bold** percentage figure in brackets denotes the relative proportion of the Severn Estuary's entire wintering Qualifying Assemblage within Sector 1 for the winter period.

6.12 The WeBS data indicate that Sector 1 supports an average of approximately 1043 'listed' waterbirds from the SPA Qualifying Assemblage during the winter months. This total equates to approximately 2.8% of the entire Severn Estuary Qualifying Assemblage for the winter period.

6.13 It is apparent that each of the roost sites within Sector 1 support several waterbird species which form part the SPA Qualifying Assemblage (either as 'listed' or 'non-listed' component species). Furthermore, at least two 'listed'

waterbird species within the SPA Qualifying Assemblage are present at each roost site.

6.14 All of the roost sites in Sector 1 support at least three SPA Qualifying Assemblage species (see Table 1c on pages 26 to 29). The roost sites which appear to support the greatest waterbird species are:

- Roost 1C (eight SPA Qualifying Assemblage species, of which five are 'listed' waterbird species (shelduck, dunlin, redshank, wigeon and teal)).
- Roost 1B (seven SPA Qualifying Assemblage species, of which four are 'listed' waterbird species (shelduck, wigeon, teal and curlew)).
- Roost 1A (six SPA Qualifying Assemblage species, of which three are 'listed' waterbird species (shelduck, dunlin and redshank)).

6.15 Within Sector 1, SPA Qualifying Assemblage waterbirds appear to be recorded in the largest numbers and with the greatest degree of frequency at Roosts 1B, 1C, 1A and 1F, as described in the following paragraphs (see also Table 1c on pages 26 to 29).

6.16 Relatively high counts of the following waterbirds are recorded at Roost 1B on the vast majority/all of the WeBS visits during the winter months and passage periods: shelduck (100-150 birds); teal (50-200 birds); wigeon (10-20 birds); curlew (40-80 birds); oystercatcher (100-150 birds) and lapwing (100-200 birds). Smaller numbers of golden plover are also present on a less frequent basis.

6.17 Relatively high counts of the following waterbirds are recorded at Roost 1C on the vast majority/all of the WeBS visits during the winter months and passage periods: shelduck (20-50 birds); dunlin (10-200 birds); redshank (100-200 birds); wigeon (10-20 birds); and teal (20-50 birds). Smaller numbers of knot, black-tailed godwit and bar-tailed godwit are also present on a less frequent basis.

6.18 Relatively high counts of the following waterbirds are recorded at Roost 1A on the vast majority/all of the WeBS visits during the winter months and passage periods: shelduck (20 birds); and oystercatcher (100-150 birds). Dunlin, redshank, cormorant, and lapwing are also present in smaller numbers and/or on a less frequent basis.

6.19 Relatively high counts of the following waterbirds are recorded at Roost 1A on the vast majority/all of the WeBS visits during the winter months and passage periods: shelduck (10-20 birds); dunlin (10-20 birds); redshank (100-200 birds); and teal (10-50 birds).

3. Gulls

6.20 Whilst gulls do not form part of the SPA designation, small numbers (up to six birds) of lesser black-backed gulls and herring gulls are recorded at Roost 1A during the vast majority of the WeBS counts during the winter months and passage periods.

Roost Habitats

6.21 The roost sites in Sector 1 are associated with a variety of habitats. Roost 1A is located on Black Rock, a rocky island which is cut off from the coast at high tide. Roost 1B is predominantly located upon a shingle bank; however, adjacent areas of saltmarsh and open water are also occupied by birds during the high tide period. Roosts 1C, 1D and 1F are all situated on areas of saltmarsh, although saltmarsh creek channels and areas of open water also tend to be used by wildfowl at high tide, and are considered to form part of the roost sites. Roost 1E comprises an area of sandflat, whereas Roosts 1G and 1H comprise freshwater pools.

6.22 Roost E becomes submerged during the upper end of the spring tidal range, rendering it unavailable to roosting waders; all other roost sites within Sector 1 remain available to waterbirds throughout all high tide conditions. With the exception of Roosts 1G and 1H (which are enclosed by tall stands of reeds), all of the Roost sites within Sector 1 afford waterbirds with extensive sightlines over a range of aspects.

Roost Disturbance

6.23 The findings of the WeBS interviews indicate that boats and jet ski movements take place in the vicinity of Roosts 1A to 1F, inclusive. The effect of this water-based traffic upon waterbirds varies (depending upon the species and roost site that is affected) but, in general, birds tend to be displaced from the roost sites. In some instances the displaced birds relocate to an alternative roost site within Sector 1 (frequently Roosts 1C and 1F). Alternatively, the displaced birds appear to vacate Sector 1 altogether.

6.24 The presence of walkers, dogs and vehicles on the southern end of the beach in Weston Bay appears to disturb to waders using Roost 1E. When disturbed, the birds typically take flight and depart the roost.

6.25 Vehicle movements to/from the adjacent Sewage Treatment Works can also disturb waterbirds at Roost 1H. The effect of this disturbance tends to be relatively small-scale, and generally involves birds being flushed and relocating to a more distant location within the pools.

6.26 With the exception of Roost 1G, it is considered possible that all of the roost sites within Sector 1 could be subject to potentially significant levels of disturbance as a result of the various human activities taking place in the area. Further studies would be required to validate this.

6.27 Whilst few mitigation measures to address existing levels of human disturbance have been deemed practicable, the possibility of introducing restrictions on jet ski and water ski movements along the lower reaches of the River Axe was proposed.

Table 1c: Summary of Waterbird High Tide Roost Sites in Sector 1

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
1A	ST 30650 58780	Mixed waterbird	Shelduck	✓	L	✓	20	90	No	Black Rock - rock outcrop with a very limited covering of vegetation	Possible
			Dunlin	✓	L	✓	10-50	50	No		
			Redshank	✓	L	✓	10-50	50	Possible		
			Cormorant		N-L		1-2	50	-		
			Oystercatcher		N-L		100-150	90	-		
			Lapwing		N-L		20-50	50	-		
			Lesser black-backed gull				6	90	-		
			Herring gull				6	90	-		
1B	ST 30310 58650	Mixed waterbird	Shelduck	✓	L	✓	100-150	100	Yes	Shingle bank plus adjacent areas of saltmarsh and open water	Possible
			Wigeon		L	✓	10-20	75	-		
			Teal		L		50-200	100	-		
			Curlew		L	✓	40-80	100			
			Oystercatcher		N-L		100-150	90	-		
			Golden plover		N-L		5-10	10-20	-		
			Lapwing		N-L		100-200	100	-		

Table 1c: Summary of Waterbird High Tide Roost Sites in Sector 1 (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
1C	ST 33630 58490	Mixed waterbird	Shelduck	✓	L	✓	20-50	100	Possible	Saltmarsh and associated creek/channel	Possible
			Dunlin	✓	L	✓	10-200	100	Possible		
			Redshank	✓	L	✓	100-200	100	Yes		
			Wigeon		L	✓	10-20	100	-		
			Teal		L		20-50	100	-		
			Knot		N-L	✓	1-10	50	-		
			Black-tailed godwit		N-L		1-5	50	-		
			Bar-tailed godwit		N-L		0-3	10	-		
1D	ST 33820 58290	Mixed waterbird	Dunlin	✓	L	✓	10-200	50	Possible	Saltmarsh margins (all species) and open water (mallard only)	Possible
			Redshank	✓	L	✓	100-200	50	Yes		
			Mallard		N-L		20-50	100	-		
1E	ST 31000 58630	Wader	Dunlin	✓	L	✓	5-20	75	No	Sandflats	Possible
			Ringed plover		L	✓	5-20	75	-		
			Sanderling		N-L		0-6	Variable	-		
1F	ST 31190 57210	Mixed waterbird	Shelduck	✓	L	✓	10-20	100	No	Saltmarsh	Possible
			Dunlin	✓	L	✓	10-20	50-75	No		
			Redshank	✓	L	✓	100-200	50-75	Yes		
			Teal		L		10-50	100	-		

Table 1c: Summary of Waterbird High Tide Roost Sites in Sector 1 (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
1G	ST 31560 57110	Wildfowl	Wigeon		L	✓	20-50	25	-	Freshwater pool - open water and reedbeds	Unlikely
			Teal		L		10-20	25	-		
			Mallard		N-L		10-20	50	-		
1H	ST31280 56810	Mixed waterbird	Wigeon		L	✓	20-50	25	-	Freshwater pool - open water and reedbeds	Possible
			Teal		L		10-20	25	-		
			Mallard		N-L		10-20	50	-		
			Snipe		N-L	✓	1-5	50-75	-		

Notes:

SPA QS denotes a SPA Qualifying Species for the Severn Estuary.

SPA QA denotes a waterbird species which forms part of the Severn Estuary SPA Qualifying Assemblage (either as a 'listed' or 'non-listed' component).

L denotes a waterbird species which is a 'listed' component of the SPA Qualifying Assemblage.

N-L denotes a waterbird species which is a 'non-listed' component of the SPA Qualifying Assemblage.

SSSI denotes a waterbird species which forms part of the notification reasons for the Severn Estuary SSSI.

[1] This table column presents the estimated number of birds recorded during the WeBS counts across the winter and passage periods. Where appropriate to do so, the number of birds is expressed as a range of values (e.g. 50-100 birds). Where appropriate, the term 'Variable' is used to denote those instances where it is not possible to provide an estimate of bird numbers for a given species (eg, due to high fluctuations in bird numbers between WeBS counts).

2 This table column presents the estimated percentage frequency with which a species is *typically* encountered during the course of WeBS counts during the winter and passage periods. Where appropriate to do so, the estimated frequency is expressed as a range of values (e.g. 10-20%). A variety of other terms are also used on occasions, as follows:

Variable - the term 'Variable' is used to denote those instances where the presence/number of a given waterbird species tends to vary between WeBS visits, such that it is not possible to provide an typical estimate.

Unknown - the term 'Unknown' is used to denote those instances where the WeBS Counter could not recall the frequency with which a given waterbird species is recorded at the roost site.

Annual passage – the term 'Annual passage' is used to denote those instances where a waterbird species tends to be present at a roost site on an annual basis, but only during the spring and/or autumn passage period (and not during the winter months).

3 This table column denotes those roost sites which would be classified as a 'SPA primary roost' or 'possible SPA primary roost' for a given **SPA Qualifying Species** only. This assessment is based upon roost-specific information collected during the WeBS interviews and the latest five-year WeBS data for the SPA. The definitions for a 'SPA primary roost' or 'possible SPA primary roost' are as follows:

- SPA primary roost - supports a SPA Qualifying Species in numbers that exceed 1% of the entire SPA population for that species, on more than 50% of the WeBS counts during the winter months and/or passage periods.
- Possible SPA primary roost - may support numbers of a SPA Qualifying Species that exceed 1% of the entire SPA population for that species, on more than 50% of the counts during the winter months and/or passage periods. However, owing to uncertainties surrounding the frequency with which bird numbers exceed 1% of the Severn Estuary's wintering/passage population, its status remains equivocal.

4 This table column presents the outcomes of a subjective assessment regarding existing human disturbance upon waterbirds at each of the identified roost sites. It is based upon the findings of the WeBS interviews and (where appropriate) the site visits to the roost sites.

Sector 2 - Anchor Head to Sand Point

6.28 The section of coastline between Anchor Head and Sand Point supports a total of four known waterbird roost sites (Roosts 2A to 2D on Map 2). The characteristics and waterbird species/assemblages associated with each of these roost sites are described in the following paragraphs. Table 2c also provides a summary of the main characteristics of each roost site within Sector 2 (see pages 34 to 36).

Roost Locations

6.29 A total of four waterbird high tide roost sites (Roosts 2A to 2D) have been identified within the section of coastline between Anchor Head and Sand Point. As shown on Map 2, the roost sites are distributed throughout the sector.

Roost Composition

6.30 A breakdown of the waterbird species which are typically present at each roost site, along with an estimate of the number of birds and frequency with which they are recorded during the WeBS visits (where possible), is presented for each roost within Table 2c on pages 34 to 36. However, in general terms, the roost sites in Sector 2 can be categorised as follows:

- Roost 2A – a mixed waterbird roost, which is typically dominated by a range of wader species and also supports small numbers of little egret.
- Roost 2B – a mixed waterbird roost, which is typically dominated by shelduck and black-headed gulls, and also supports small numbers of mallard and *Larus* gulls.
- Roost 2C - a mixed waterbird roost, which is typically dominated by shelduck (2C.2) and black-headed gulls (2C.1), and also supports small numbers of *Larus* gulls.
- Roost 2D - a gull roost dominated by black-headed gulls with smaller numbers of herring gulls.

1. SPA Qualifying Species

6.31 The latest five-year summary WeBS data indicate that Sector 2 supports three SPA Qualifying Species: shelduck; dunlin; and redshank. According to the WeBS data, the number of all three species tends to peak within the sector during the winter months, as shown by Table 2a, overleaf.

Table 2a: Sector 2 SPA Qualifying Species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	50.3	**276.4 (12%)**	20.3
Dunlin	65.3	**219.6 (1.2%)**	2.3
Redshank	1.5	**40 (1.5%)**	0

Note: the **bold** figures denote the peak seasonal mean count for each species. The **bold** percentage figures in brackets provide an indication of the relative proportion of the Severn Estuary's entire wintering population for each species within Sector 2 during the winter period.

6.32 The WeBS data indicate that Sector 2 is of particular nature conservation importance for all three of these SPA Qualifying Species. The mean number of wintering shelduck within Sector 2 between 2008/09 and 2012/13 equates to 12% of the entire SPA wintering population for this period. Sector 2 also supported 1.2% and 1.5% of the SPA's wintering populations of dunlin and redshank, respectively, during the same period.

6.33 The findings of the WeBS interviews concur with the WeBS data, in that shelduck, dunlin and redshank are identified as the only SPA Qualifying Species typically associated with the high tide roost sites in Sector 2. With the exception of Roost 2D, all of the roost sites in Sector 2 support at least one SPA Qualifying Species.

6.34 Based upon the information collated at the WeBS interviews it was not possible to confirm whether any of the roost sites in Sector 2 would be classified as SPA Priority Roosts, due to uncertainties surrounding the frequency with which bird numbers exceed 1% of the Severn Estuary's wintering/passage population. However, the latest WeBS data for this sector indicate that it supports, on average, 12% of the Severn Estuary's entire wintering shelduck population, 1.5% of the Severn Estuary's entire wintering dunlin population, and 1.2% of the Severn Estuary's entire wintering redshank population. Shelduck only occur at Roosts 2B and 2C, and dunlin and redshank are only present at Roost 2A. Therefore, in view of the high wintering populations that occur within the sector, and given that these birds are distributed across one or two roost sites only, it is assumed that they should be classified as SPA Priority Roosts for these species for the purposes of this study.

2. SPA Qualifying Assemblage

6.35 The latest five-year (2008/09-12/13) summary WeBS data indicate that the section of coastline between Anchor Head and Sand Point supports a range of 'listed' waterbird species which form part of the SPA Qualifying Assemblage. According to the WeBS data, the number of these waterbirds tends to peak during the winter months, as shown by Table 2b, overleaf.

Table 2b: Sector 2 SPA Qualifying Assemblage 'listed' species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	50.3	276.4	20.3
Ringed plover	26.5	0	1
Grey plover	0	2.2	0
Dunlin	65.3	219.6	2.3
Whimbrel	0	0	1
Curlew	81	63.4	20.3
Redshank	1.5	40	0
TOTAL	224.5	**601.6 (1.6%)**	45

Note: the **bold** figure denotes the peak seasonal mean total count for the SPA Qualifying Assemblage species in Sector 2. The **bold** percentage figure in brackets denotes the relative proportion of the Severn Estuary's entire wintering Qualifying Assemblage within Sector 2 for the winter period.

6.36 The WeBS data indicate that Sector 2 supports an average of approximately 602 'listed' birds associated with the SPA Qualifying Assemblage during the winter months. This total equates to approximately 1.6% of the entire SPA Qualifying Assemblage for the winter period.

6.37 Roost 2A supports 10 SPA Qualifying Assemblage species, which is the greatest diversity of SPA waterbird species within the sector. A total of six 'listed' waterbird species within the SPA Qualifying Assemblage are present at Roost 2A. These comprise: dunlin; redshank; ringed plover; grey plover; curlew; and whimbrel (passage periods only). A further four 'non-listed' waterbird species within the SPA Qualifying Assemblage are also present in relatively small numbers and with variable frequency: little egret; oystercatcher; sanderling; and common snipe.

6.38 Of the remaining roost sites within Sector 2, only Roosts 2B and 2C support any SPA Qualifying Assemblage species. Roost 2B supports shelduck in variable numbers on the vast majority of WeBS visits during the winter months and passage periods, as well as small numbers of mallard on a less frequent basis. Roost 2C supports shelduck only, again in variable numbers on the vast majority of WeBS visits during the winter months and passage periods.

3. Gulls

6.39 Whilst these species do not form part of the SPA designation, Roosts 2B, 2C and 2D support a range of gull species. Gulls are present on all of the WeBS visits at these roost sites and typically comprise relatively large numbers of black-headed gulls (300 to 500 birds at Roosts 2A to 2C and variable numbers at Roost 2D) and smaller numbers of lesser black-backed gulls (up to 10 birds at Roost 2B and 2C only), herring gulls (up to 10 birds at all roosts), and great black-backed gulls (up to 5 birds at Roost 2B and 2C only).

Roost Habitats

6.40 The roost sites in Sector 2 are associated with a variety of habitats. Roost 2A is located on a relatively large area of saltmarsh, which remains available as a terrestrial roost site on all but the highest tides. Roosts 2B and 2C comprise areas of open water within Sand Bay. Roost 2D comprises a section of rocky outcrop/cliff along the northern side of Anchor Head. All of these roost sites afford the waterbirds a degree of physical separation from nearby areas of human activity (eg, beach users). The roost sites also afford waterbirds with extensive sightlines over a range of aspects.

Roost Disturbance

6.41 A variety of recreational activities routinely take place on the beach at Sand Bay, including walking, dog walking and horse riding. Despite this, the findings of the WeBS interviews and site visit indicate that very little human activity encroaches into the saltmarsh within which Roost 2A is located. Whilst horse riders and dogs off the lead have been observed entering the saltmarsh and displacing waterbirds from Roost 2A on a small number of occasions, the birds quickly return to the roost. In view of this, waterbirds at Roost 2A do not appear be subject to significant levels of human disturbance under existing conditions.

6.42 The waterbirds using Roost 2A appear to be more susceptible to adverse disturbance-related impacts as they move into the transitional area to the south of the roost site. At this time the presence of dog walkers appears to cause some disturbance to the waterbirds, which can lead to the birds taking flight and departing the area altogether. Whilst the potential significance of this impact remains uncertain, its effect is likely short-lived since alternative refuges will quickly become available to the birds as the tide continues to fall.

6.43 The WeBS interviews identified jet skiing and life boat manoeuvres in Sand Bay as potential sources of disturbance to the waterbirds at Roosts 2B and 2C However, as these activities tend to take place more frequently during the summer months (when waterbirds are present with less frequency and abundance), any disturbance is not perceived to be significant. No practical measures have been identified to eradicate or minimise this form of potential disturbance.

6.44 Given the degree of separation between Roost 2D and any nearby human activities, this roost site is not considered to be subject to any potentially significant disturbance-related impacts under existing conditions.

Table 2c: Sector 2 - Summary of roost site characteristics

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
2A	ST 32680 65670	Mixed waterbird	Dunlin	✓	L	✓	Variable	>50	Yes*	Saltmarsh	Unlikely
			Redshank	✓	L	✓	50-200	<50	No		
			Ringed plover		L	✓	Variable	>50	-		
			Grey plover		L	✓	10-20	<30	-		
			Curlew		L	✓	80	75	-		
			Whimbrel		L	✓	0-10	Annual passage	-		
			Little egret		N-L		1-3	Unknown	-		
			Oystercatcher		N-L		30	75	-		
			Sanderling		N-L		2-9	<10	-		
			Snipe		N-L		0-1	<10	-		
2B	ST 32530 65470	Mixed Waterbird	Shelduck	✓	L	✓	Variable	90	Yes*	Open Water	Unlikely
			Mallard		N-L		1-2	50	-		
			Black-headed gull				300-500	Variable	-		
			Lesser black-backed gull				0-10	100	-		
			Herring gull				0-10	100	-		
			Great black-backed gull				0-5	100	-		

Table 2c: Sector 2 - Summary of roost site characteristics (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance [4]
				SPA QS	SPA QA	SSSI					
2C	ST 32240 63750	Mixed waterbird	Shelduck	✓	L	✓	Variable	90	Yes*	Open water	Unlikely
			Black-headed gull				300-500	100	-		
			Lesser black-backed gull				0-10	100	-		
			Herring gull				0-10	100	-		
			Greater black-backed gull				0-5	100	-		
2D	ST 32470 63030	Gull	Black-headed gull				Variable	100	-	Rock outcrop	Unlikely
			Herring gull				2-3	100	-		

Notes:

SPA QS denotes a SPA Qualifying Species for the Severn Estuary SPA QA denotes a waterbird species which forms part of the Severn Estuary SPA Qualifying Assemblage (either as a 'listed' or 'non-listed' component).

L denotes a waterbird species which is a 'listed' component of the SPA Qualifying Assemblage.

N-L denotes a waterbird species which is a 'non-listed' component of the SPA Qualifying Assemblage.

SSSI denotes a waterbird species which forms part of the notification reasons for the Severn Estuary SSSI.

[1] This table column presents the estimated number of birds recorded during the WeBS counts across the winter and passage periods. Where appropriate to do so, the number of birds is expressed as a range of values (e.g. 50-100 birds). Where appropriate, the term 'Variable' is used to denote those instances where it is not possible to provide an estimate of bird numbers for a given species (eg, due to high fluctuations in bird numbers between WeBS counts).

[2] This table column presents the estimated percentage frequency with which a species is *typically* encountered during the course of WeBS counts during the winter and passage periods. Where appropriate to do so, the estimated frequency is expressed as a range of values (e.g. 10-20%). A variety of other terms are also used on occasions, as follows:

Variable - the term 'Variable' is used to denote those instances where the presence/number of a given waterbird species tends to vary between WeBS visits, such that it is not possible to provide an typical estimate.

Unknown - the term 'Unknown' is used to denote those instances where the WeBS Counter could not recall the frequency with which a given waterbird species is recorded at the roost site.

Annual passage – the term 'Annual passage' is used to denote those instances where a waterbird species tends to be present at a roost site on an annual basis, but only during the spring and/or autumn passage period (and not during the winter months).

[3] This table column denotes those roost sites which would be classified as a 'SPA primary roost' or 'possible SPA primary roost' for a given **SPA Qualifying Species** only. This assessment is based upon roost-specific information collected during the WeBS interviews and the latest five-year WeBS data for the SPA. The definitions for a 'SPA primary roost' or 'possible SPA primary roost' are as follows:

- SPA primary roost - supports a SPA Qualifying Species in numbers that exceed 1% of the entire SPA population for that species, on more than 50% of the WeBS counts during the winter months and/or passage periods.
- Possible SPA primary roost - may support numbers of a SPA Qualifying Species that exceed 1% of the entire SPA population for that species, on more than 50% of the counts during the winter months and/or passage periods. However, owing to uncertainties surrounding the frequency with which bird numbers exceed 1% of the Severn Estuary's wintering/passage population, its status remains equivocal.

* In view of the high wintering populations that occur within the sector, and given that these birds are distributed across one or two roost sites only, it is assumed that they should be classified as SPA Priority Roosts for these species for the purposes of this study (see paragraph 6.34 for further details).

[4] This table column presents the outcomes of a subjective assessment regarding existing human disturbance upon waterbirds at each of the identified roost sites. It is based upon the findings of the WeBS interviews and (where appropriate) the site visits to the roost sites.

Sector 3 - Sand Point to the River Yeo

6.45 The section of coastline between Sand Point and the River Yeo (including the lower reaches of the River Banwell) supports a total of 11 waterbird roost sites (Roosts 3A to 3K on Map 3). The characteristics and waterbird species/assemblages associated with each of these roost sites are described in the following paragraphs. This information is summarised in Table 3c (see pages 43 to 46).

Roost Locations

6.46 A total of 11 waterbird high tide roost sites (Roosts 3A to 3K) have been identified within the section of coastline between Sand Point and the River Yeo, and including the lower reaches of the River Banwell. Whilst the roost sites are distributed throughout the sector, nine appear to be concentrated within Woodspring Bay (Roosts 3C to 3K on Map 3), with a further two roost sites located adjacent to Sand Point (Roosts 3A and 3B on Map 3). Further details regarding the habitats associated with these roost locations are provided in paragraph 6.62.

Roost Composition

6.47 A breakdown of the waterbird species which are typically present at each roost site, along with an estimate of the number of birds and the frequency with which they are recorded during the WeBS visits (where possible), is presented for each roost within Table 3c on page 43 to 46. However, in general terms, the roost sites in Sector 3 can be categorised as follows:

- Roost 3A – a small black-headed gull roost.
- Roost 3B – a mixed waterbird roost typically supporting small numbers of oystercatchers and black-headed gulls.
- Roost 3C – a redshank roost site.
- Roost 3D – a redshank roost site.
- Roost 3E – a mixed waterbird roost typically supporting small numbers of mallard, redshank and snipe.
- Roost 3F – a mixed waterbird roost typically dominated by shelduck and black-headed gulls, with smaller numbers of other wildfowl and gull species.
- Roost 3G – a mixed waterbird roost typically supporting a range of wildfowl and gull species
- Roost 3H – a wildfowl roost typically supporting shelduck, wigeon and mallard.
- Roost 3I – a small shelduck roost site.

- Roost 3J – a mixed waterbird roost site typically supporting a range of wildfowl, wader and gull species.
- Roost 3K - a mixed waterbird roost site typically supporting a range of wildfowl, wader and gull species.

1. SPA Qualifying Species

6.48 The latest five-year summary WeBS data indicate that Sector 3 supports three SPA Qualifying Species during the high tide period: shelduck; dunlin; and redshank. According to the WeBS data, the number of all three of these species tends to peak within the sector during the winter months, as shown by Table 3a below.

Table 3a: Sector 3 SPA Qualifying Species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	8.5	**39.2 (1.7%)**	11.7
Dunlin	3.5	**103 (0.5%)**	8
Redshank	7.5	**52.6 (1.9%)**	1

Note: the **bold** figures denote the peak seasonal mean count for each species. The **bold** percentage figures in brackets provide an indication of the relative proportion of the Severn Estuary's entire wintering population for each species within Sector 3 during the winter period.

6.49 The WeBS data indicate that Sector 3 is of particular importance for shelduck and redshank, since it supports, on average, 1.7% and 1.9%, respectively, of the Severn Estuary's entire wintering populations of these species.

6.50 The findings of the WeBS interviews concur with the WeBS data, in that shelduck, dunlin and redshank are identified as the only SPA Qualifying Species typically associated with the high tide roost sites in Sector 3.

6.51 As shown in Table 3c (see pages 43 to 46), Roosts 3C to 3K typically support at least one SPA Qualifying Species. However, only Roosts 3C and 3F meet the criteria for classification as a 'SPA Primary Roost', as follows:

- Roost 3C is classified as a 'SPA Primary Roost' for redshank, since it typically supports approximately 200 to 240 wintering birds during the high tide period. This equates to between approximately 7.4% and 8.9% of the Severn Estuary's wintering redshank population.
- Roost 3F is classified as a 'SPA Primary Roost' for shelduck, since it typically supports between approximately 30 and 150 wintering birds during the high tide period. This equates to between approximately 1.3% and 6.7% of the Severn Estuary's wintering redshank population.

6.52 The remaining high tide roosts (Roosts 3D, 3E and 3G to 3K) are not classified as 'SPA Primary Roosts' since they are not perceived to support numbers of

any SPA Qualifying species that exceed 1% of the entire SPA population for a given species, on more than 50% of the counts during the winter months and/or passage periods. Notwithstanding this, their importance for SPA Qualifying Species cannot be discounted, in particular, due to the role they play in providing a network of roosting opportunities for these birds in the wider Severn Estuary (see paragraph 7.17 for further discussion regarding this).

2. SPA Qualifying Assemblage

6.53 The latest five year summary WeBS data indicate that the section of coastline between Sand Point and the River Yeo supports a range of 'listed' waterbird species which form part of the SPA Qualifying Assemblage. According to the WeBS data, the number of these waterbirds tends to peak during the winter months, as shown by Table 3b, below.

Table 3b: Sector 3 SPA Qualifying Assemblage 'listed' species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	8.5	39.2	11.7
Wigeon	10.25	47.6	3.3
Teal	10.75	32	2.7
Pintail	0.25	0	0
Ringed plover	0	0	0.7
Grey plover	0	1	0
Dunlin	3.5	103	8
Whimbrel	7.5	40.6	11
Spotted redshank	0	0.2	0
Redshank	7.5	52.6	1
TOTAL	48.3	**316.2 (0.8%)**	38.3

Note: the **bold** figure denotes the peak seasonal mean total count for the SPA Qualifying Assemblage species in Sector 3. The **bold** percentage figure in brackets denotes the relative proportion of the Severn Estuary's entire wintering Qualifying Assemblage within Sector 3 for the winter period.

6.54 The WeBS data indicate that Sector 3 supports an average of 316 'listed' waterbirds associated with the SPA Qualifying Assemblage during the winter months. This total equates to approximately 0.8% of the entire Severn Estuary SPA Qualifying Assemblage.

6.55 Six of the 11 roost sites in Sector 3 (Roosts 3E, 3F, 3G, 3H, 3I and 3K) support at least three SPA Qualifying Assemblage species (either as 'listed' or 'non-listed' component species). The roost sites which appear to support the greatest diversity of SPA Qualifying Assemblage species are:

- Roost 3J (five SPA Qualifying Assemblage species, of which four are 'listed' waterbird species (dunlin, curlew, ringed plover and grey plover)). It should be noted, however, that four of these SPA Qualifying Assemblage species

(dunlin, ringed plover, grey plover and knot) are present at Roost 3J during the passage periods only.

- Roost 3K (five SPA Qualifying Assemblage species, of which two are 'listed' waterbird species (shelduck and redshank)).

- Roost 3G (four SPA Qualifying Assemblage species, of which three are 'listed' waterbird species (shelduck, wigeon and teal)).

6.56 Within Sector 3, SPA Qualifying Assemblage waterbirds appear to be recorded in the largest numbers and with the greatest degree of frequency at Roosts 3C and 3F, as described in the following paragraphs (see also Table 3c on pages 43 to 46).

6.57 Roost 3C only supports a single SPA Qualifying Species; redshank. Nevertheless, counts of between 200 to 240 birds are recorded at this roost site on approximately half of all WeBS visits.

6.58 Roost 3F supports relatively large counts of shelduck (30-150 birds), and relatively low numbers of teal (10-20 birds) and mallard (30 birds) on the vast majority/all WeBS visits.

6.59 Collectively, the roost sites in Sector 3 appear to be of lower nature conservation importance in relation to the SPA Qualifying Assemblage, in comparison with other sectors in the study. Sector 3 supports, on average, 0.8% of the SPA's Qualifying Assemblage during the winter months, whereas the remaining sectors support, on average, between 1.8% and 4.8% of the SPA's Qualifying Assemblage during the same season. In view of this, it is questionable whether any one roost site in Sector 3 should be considered as being of particular nature conservation importance in its own right. This assertion also appears to be reinforced by the WeBS interview findings, which indicate that many of the roost sites supporting SPA Qualifying Assemblage species, are used by relatively low numbers of waterbirds and/or on a relatively infrequent basis (see Table 3c on pages 43 to 46).

6.60 Therefore, in considering the nature conservation importance of this sector for the SPA Qualifying Assemblage, it may be more appropriate to place greater emphasis upon the diversity of (potential) roosting opportunities and the (potential) presence of alternate roosting sites that are available to these birds, rather than the number of birds that are typically present during the high tide period.

3. Gulls

6.61 As shown by Table 3c, several roost sites within Sector 3 support relatively small numbers of gulls on occasions. These comprise: black-headed gull (typically fewer than 70 birds at Roosts 3A, 3F, 3G, and 3J); lesser black-backed gull (typically fewer than 10 birds at Roosts 3G and 3J); and herring gull (typically fewer than five birds at Roosts 3B, 3F, 3G and 3J).

Roost Habitats

6.62 The roost sites in Sector 3 are associated with a variety of habitats. Roosts 3A, 3G, 3H and a proportion of 3F support of wildfowl and/or gulls aggregated on areas of open water within Woodspring Bay. Roost 3B comprises a section of rocky cliff/shore that is used by small numbers of roosting/loafing herring gulls and roosting oystercatchers around high water. Roost 3C comprises an area of shingle shore/mudflat which is used as a loafing area by redshank during the high tide period. Roosts 3D, 3E, 3K and a proportion of 3F are associated with areas of saltmarsh, and are used by a variety of foraging, loafing and roosting waterbirds. Roost 3I comprises an area of improved grassland that is used by roosting shelduck. Roost 3J is located on part of the man-made coastal sea defence; an earth embankment with a tarmac surface. Typically, waders and gulls loaf on this artificial structure during the high tide period.

6.63 All of the roost sites in Sector 3 afford waterbirds with extensive sightlines over a range of aspects.

Roost Disturbance

6.64 The WeBS interviews identified the following recreational activities taking place within Sector 3, which have the potential to cause disturbance to waterbirds at nearby roost sites: walking/dog walking; other land-based activities (jogging, birdwatching, etc); boating; wildfowling; and clay pigeon shooting.

6.65 Walkers/dog walkers and other land-based recreational users are present in relatively close proximity to Roosts 3A and 3B; however, neither roost site is considered to be subject to significant disturbance-related impacts. Black-headed gulls loafing on open water at Roost 3A tend to relocate further offshore in response to land-based human activity. The combined topography and presence of dense scrub adjacent to Roost 3B appears to 'screen' herring gulls and oystercatchers at Roost 3B from nearby human activity.

6.66 Land-based human activities are prevented from taking place in close proximity to Roost 3C due to land access restrictions associated with the Ministry of Defence land-holding. The only perceived potential source of human disturbance which could affect this roost site is the presence of powered boat traffic. The frequency of boat movements in/out of the River Banwell is uncertain; therefore, the likely effect remains unknown but potentially significant.

6.67 A similar range of human activities are believed to take place in the vicinity of Roosts 3D to 3F. In the case of all three of these roost sites, walkers and dog walkers cause birds to be flushed, with birds generally departing Roosts 3D and 3E altogether. Gulls and wildfowl flushed from Roost 3F tend to relocate to areas of open water further offshore in Woodspring Bay. The effect of boat movements and wildfowling on the roost sites is unknown, but may be significant in the case of Roosts 3D and 3E. Given the ability of gulls and

wildfowl using Roost 3F to relocate into areas of open water further offshore, the likelihood of boat traffic and wildfowling causing significant levels of disturbance to these birds appears to be low.

6.68 Roosts 3G and 3H support a mixed waterbird flock and a wildfowl roost, respectively, and are located on areas of open water in Woodspring Bay. Given the ability of these birds to relocate to other areas of open water in the estuary's wider vicinity in response to various sources of human disturbance, significant disturbance-related impacts upon birds using Roosts 3G and 3H seem unlikely.

6.69 The small numbers of shelduck using Roost 3I could be subject to disturbance from walkers/dog walkers and wildfowling/clay pigeon shooting. Whilst the effect of shooting on these birds is unknown, approximately half of the shelduck at Roost 3I have been observed departing the roost site in response to walkers/dog walkers passing by on the seawall adjacent to the roost site.

6.70 The presence of walkers/dog walkers along the seawall results in the displacement of birds from Roost 3J, which is also located on this structure. Whilst gulls have been observed relocating onto adjacent areas of open water in Woodspring Bay in response to human disturbance, waders tend to depart the area altogether. The effect of wildfowling and clay pigeon shooting in close proximity to this roost site remains uncertain. However, a clay pigeon shoot was in progress over Wick Warth (immediately landward of Roost 3J) during the site visit to Sector 3 undertaken as part of this study. Initially, birds were observed flushing from the coastal areas around Wick Warth in response to commencement of shooting. However, at least a proportion of these birds were also observed relocating to coastal habitats elsewhere in Sector 3 (primarily in the vicinity of Roost 3H), where they commenced feeding and loafing on areas of mudflats exposed by the falling tide.

6.71 Roost 3K supports mixed waterbird flocks which are perceived to be subject to disturbance from walkers/dog-walkers. Whilst the frequency of disturbance and the significance of any associated effect remains uncertain, birds are perceived to be flushed from this roost site causing them to depart the area altogether.

Table 3c: Sector 3 - Summary of roost site characteristics

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
3A	ST 33420 66470	Gull	Black-headed gull				10-20	50	-	Open water	Unlikely
3B	ST 33790 66510	Mixed waterbird	Oystercatcher		N-L		3-4	40	-	Rocky cliff/shore	Unlikely
			Herring gull				2-3	75	-		
3C	ST 34900 66840	Wader	Redshank	✓	L	✓	200-240	50	Yes	Shingle shore/mudflat	Possible
3D	ST 34870 66640	Wader	Redshank	✓	L	✓	80-100	15-30	No	Saltmarsh	Possible
3E	ST 35000 66560	Mixed waterbird	Redshank	✓	L	✓	10	20	No	Saltmarsh	Possible
			Mallard		N-L		7	100	-		
			Snipe		N-L		0	20	-		
3F	ST 35130 66830	Mixed waterbird	Shelduck	✓	L	✓	30-150	90	Yes	Saltmarsh & open water	Unlikely
			Teal		L		10-20	100	-		
			Mallard		N-L		30	100	-		
			Black-headed gull				60-70	100	-		
			Herring gull				1-3	50	-		

Table 3c: Sector 3 - Summary of roost site characteristics (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance [4]
				SPA QS	SPA QA	SSSI					
3G	ST 35550 67100	Mixed waterbird	Shelduck	✓	L	✓	10	50	No	Open water	Unlikely
			Wigeon		L	✓	15	50	-		
			Teal		L		5-10	50	-		
			Mallard		N-L		5-10	50	-		
			Black-headed gull				0-10	40	-		
			Lesser black-backed gull				0-5	40	-		
			Herring gull				0-5	40	-		
3H	ST 36250 67000	Wildfowl	Shelduck	✓	L	✓	10-15	100	No	Open water	Unlikely
			Wigeon		L	✓	40	80	-		
			Mallard		N-L		10	80	-		
3I	ST 35140 66480	Wildfowl	Shelduck	✓	L	✓	7-8	<30	No	Grassland	Possible
3J	ST 35620 66610	Mixed waterbird	Dunlin	✓	L	✓	10-20	Annual passage	No	Artificial structure – sea defence	Unlikely
			Curlew		L	✓	40 or 80	30	-		
			Ringed plover		L	✓	0-2	Annual passage	-		
			Grey plover		L	✓	0-4	Annual passage	-		
			Knot		N-L	✓	0-10	Annual passage	-		
			Black-headed gull				15	30	-		
			Common gull				0-3	Annual passage	-		
			Lesser black-backed gull				1	10	-		
			Herring gull				2-3	30	-		

Table 3c: Sector 3 - Summary of roost site characteristics (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance [4]
				SPA QS	SPA QA	SSSI					
3K	ST 35130 66300	Mixed waterbird	Shelduck	✓	L	✓	10	20	No	Saltmarsh	Possible
			Redshank	✓	L	✓	5	10	No		
			Little egret		N-L		2	20	-		
			Grey heron		N-L		0	<10	-		
			Common sandpiper		N-L		0	<10	-		

Notes:

SPA QS denotes a SPA Qualifying Species for the Severn Estuary.

SPA QA denotes a waterbird species which forms part of the Severn Estuary SPA Qualifying Assemblage (either as a 'listed' or 'non-listed' component).

L denotes a waterbird species which is a 'listed' component of the SPA Qualifying Assemblage.

N-L denotes a waterbird species which is a 'non-listed' component of the SPA Qualifying Assemblage.

SSSI denotes a waterbird species which forms part of the notification reasons for the Severn Estuary SSSI.

1 This table column presents the estimated number of birds recorded during the WeBS counts across the winter and passage periods. Where appropriate to do so, the number of birds is expressed as a range of values (e.g. 50-100 birds). Where appropriate, the term 'Variable' is used to denote those instances where it is not possible to provide an estimate of bird numbers for a given species (eg, due to high fluctuations in bird numbers between WeBS counts).

2 This table column presents the estimated percentage frequency with which a species is *typically* encountered during the course of WeBS counts during the winter and passage periods. Where appropriate to do so, the estimated frequency is expressed as a range of values (e.g. 10-20%). A variety of other terms are also used on occasions, as follows:

Variable - the term 'Variable' is used to denote those instances where the presence/number of a given waterbird species tends to vary between WeBS visits, such that it is not possible to provide an typical estimate.

Unknown - the term 'Unknown' is used to denote those instances where the WeBS Counter could not recall the frequency with which a given waterbird species is recorded at the roost site.

Annual passage – the term 'Annual passage' is used to denote those instances where a waterbird species tends to be present at a roost site on an annual basis, but only during the spring and/or autumn passage period (and not during the winter months).

[3] This table column denotes those roost sites which would be classified as a 'SPA primary roost' or 'possible SPA primary roost' for a given **SPA Qualifying Species** only. This assessment is based upon roost-specific information collected during the WeBS interviews and the latest five-year WeBS data for the SPA. The definitions for a 'SPA primary roost' or 'possible SPA primary roost' are as follows:

- SPA primary roost - supports a SPA Qualifying Species in numbers that exceed 1% of the entire SPA population for that species, on more than 50% of the WeBS counts during the winter months and/or passage periods.
- Possible SPA primary roost - may support numbers of a SPA Qualifying Species that exceed 1% of the entire SPA population for that species, on more than 50% of the counts during the winter months and/or passage periods. However, owing to uncertainties surrounding the frequency with which bird numbers exceed 1% of the Severn Estuary's wintering/passage population, its status remains equivocal.

[4] This table column presents the outcomes of a subjective assessment regarding existing human disturbance upon waterbirds at each of the identified roost sites. It is based upon the findings of the WeBS interviews and (where appropriate) the site visits to the roost sites.

Sector 4 - The River Yeo to Clevedon

6.72 The section of coastline between the River Yeo and Clevedon (including the lower reaches of the River Yeo) supports a total of 12 waterbird roost sites (Roosts 4A to 4L on Map 4). The characteristics and waterbird species/assemblages associated with each of these roost sites are described in the following paragraphs. This information is summarised in Table 4c (see pages 57 to 61).

Roost Locations

6.73 A total of 12 waterbird high tide roost sites (Roosts 4A to 4L on Map 4) have been identified within the section of coastline between the River Yeo and Clevedon, including the lower reaches of the River Yeo. These roosts are distributed throughout the sector. Whilst many are associated with particular habitats/features, no particular trends are apparent in terms of their location. Further details regarding the habitats associated with these roost locations are provided in paragraphs 6.92 to 6.96.

Roost Composition

6.74 A breakdown of the waterbird species which are typically present at each roost site, along with an estimate of the number of birds and the frequency with which they are recorded during the WeBS visits (where possible), is presented for each roost within Table 4c on pages 57 to 61. However, in general terms, the roost sites in Sector 4 can be categorised as follows:

- Roost 4A – a mixed assemblage of waders and black-headed gulls.
- Roost 4B – a mixed assemblage of waterbirds, typically comprising wildfowl and waders.
- Roost 4C – a mixed assemblage of waterbirds, typically comprising wildfowl and gulls.
- Roost 4D – a small flock of roosting oystercatchers.
- Roost 4E – a small to moderate sized flock of loafing black-headed gulls.
- Roost 4F – a mixed assemblage of waterbirds, typically dominated by waders with small numbers of little egrets and herring gulls.
- Roost 4G – an assemblage of waders typically including dunlin, redshank, turnstone, curlew and grey plover. In addition, ringed plover, whimbrel and bar-tailed godwit tend to be present during the passage periods.
- Roost 4H – an assemblage of waders typically dominated by dunlin, with a range of other species also present, including whimbrel during passage periods.

- Roost 4I – an assemblage of waders comprising dunlin, redshank, curlew and snipe.
- Roost 4J – an assemblage of waders dominated by dunlin, redshank and curlew, with a range of other species including bar-tailed godwit and whimbrel during passage periods.
- Roost 4K - a small to moderate-sized flock of redshank.
- Roost 4L – a mixed assemblage of wildfowl and gulls, dominated by shelduck.

1. SPA Qualifying Species

6.75 The latest five-year summary WeBS data indicate that Sector 4 supports three SPA Qualifying Species during the high tide period: shelduck; dunlin; and redshank. According to the WeBS data, the number of all three of these species tends to peak within the sector during the winter months, as shown by Table 4a below.

Table 4a: Sector 4 SPA Qualifying Species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	53.5	**87.2 (3.9%)**	60.7
Dunlin	149	**995.8 (5.3%)**	40.7
Redshank	92	**173 (6.4%)**	36.7

Note: the **bold** figures denote the peak seasonal mean count for each species. The **bold** percentage figures in brackets provide an indication of the relative proportion of the Severn Estuary's entire wintering population for each species within Sector 4 during the winter period.

6.76 The WeBS data indicate that Sector 4 is of particular importance for all three of these SPA Qualifying Species, since it typically supports, on average, between 3.9% and 6.4% of their wintering populations on the Severn Estuary.

6.77 The findings of the WeBS interviews concur with the WeBS data, in that shelduck, dunlin and redshank are identified as the only SPA Qualifying Species typically associated with the high tide roost sites in Sector 4.

6.78 With the exception of Roost 4D and 4E, all of the roost sites in Sector 4 typically support at least one SPA Qualifying Species. Of these, Roosts 4B, 4H, 4J and 4L meet the criteria for classification as a 'SPA Primary Roost', as follows:

- Roost 4B is classified as a 'SPA Primary Roost' for dunlin, since it typically supports approximately 200 to 300 wintering birds during the high tide period. This equates to between approximately 1.1% and 1.6% of the Severn Estuary's wintering dunlin population.

- Roost 4B is also classified as a 'SPA Primary Roost' for redshank, since it typically supports between approximately 50 and 150 wintering birds during the high tide period. This equates to between approximately 1.9% and 5.5% of the Severn Estuary's wintering redshank population.

- Roost 4H is classified as a 'SPA Primary Roost' for dunlin, since it typically supports up to approximately 3000 wintering birds during the high tide period. This equates to up to approximately 16% of the Severn Estuary's wintering dunlin population.

- Roost 4J is classified as a 'SPA Primary Roost' for dunlin since it typically supports between approximately 300 and 400 wintering birds during the high tide period. This equates to between approximately 1.6% and 2.1% of the Severn Estuary's wintering dunlin population.

- Roost 4J is also classified as a 'SPA Primary Roost' for redshank, since it typically supports approximately 200 wintering birds during the high tide period. This equates to between approximately 7.4% of the Severn Estuary's wintering redshank population.

- Roost 4L is classified as a 'SPA Primary Roost' for shelduck, since it typically supports approximately 100 wintering birds during the high tide period. This equates to approximately 4.4% of the Severn Estuary's wintering shelduck population.

6.79 The following high tide roosts are classified as 'possible SPA Primary Roosts'. This is because they may support numbers of a SPA Qualifying Species that exceed 1% of the entire SPA population for that species, on more than 50% of the counts during the winter months and/or passage periods, although in each case the frequency with which bird numbers exceed 1% of the of the Severn Estuary's wintering population for that species remains uncertain.

- Roost 4C is classified as a 'possible SPA Primary Roost' for shelduck, since it can support from zero to 200 wintering birds during the high tide period. This equates to up to 8.9% of the Severn Estuary's wintering shelduck population.

- Roost 4F is classified as a 'possible SPA Primary Roost' for dunlin, since it supports between approximately 200 and 300 wintering birds during the high tide period, although the frequency with which they are recorded during the WeBS counts remains uncertain. When present, this equates to between approximately 1.1% and 1.6% of the Severn Estuary's wintering dunlin population.

- Roost 4F is also classified as a 'possible SPA Primary Roost' for redshank, since it typically supports between approximately 50 and 150 wintering birds during the high tide period, although the frequency with which they are recorded during the WeBS counts remains uncertain. When present, this equates to between approximately 1.9% and 5.5% of the Severn Estuary's wintering redshank population.

- Roost 4G is classified as a 'possible SPA Primary Roost' for dunlin and redshank. Whilst these species are present at Roost 4G during most of the winter WeBS counts, their numbers are highly variable. It is therefore not possible to identify whether the numbers of these species exceed 1% of the Severn Estuary's wintering population on more than 50% of the WeBS counts.

- Roost 4H is classified as a 'possible SPA Primary Roost' for redshank, since it typically supports approximately 100 wintering birds during the high tide period, although the frequency with which they are recorded during the WeBS counts remains uncertain. When present, this equates up to approximately 3.7% of the Severn Estuary's wintering redshank population.

- Roost 4I is classified as a 'possible SPA Primary Roost' for dunlin, since it can support up to 500 wintering birds during the high tide period, although on occasions birds are absent altogether. When present, this equates to up to 2.6% of the Severn Estuary's wintering dunlin population.

- Roost 4I is also classified as a 'possible SPA Primary Roost' for redshank, since it can support up to 60 wintering birds during the high tide period, although on occasions birds are absent altogether. When present, this equates to up to 2.2% of the Severn Estuary's wintering redshank population.

2. SPA Qualifying Assemblage

6.80 The latest five year summary WeBS data indicate that the section of coastline between the River Yeo and Clevedon supports a range of 'listed' waterbird species which form part of the SPA Qualifying Assemblage. According to the WeBS data, the number of these waterbirds tends to peak during the winter months, as shown by Table 4b, overleaf.

Table 4b: Sector 4 SPA Qualifying Assemblage 'listed' species – Five year mean WeBS counts during the autumn, winter and spring periods (2008/09-12/13)

Species	5 year autumn mean (Jul-Oct)	5 year winter mean (Nov-Mar)	5 year spring mean (Apr-Jun)
Shelduck	53.5	87.2	60.7
Wigeon	19.8	113.8	3
Teal	7.5	79.6	17.3
Tufted duck	0	0	0.3
Ringed plover	59	2.2	7.7
Grey plover	2.3	22.8	1.3
Dunlin	149	995.8	40.7
Whimbrel	2.3	0	9
Curlew	134.8	116	28.7
Spotted redshank	0	0.2	0.3
Redshank	92	173	36.7
TOTAL	520	**1590.6 (4.3%)**	205.7

Note: the **bold** figure denotes the peak seasonal mean total count for the SPA Qualifying Assemblage species in Sector 4. The **bold** percentage figure in brackets denotes the relative proportion of the Severn Estuary's entire wintering Qualifying Assemblage within Sector 4 for the winter period.

6.81 The WeBS data indicate that Sector 4 supports an average of approximately 1590 'listed' birds associated with the SPA Qualifying Assemblage during the winter months. This total equates to approximately 4.3% of the entire Severn Estuary SPA Qualifying Assemblage.

6.82 With the exception of Roosts 4D, 4E and 4K, all of the roost sites within Sector 4 support at least three waterbird species which form part the SPA Qualifying Assemblage (either as 'listed' or 'un-listed' component species). Furthermore, at least three 'listed' waterbird species within the SPA Qualifying Assemblage are present at 10 of these roost sites.

6.83 The majority of these roost sites appear to support a high diversity of SPA Qualifying Assemblage species, as follows:

- Roost 4B - 11 SPA Qualifying Assemblage species, of which five are 'listed' waterbird species (dunlin, redshank, wigeon teal and curlew).
- Roost 4G - eight SPA Qualifying Assemblage species, of which six are 'listed' waterbird species (dunlin, redshank, ringed plover, grey plover, curlew and whimbrel (passage periods only)).
- Roost 4H - seven SPA Qualifying Assemblage species, of which five are 'listed' waterbird species (dunlin, redshank, grey plover, curlew and whimbrel (passage periods only)).

- Roost 4J - seven SPA Qualifying Assemblage species, of which four are 'listed' waterbird species (dunlin, redshank, curlew and whimbrel (passage periods only)).
- Roost 4F - seven SPA Qualifying Assemblage species, of which three are 'listed' waterbird species (dunlin, redshank and curlew).
- Roost 4A - five SPA Qualifying Assemblage species, of which three are 'listed' waterbird species (shelduck, dunlin and curlew).
- Roost 4C - four SPA Qualifying Assemblage species, of which three are 'listed' waterbird species (shelduck, wigeon and teal).
- Roost 4L - four SPA Qualifying Assemblage species, of which three are 'listed' waterbird species (shelduck, wigeon and teal).
- Roost 4I – three SPA Qualifying Assemblage species, all of which are listed' waterbird species (dunlin, redshank and curlew).

6.84 SPA Qualifying Assemblage waterbirds appear to be recorded in the largest numbers and with the greatest degree of frequency at Roosts 4H, 4J, 4B, 4C, 4I and 4A, as described in the following paragraphs (see also Table 4c on pages 57 to 61).

6.85 Roost 4H supports dunlin on virtually all WeBS visits, with up to 3000 birds present on some occasions. The findings of the WeBS interviews indicate that the number of birds varies between WeBS visits; however, this figure represents a significant proportion of the SPA Qualifying Assemblage for the entire estuary in its own right (up to 8% of the SPA Qualifying Assemblage 'listed' species). Whilst the WeBS counter was not able to estimate the frequency with which they are recorded during the WeBS counts (due to the variability with which they occur), their presence will nevertheless make a further contribution to the likely nature conservation importance of this roost site. These species comprise: redshank (100 birds), grey plover (40-50 birds), curlew (150 birds), whimbrel (120 birds – passage periods only), and turnstone (25-30 birds).

6.86 Roost 4J supports relatively large flocks of dunlin (300-400 birds), redshank (200 birds) and curlew (150 birds) on all WeBS visits. Relatively large flocks of whimbrel (up to 100 birds) are also present during the passage periods; however, the WeBS counter was not able to estimate the frequency with which they are recorded during the WeBS visits due to the variability with which they occur.

6.87 Roost 4B supports relatively large flocks of dunlin (200-300 birds), redshank (50-150 birds), wigeon (up to 200 birds), teal (20-100 birds), curlew (30-50 birds), and mallard (20-100 birds) on virtually all WeBS visits.

6.88 Roost 4C supports relatively large flocks of shelduck (up to 200 birds), wigeon (up to 200 birds), teal and mallard (20-100 birds) on virtually all WeBS visits.

6.89 Roost 4I supports relatively large flocks of dunlin (up to 500 birds), redshank (up to 60 birds) and curlew (up to 100 birds). on approximately half of the WeBS visits.

6.90 Roost 4A supports relatively large flocks of shelduck (20 birds), dunlin (100 birds), curlew (10-20 birds), oystercatcher (10-20 birds) and turnstone (10-20 birds) on the majority of WeBS visits.

3. Gulls

6.91 As shown by Table 4c, five of the roost sites within Sector 4 support gull species: Roosts 4A, 4C, 4E, 4F and 4L. Of these, the largest roosts are present at roosts 4C and 4E, and involve large flocks of black-headed gulls (100-500 birds) which are present on the majority of the WeBS visits. Smaller numbers of herring gulls (10 birds) are also present at Roost 4C on occasions. The remaining roost sites support variable numbers (typically fewer than 70 birds) of black-headed gulls and/or herring gulls, which tend to be present on a variable basis.

Roost Habitats

6.92 The roost sites in Sector 4 are associated with a variety of habitats. Roost 4A supports shelduck, a mixed assemblage of waders and black-headed. The roost is located on Blackstone Rock, a rocky outcrop that remains available to the waterbirds through all high tide periods.

6.93 Roosts 4B, 4F, 4I and 4J predominantly support waders and are located exclusively within areas of saltmarsh. Roost 4F tends to be occupied by birds on the highest tides only (typically when the high water level exceeds 13 metres), when Roost 4B becomes submerged and birds are forced to relocate on to Roost 4F. Roost 4I is generally submerged at high tide and therefore only becomes occupied by birds after the tide begins to recede. It is not occupied by birds on every tidal cycle. Roost 4J tends to be occupied by birds until the tide begins to recede, after which they tend to relocate to Roost 4I. During very high tidal conditions, the roost will be positioned on the adjacent man-made costal flood embankment, since the saltmarsh will generally be submerged and unavailable to the birds.

6.94 Roost 4K represents a redshank roost site and is located within an area of former grazing pasture which has subsequently been subject to inundation as a result of managed retreat works. It comprises an area of standing water and receives regular brackish inputs due to its regular submersion by the incoming tide. Saltmarsh vegetation is likely to develop and become established over time.

6.95 The remaining roost sites (4C, 4E and 4L) comprise areas of open water and are used by flocks of wildfowl and/or gulls.

6.96 All of the roost sites in Sector 4 afford waterbirds with extensive sightlines over a range of aspects.

Roost Disturbance

6.97 The WeBS interviews identified that the following activities take place within/adjacent to Sector 4, all of which have the potential to cause disturbance to waterbirds at nearby roost sites: walking/dog walking; fishing; and farming activities.

6.98 According to the findings of the WeBS interviews, fishing takes place in close proximity to Roost 4A. One or two fishermen are typically seen on Blackstone Rock (Roost 4A) on an infrequent basis. The response of nearby waterbirds to this human activity is perceived to be dependent upon the location of the fishermen on Blackstone Rock. In general, the shelduck, waders and black-headed gulls using this roost site appear to remain on Blackstone Rock during the high tide period, despite the presence of fishermen, provided that the anglers are located towards one end of the rock. Under these conditions, the birds appear to locate themselves at the opposite end of the rock and remain *in situ.* However, on those occasions when fishermen are present at two separate locations on Blackstone Rock, the birds appear to show a reluctance to remain at the roost site, and generally depart the roost altogether. Whilst the presence of fishermen on Blackstone Rock can lead to the displacement of waterbirds from Roost 4A, this is not perceived to be significant due to the relatively low frequency of these disturbance events.

6.99 The WeBS interviews identified that the presence of walkers and dog walkers can result in disturbance to waterbirds using roost sites 4B, 4C, 4D, and 4F. Due to uncertainties within the anecdotal information underpinning this study, it is not possible to determine the approximate frequency with which walkers/dog walkers come into close proximity with waterbirds at Roosts 4B, 4C, 4D and 4F, although it is perceived to be a relatively infrequent occurrence. The effect of passing walkers/dog walkers on birds using these roost sites is also uncertain, but is perceived to be similar to the response elicited by the presence of the WeBS counter. As such, it is considered likely that:

- waterbirds using Roost 4B generally remain within, or in close proximity to, the roost site. Initially, the waterbirds are flushed by the presence of a passing WeBS counter. The waders and some of the wildfowl tend to relocate to the farthest reaches of the roost site. Many of the wildfowl tend to relocate onto adjacent areas of open water, but remain in the general vicinity of the roost site. It is considered likely that the waterbirds at Roost 4B react in a similar fashion to the presence of a passing walker/dog walker.

- waterbirds are displaced from Roosts 4C, 4D and 4F before relocating to Roost 4B and/or adjacent areas of open water.

6.100 Whilst the frequency and effects of disturbance caused by walkers/dog walkers upon waterbirds at Roosts 4B, 4C, 4D and 4F remain uncertain, the findings of the WeBS interviews indicate that it is unlikely to be having a significant adverse effect upon any of these roost sites. This is largely due to the perception that these disturbance events take place on a relatively infrequent basis, and also in view of the birds' apparent willingness to remain within, or in close proximity to the roost sites despite the presence of a nearby WeBS counter.

6.101 The WeBS interviews identified walkers/dog walkers and fishermen as sources of human disturbance which appear to affect waterbirds using Roost 4G. There is perceived to be a greater frequency of human presence along this section of the coastline (compared to other parts of Sector 4) due to informal public access to the coast from Channel View Farm and associated car parking opportunities. The WeBS counter estimates that one walker/dog walker and up to three fishermen could be present in the vicinity of Roost 4G during each WeBS visit. Typically, waterbirds tend to respond to the presence of nearby walkers/dog walkers/fishermen by relocating to the farthest reaches of the roost site, where they resume roosting/feeding. However, this roost site generally becomes unavailable for a period around high water due to submersion by the incoming tide. As the tide rises, birds are forced into closer proximity to the areas typically used by walkers/dog walkers/fishermen and, therefore, waterbirds are perceived to be at greater risk of disturbance during these times. Notwithstanding this, the existing levels of human disturbance in the vicinity of Roost 4G are not perceived to be having a significant adverse effect upon the roost site.

6.102 According to the WeBS interviews, walkers/dog walkers affect waterbirds using Roost 4H, but on a very occasional basis only. The roost is located on the top of the man-made sea defence embankment, which is also used by walkers/dog walkers. As a result, the waterbirds tend to respond to the presence of people/dogs by taking flight and relocating to a different part of the coastal defence feature. Given the apparent low frequent of such disturbance events, and the ability of waterbirds to relocate to other parts of the roost site, human activities are not perceived to be causing significant levels of disturbance to Roost 4H under existing conditions.

6.103 The WeBS interviews indicate that Roost 4I is likely subject to the same type and level of human disturbance from walkers/dog walkers as Roost 4H. The waterbirds using Roost 4I are also likely to be affected by noise and visual disturbance associated with farm operations taking place on nearby land. However, due to uncertainties within the anecdotal information underpinning this study, it is not possible to determine the approximate frequency, duration and nature of any farming-related disturbance. Notwithstanding this, the findings of the WeBS interviews indicate that waterbirds using Roost 4I are unlikely to be significantly affected by human disturbance in close proximity to the roost site under existing conditions.

6.104 The WeBS interviews did not identify any particular sources of human disturbance which give rise to potentially significant adverse effects on Roosts 4E, 4J, 4K and 4L.

Table 4c: Sector 4 - Summary of roost site characteristics

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
4A	ST 38540 70180	Mixed waterbird	Shelduck	✓	L	✓	20	70	No	Rock outcrop – Blackstone Rock	Unlikely
			Dunlin	✓	L	✓	100	70	No		
			Curlew		L	✓	10-20	70	-		
			Oystercatcher		N-L		10-20	70	-		
			Turnstone		N-L	✓	10-20	70	-		
			Black-headed gull				50-60	70	-		
4B	ST 33380 68710	Mixed waterbird	Dunlin	✓	L	✓	200-300	90	Yes	Saltmarsh	Unlikely
			Redshank	✓	L	✓	50-150	90	Yes		
			Wigeon		L	✓	0-200	90	-		
			Teal		L		20-100	90	-		
			Curlew		L	✓	30-50	90	-		
			Brent goose		N-L		0-2	15	-		
			Little egret		N-L		4-5	50	-		
			Mallard		N-L		20-100	90	-		
			Oystercatcher		N-L		0-30	90	-		
			Jack snipe		N-L		1-2	50-75	-		
			Snipe		N-L		0-10	90	-		
4C	ST 38290 68820	Mixed waterbird	Shelduck	✓	L	✓	0-200	90	Possible	Open water	Unlikely
			Wigeon		L	✓	0-200	90	-		
			Teal		L		20-100	90	-		
			Mallard		N-L		20-100	90	-		
			Black-headed gull				100-500	90	-		
			Herring gull				10	50	-		

Table 4c: Sector 4 - Summary of roost site characteristics (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
4D	ST 38180 68570	Wader	Oystercatcher		N-L		0-30	Unknown	-	Artificial structure - sea defence	Unlikely
4E	ST 38130 69600	Gull	Black-headed gull				100-500	100	-	Open water	Unlikely
4F	ST 38110 68420	Mixed waterbird	Dunlin	✓	L	✓	200-300	Unknown	Possible	Saltmarsh	Unlikely
			Redshank	✓	L	✓	50-150	Unknown	Possible		
			Curlew		L	✓	30-50	Unknown	-		
			Little egret		N-L		4-5	Unknown	-		
			Oystercatcher		N-L		0-30	Unknown	-		
			Jack snipe		N-L		1-2	Unknown	-		
			Snipe		N-L		0-10	Unknown	-		
			Herring gull				10	Unknown	-		
4G	ST 37740 67900	Wader	Dunlin	✓	L	✓	Variable	90	Possible	Saltmarsh, rock outcrop and artificial structure – sea defence	Unlikely
			Redshank	✓	L	✓	Variable	90	Possible		
			Ringed plover		L	✓	0-450	Unknown – annual passage			
			Grey plover		L	✓	10	90	-		
			Curlew		L	✓	Variable	50	-		
			Whimbrel		L	✓	0-120	Unknown – annual passage	-		
			Bar-tailed godwit		N-L		10	Unknown – annual passage	-		
			Turnstone		N-L	✓	20-50	90	-		

Table 4c: Sector 4 - Summary of roost site characteristics (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
4H	ST 37310 67400	Wader	Dunlin	✓	L	✓	3000	90	Yes	Saltmarsh and artificial structure – sea defence	Unlikely
			Redshank	✓	L	✓	100	Unknown	Possible		
			Grey plover		L	✓	40-50	Unknown	-		
			Curlew		L	✓	150	Unknown	-		
			Whimbrel		L	✓	120	Unknown - Annual passage	-		
			Knot		N-L	✓	100	<10	-		
			Turnstone		N-L	✓	25-30	Unknown	-		
4I	ST 36760 66970	Wader	Dunlin	✓	L	✓	0-500	50	Possible	Saltmarsh	Unlikely
			Redshank	✓	L	✓	0-60	50	Possible		
			Curlew		L	✓	0-100	50	-		
			Snipe				0-10	50	-		
4J	ST 37020 66280	Wader	Dunlin	✓	L	✓	300-400	100	Yes	Saltmarsh	Unlikely
			Redshank	✓	L	✓	200	100	Yes		
			Curlew		L	✓	150	100	-		
			Whimbrel		L	✓	0-100	Unknown - Annual passage	-		
			Knot		N-L	✓	0-15	10	-		
			Black tailed godwit		N-L		10	Unknown	-		
			Bar-tailed godwit		N-L		0-10	Unknown - Annual passage	-		
4K	ST 37690 66250	Wader	Redshank	✓	L	✓	0-80	30	No	Managed retreat	Unlikely

Table 4c: Sector 4 - Summary of roost site characteristics (continued)

Roost ID	Grid Reference	Roost Type	Species Composition	Status			Number of birds[1]	Percentage presence at roost site (%)[2]	SPA Primary Roost[3]	Description of Habitat/Feature/ Substrate	Significant Existing Disturbance[4]
				SPA QS	SPA QA	SSSI					
4L	ST 36600 68000	Mixed waterbird	Shelduck	✓	L	✓	100	100	Yes	Open water	Unlikely
			Wigeon		L	✓	100	Unknown	-		
			Teal		L		100	Unknown	-		
			Mallard		N-L		0-100	Unknown	-		
			Gulls				unknown	Unknown	-		

Notes:

SPA QS denotes a SPA Qualifying Species for the Severn Estuary.

SPA QA denotes a waterbird species which forms part of the Severn Estuary SPA Qualifying Assemblage (either as a 'listed' or 'non-listed' component).

L denotes a waterbird species which is a 'listed' component of the SPA Qualifying Assemblage.

N-L denotes a waterbird species which is a 'non-listed' component of the SPA Qualifying Assemblage.

SSSI denotes a waterbird species which forms part of the notification reasons for the Severn Estuary SSSI.

[1] This table column presents the estimated number of birds recorded during the WeBS counts across the winter and passage periods. Where appropriate to do so, the number of birds is expressed as a range of values (e.g. 50-100 birds). Where appropriate, the term 'Variable' is used to denote those instances where it is not possible to provide an estimate of bird numbers for a given species (eg, due to high fluctuations in bird numbers between WeBS counts).

[2] This table column presents the estimated percentage frequency with which a species is *typically* encountered during the course of WeBS counts during the winter and passage periods. Where appropriate to do so, the estimated frequency is expressed as a range of values (e.g. 10-20%). A variety of other terms are also used on occasions, as follows:

Variable - the term 'Variable' is used to denote those instances where the presence/number of a given waterbird species tends to vary between WeBS visits, such that it is not possible to provide an typical estimate.

Unknown - the term 'Unknown' is used to denote those instances where the WeBS Counter could not recall the frequency with which a given waterbird species is recorded at the roost site.

Annual passage – the term 'Annual passage' is used to denote those instances where a waterbird species tends to be present at a roost site on an annual basis, but only during the spring and/or autumn passage period (and not during the winter months).

[3] This table column denotes those roost sites which would be classified as a 'SPA primary roost' or 'possible SPA primary roost' for a given **SPA Qualifying Species** only. This assessment is based upon roost-specific information collected during the WeBS interviews and the latest five-year WeBS data for the SPA. The definitions for a 'SPA primary roost' or 'possible SPA primary roost' are as follows:

- SPA primary roost - supports a SPA Qualifying Species in numbers that exceed 1% of the entire SPA population for that species, on more than 50% of the WeBS counts during the winter months and/or passage periods.
- Possible SPA primary roost - may support numbers of a SPA Qualifying Species that exceed 1% of the entire SPA population for that species, on more than 50% of the counts during the winter months and/or passage periods. However, owing to uncertainties surrounding the frequency with which bird numbers exceed 1% of the Severn Estuary's wintering/passage population, its status remains equivocal.

[4] This table column presents the outcomes of a subjective assessment regarding existing human disturbance upon waterbirds at each of the identified roost sites. It is based upon the findings of the WeBS interviews and (where appropriate) the site visits to the roost sites.

7. Discussion & Conclusions

7.1 Based upon the information collated during the WeBS interviews and site visits, the study has sought to characterise the high tide waterbird roost sites between Brean Down and Clevedon in relation to four main aims. These are to identify:

1. The locations of any waterbird high-tide roost sites within the study area, which are used during the winter months and passage periods.
2. The composition of waterbird species which make up each roost site.
3. The physical habitat, feature and/or substrate-type upon which each roost site is located.
4. Any (potential) sources of disturbance within the study area, which could result in the displacement of waterbirds from roost sites.

7.2 This section of the report reviews the main findings of the study and, where possible, attempts to draw conclusions in relation to each of the study aims. Consideration has also been given to any factors or limitations which could affect the validity of the findings and conclusions. This is discussed in Chapter 8 of the report.

Roost Locations

7.3 A total of 35 high tide waterbird roost sites have been identified within the study area. Whilst these roost sites are distributed throughout the study area, there appears to be some association between roost site locations and the rivers which flow into the Severn Estuary. In particular, all of the roost sites in Sector 1 are either associated with the lower reaches of the River Axe, or the estuarine areas within/immediately adjacent to its river mouth. Six of the roost sites in Sectors 3 appear to be aggregated around the lower reaches and mouth of the River Banwell (Roosts 3C, 3D, 3E, 3F, 3I and 3K), and a further three roost sites in the study area are associated with the River Yeo (Roosts 3H, 4J and 4K).

7.4 The factors influencing the locations of high tide roost sites within the study area are likely to be complex, and no attempt has been made to define these within this report. Nevertheless, it is possible that these rivers could provide waterbirds with one or more of the following opportunities, which may influence the apparent preference in their usage as roosting areas: (a) close proximity to nearby foraging resources; (b) extensive sightlines over a range of aspects; (c) relatively low levels of human disturbance in comparison with other parts of the study area; (d) and shelter from the prevailing weather conditions.

7.5 Roosts 1A and 4A are located on rocky outcrops which are typically cut-off from the adjacent shoreline at high tide. Although some human activity occurs on/around these roost sites, it seems feasible that their usage as waterbird roost sites could be due to their relative isolation from mainland areas.

Roost Composition

7.6 Of the 35 high-tide waterbird roost sites identified by this study, 20 (57%) support mixed flocks of waterbirds, nine (26%) support waders only, three (8.5%) support wildfowl only, and three (8.5%) support gulls only.

SPA Qualifying Species

7.7 The latest WeBS count data and the findings of the WeBS interviews indicate that the study area supports three SPA Qualifying Species during the winter months and passage periods: shelduck, dunlin and redshank. These species are present throughout the study area, and in numbers which are of particular nature conservation importance.

7.8 The study sought to define those roost sites which are of particular nature conservation importance to each of the SPA Qualifying Species. These were termed 'SPA Primary Roosts' and were defined as supporting at least one SPA Qualifying Species in numbers which typically exceed 1% of the entire SPA population (for that species), on more than 50% of the WeBS visits during the winter and/or passage periods.

7.9 As shown by Table 5 (below), the study identified a total of 15 SPA Primary Roosts. Of these, six relate to redshank (Roosts 1C, 1D, 1F, 3C, 4B and 4J), five relate to shelduck (Roosts 1B, 2B, 2C, 3F and 4L), and a further four relate to dunlin (2A, 4B, 4H and 4J).

Table 5: Summary of SPA Primary Roosts

Sector	Roost ID	SPA Primary Roost Species
1	1B	Shelduck
	1C	Redshank
	1D	Redshank
	1F	Redshank
2	2A	Dunlin
	2B	Shelduck
	2C	Shelduck
3	3C	Redshank
	3F	Shelduck
4	4B	Dunlin
		Redshank
	4H	Dunlin
	4J	Dunlin
		Redshank
	4L	Shelduck

7.10 In many cases it was not possible to determine whether a roost site warranted categorisation as a 'SPA Primary Roost' owing to uncertainties surrounding the frequency with which bird numbers exceed 1% of the Severn Estuary's wintering/passage population. These roosts were termed 'Possible SPA Primary Roosts'. As shown by Table 6 below, the study identified as total of 12 Possible SPA Primary Roosts. Of these, five relate to redshank (Roosts 1A, 4F, 4G, 4H

and 4I), five relate to dunlin (Roosts 1C, 1D, 4F, 4G, and 4I) and a further two relate to shelduck (Roosts 1C and 4C).

Table 6: Summary of Possible SPA Primary Roosts

Sector	Roost ID	Possible SPA Primary Roost Species
1	1A	Redshank
	1C	Shelduck
		Dunlin
	1D	Dunlin
2	-	-
3	-	-
4	4C	Shelduck
	4F	Dunlin
		Redshank
	4G	Dunlin
		Redshank
	4H	Redshank
	4I	Dunlin
		Redshank

7.11 In the event that further surveys targeted towards determining waterbird usage at these roost sites were carried out, it is possible that their status as 'SPA Primary Roosts' would be confirmed.

SPA Qualifying Assemblage

7.12 All of the sectors within the study area are considered to be of nature conservation importance in relation to the overall number and diversity of waterbird species that they support during the winter months and passage periods. The study has not been able to make a comprehensive quantitative assessment regarding the likely nature conservation importance of all the roost sites individually (see Chapter 8 for further details in this regard). As a result it has not been possible to identify 'SPA Primary Roosts' *per se* in relation to the SPA Qualifying Assemblage. Nevertheless, conclusions have been drawn, as far as possible, from the assessment that has been undertaken. These aim to identify those roost sites which, in their own right, appear: (a) to support the greatest diversity of waterbird species; and (b) likely to support significant numbers of waterbirds (ie, in excess of 1% of the Severn Estuary's total waterbird count) on the majority of the WeBS visits.

7.13 The latest WeBS data for the study area indicate that Sector 4 is perhaps of greatest nature conservation importance in relation to the SPA Qualifying Assemblage. It supports, on average, 4.3% of all the 'listed' SPA Qualifying Assemblage waterbird species within the Severn Estuary. The findings of the WeBS interviews and site visit indicate that the virtually all of the roost sites in Sector 4 support a diverse range of waterfowl species. Of the 12 roost sites that have been identified, nine have been found to support between three and 11 waterbird species. The greatest species diversity is found at: Roosts 4B (11 waterbird species); 4G (eight waterbird species); and 4F, 4H and 4J (seven

waterbird species). Based upon the information collected during the WeBS interviews, it seems likely that, as a minimum, Roosts 4B, 4H and 4J individually support significant numbers of waterbirds (ie, in excess of 1% of the Severn Estuary's total waterbird count) on the majority of the WeBS visits. Consequently, these roost sites would likely warrant consideration as being of particular nature conservation importance, in their own right, within the context of the entire SPA. It is likely that other roost sites within Sector 4 would also warrant consideration in this regard (eg, Roosts 4A, 4B, 4C and 4I), albeit that more definitive empirical information (regarding waterbird numbers and the frequency with which birds are present) is absent, and would be useful in confirming this assertion (see Chapter 9 for further details regarding this).

7.14 Sector 1 appears likely to support the second largest aggregation of waterbirds within the study area. On average, this section of coast supports approximately 2.8% of all the 'listed' SPA Qualifying Assemblage waterbird species within the Severn Estuary. All eight of the roost sites within the sector support at least three SPA Qualifying Assemblage species, with the greatest species diversity being found at Roosts 1C (eight waterbird species), 1B (seven waterbird species) and 1A (six waterbird species). Based upon the information collected during the WeBS interviews, it seems feasible that Roost 1B, and possibly Roost 1C, could individually support significant numbers of waterbirds (ie, in excess of 1% of the Severn Estuary's total waterbird count) on occasions during the winter months and passage periods. Consequently, these roost sites could warrant consideration as being of particular nature conservation importance, in their own right, within the context of the entire SPA. The remaining roost sites do not appear likely to support sufficiently large numbers of waterbirds on a routine basis for consideration in this regard.

7.15 Sector 3 appears likely to support the third largest aggregation of waterbirds within the study area. On average, this section of coast supports approximately 1.6% of all the 'listed' SPA Qualifying Assemblage waterbird species within the Severn Estuary. Overall, the roost sites in Sector 3 appear to support a slightly less diverse range of waterbirds in comparison with Sectors 4 and 1. Of the 11 roost sites identified within the Sector, six support at least three waterbird species (Roosts 3E, 3F, 3G, 3H, 3J and 3K). The greatest species diversity is found at Roosts 3J (five waterbird species), 3K (five waterbird species), 3F (four waterbird species) and 3G (four waterbird species). Based upon the information collected during the WeBS interviews, it seems unlikely that any of the roost sites individually support aggregations of waterbirds which are significant in estuary terms (ie, which exceed 1% of the Severn Estuary's total waterbird count) on a routine basis.

7.16 Sector 2 appears likely to support the fourth largest aggregation of waterbirds within the study area. On average, this section of coast supports approximately 0.8% of all the 'listed' SPA Qualifying Assemblage waterbird species within the Severn Estuary. The greatest species diversity within Sector 2 is found at Roost 2A, which supports a total of 10 waterbirds, including six 'listed' species within the

SPA Qualifying Assemblage. Roosts 2B supports two waterbird species (shelduck and mallard) and 2C only support one waterbird species (shelduck) from the SPA Qualifying Assemblage. Roost 2D is only used by gulls, which do not form part of the SPA Qualifying Assemblage. Based upon the information collected during the WeBS interviews it is possible that Roost 2A, and to a lesser extent, Roosts 2B and 2C could individually support significant numbers of waterbirds (ie, in excess of 1% of the Severn Estuary's total waterbird count) on occasions during the winter months and passage periods. Under these circumstances, they may warrant consideration as being of particular nature conservation importance, in their own right, within the context of the SPA. However, due to uncertainties surrounding the frequency with which waterbird numbers exceed 1% of the Severn Estuary's wintering/passage population, further work would be required to validate this assertion (see Chapter 9 for further details).

7.17 The study has placed an emphasis upon the following factors when identifying which roost sites could be of greatest nature conservation importance for the SPA Qualifying Assemblage: waterbird species diversity; waterbird number; and the frequency with which waterbird species are present at any given roost site. Whilst these represent an obvious measure of a roost site's status in the context of the SPA, it is important to remember that roost sites should not be considered in isolation from each other. This study has identified a network of 35 roost sites between Brean Down and Clevedon. Collectively, these roost sites have been shown to provide a diverse assemblage of waterbird species with a range of roosting opportunities. In a dynamic ecosystem such as an estuary, waterbirds rely upon alternate roost sites in order that they can react and adapt to changing environmental conditions, which often arise over varying timeframes. This includes, for example, the ability of waterbirds to adapt their high tide roosting patterns in response changes in weather conditions, tide levels, human disturbance and land use. The habitats and substrates within Severn Estuary are also prone to change due to the effects of scour and deposition. As a result of these coastal processes, some roost sites do not necessarily remain as permanent refuges that are available to waterbirds in the long-term, but are more dynamic their availability. These natural and anthropogenic factors place a reliance upon waterbird populations having a range of alternate roosting opportunities, which enable them to seek refuge from high tides and conserve energy until feeding can resume as the tide recedes. Consequently, the overall nature conservation value of a network of roost sites to waterbird populations should be considered to be greater than the simply the sum of its constituent roosts.

Gulls

7.18 Although not part of the SPA Qualifying Assemblage, consideration has been given to gulls within this study since: (a) they occur regularly and in large numbers within parts of the estuary; and (b) herring gull is included on the RSPB's 'red list' and black-headed gull; common gull and lesser black-backed gull included on the RSPB's 'amber list' (Eaton *et al*, 2009).

7.19 Of the 35 roost sites, a total of 14 (40%) support gulls. Typically, the flocks of gulls at these roost sites comprises low numbers of black headed gulls (up to 100 birds), lesser black-backed gulls (up to 10 birds) and herring gulls (up to 10 birds). Other gulls which occur in small numbers on a more sporadic basis are common gull and greater blacked gulls. The largest aggregations of gulls relate to flocks of black-headed gulls at Roosts 2C (300 to 500 birds), 4C (100 to 500 birds) and 4E (100-500 birds), which tend to be present on almost all WeBS visits.

Roost Habitats

7.20 The roost sites within the study area are associated with a range of habitat types, including: saltmarsh; rocky shore; sandflats; grassland; artificial structures (eg rock armour, sea defences, etc), and shingle shore. Not surprisingly, many of the wildfowl and gulls roost sites are associated with areas of open water, whereas waders are confined to terrestrial habitats.

7.21 No definitive trends or particular habitat associations have been identified, although all of the roost sites afford waterbirds with extensive sightlines across a range of aspects.

Roost Disturbance

7.22 The study has identified that a range of human activities take place along the coast between Brean Down and Clevedon. Not surprisingly, the most frequent forms of human activity encountered by the WeBS counters are walkers and dog walkers, which tend to be present throughout large parts of the study area albeit to varying degrees. The lower reaches of the River Axe and the River Banwell appear to be subject to movements from motor boats. Jet skiing and water skiing also takes place along the lower reaches of the River Axe on occasions. Fishing tends to occur at a few specific locations, typically the beach at Sand Bay (Sector 2), between the River Axe and Clevedon (Sector 4) and Blackstone Rock (Sector 4). Other activities taking place on a more sporadic basis include horse-riding (typically on the beach at Sand Bay), kite flying and agricultural operations in adjacent farmland.

7.23 The study has also identified several activities which are more difficult to characterise, since they tend not to take place when the WeBS counters are present. These include wildfowling and clay pigeon shooting in between the River Banwell and the River Axe (Sector 3) and lifeboat movements to/from the station at St Thomas Head (Sector 3).

7.24 The information supplied by the WeBS counters indicates that these activities tend to cause disturbance to waterbirds at nearby roost sites. However, the extent to which this could be having a significant impact upon the viability of roost sites remains uncertain. There appear to be instances where waterbirds are flushed from their roost sites causing them to depart the area altogether. In particular, this has been noted in relation to Roosts 1A to 1F as a result of passing powered watercraft and dog walkers. However, many of the disturbance events witnessed by the WeBS counters tend result in displaced birds relocating to an alternative nearby roost site. In the case of wildfowl and gulls, this often involves birds moving

onto areas of open water within the estuary. In several cases, waders that are flushed from roost sites are observed either relocating back to the roost once the source of disturbance has ceased, or to an alternative nearby roost site. This tends to be the case for the large aggregations of waterbirds using Roosts 4B, 4C, 4D, 4F, 4G, 4H, and 4I. Whilst this places an addition energetic cost upon the birds, it would appear that disturbance is not leading to the abandonment of roost sites altogether.

7.25 Clearly it is not possible to make a definitive assessment regarding the significance of existing human disturbance upon waterbird roost sites using a study of this nature, and therefore its findings should be treated with a degree of caution. Few practical measures to reduce the effects of existing disturbance were also identified, although consideration could be given to the possible exclusion of power boats, jet skiers and water skiers along the lower reaches of the River Axe (ie in the vicinity of Roosts 1A to 1F). Notwithstanding this, it is apparent that the waterbird roost along the coast between Brean Down and Clevedon are susceptible to further adverse effects which could arise as a result of future increases in human presence and activity. Any such increases would need to be carefully managed, and further work would be needed to assess any associated impacts upon roosting waterbirds.

8. Consideration of Study Limitations

8.1 The scope of this study has relied heavily upon the inputs from WeBS counters, and their local knowledge and expertise has proved invaluable in addressing the study's aims. The information they have provided is based upon their experiences from undertaking WeBS counts within the study area. As such, a proportion of this information is inevitably anecdotal in its nature. This chapter of the report gives consideration to any potential limitations within the study outcomes that could apply as a result of unavoidable inaccuracies within this anecdotal information. This is not intended to undermine the scope and findings of the study, or the valuable inputs of those who have contributed to it. However, it is recognised that a variety of future assessments and decisions may be influenced by, or reliant upon, this piece of work. It is, therefore, considered appropriate to highlight any uncertainties or potential inaccuracies, so that these may be taken into account in any future application of the study's findings.

Roost Locations

8.2 Having reviewed the survey routes/areas used by the WeBS counters it is considered relatively likely that the locations of most waterbird roost sites (particularly those which support the largest numbers of birds and/or which are used on the most frequent basis) will have been identified during the course of this study. The survey coverage achieved by the WeBS counters appears to be relatively comprehensive. Where any gaps in WeBS survey coverage do exist, these typically coincide with those locations where the presence of roosting waterbirds seems unlikely. These include, for example, steep-sided cliffs with limited roosting opportunities for waterbirds, as well as sections of coastline which typically receive high levels of human disturbance due to visitor pressure.

Roost Composition

8.3 The study sought to characterise the waterbird composition at each of the identified high tide roost sites. This was perhaps the most difficult aim of the study to investigate, given that waterbird species presence and abundance will undoubtedly be dynamic in an estuarine setting such as this. Despite this, the study appears to have been relatively successful in addressing this aim, albeit that some weakness and limitations affecting the validity of the study outputs are apparent.

8.4 In attempting to characterise waterbird species composition at each of the roost sites, the study focussed upon the Severn Estuary SPA Qualifying Species and the SPA Qualifying Assemblage. This is due to these species/groups forming the basis of the Severn Estuary's designation as a site of international nature conservation importance for birds. For each roost site, the WeBS counters provided a list of the waterbird species which they considered to have been recorded on at least one WeBS visit during the winter months and/or passage periods over the previous five years. In an attempt to assess the likely accuracy of this information, it was compared to the latest five-year WeBS summary data on a sector by sector basis. This exercise appeared to indicate that, in general, the WeBS interviews were relatively successful in capturing those species which

appear to make the largest contributions to the waterbird assemblages, either due to large numbers of birds being present and/or the high frequency with which birds are present. This trend was apparent in relation to all sectors and, in particular, Sectors 2 and 3. Slightly more discrepancies between the WeBS interview findings and the latest five year WeBS count data were identified in relation to Sectors 1 and 4. For example, the latest five year WeBS count data indicate that several waterfowl species (such as gadwall, shoveler, pochard and tufted duck) are regularly present in Sector 1, with peak average monthly counts of up to 20 to 30 birds recorded during the winter and passage periods. However, none of these species were identified during the WeBS interviews. The WeBS data also indicate that lapwings are present in Sector 1, with the peak average monthly count exceeding 400 birds. Again, this species was not identified during the WeBS interviews.

8.5 The number of birds at each roost site and the frequency with which they are present represent key factors in determining the likely significance of the roost in nature conservation terms, particularly in the context of the Severn Estuary SPA. The study has attempted to capture this information based upon the WeBS counters' previous field experiences. This was undertaken primarily in relation to the SPA Qualifying Species to determine which of the roost sites could be of particular nature conservation importance for these species.

8.6 In the absence of any roost-specific empirical data against which the information can be compared, it is very difficult to verify the extent to which an accurate representation of the baseline conditions within the study area has been captured. In particular, there are number of instances where the estimated bird numbers at a given roost site appear to be excessive when compared to the five-year WeBS summary data for the corresponding sector. For example, information from the WeBS interviews suggest that Roost 4H typically supports approximately 16% of the Severn Estuary's wintering dunlin population on approximately 90% of the WeBS visits during this period. However, the latest five-year WeBS summary data indicate that Sector 4, as a whole, has only supported, on average, 5.3% of the estuary's wintering dunlin during the winter periods from 2008/09 to 2012/13. Likewise, information suggests that Roost 1B supports 4.5% to 6.7% of the estuary's wintering shelduck on all WeBS visits, whereas the corresponding WeBS data indicate that the average wintering count for Sector 1, as a whole, equated to 4.4% of the estuary total for this species from 2008/09 to 2012/13.

8.7 There are also a number of instances where a WeBS counter was not able to provide an estimate of bird numbers and the frequency with which birds are present at a roost site, due to the high degree of variation in bird presence and abundance that occurs.

8.8 In view of these uncertainties, there may be instances where it is appropriate to undertake further validation work in relation to these uncertainties, depending upon the ways in which this information could be used in the future (see Chapter 9 for further discussion regarding this).

8.9 Notwithstanding this, it seems reasonable to assume that the information could be sufficiently robust to enable a relative assessment of roost site significance, within the context of each Sector, to be carried out.

Roost Habitats

8.10 The combination of the WeBS interviews and the site visits were considered to have been relatively successful in confirming the broad habitat types at each roost site.

Roost Disturbance

*8.*11 Whilst every effort was made to characterise the types of human disturbance within the study area, and their effect on waterbirds, the extent to which this has been achieved remains unknown. In those cases where a comprehensive assessment of disturbance-related impacts upon waterbirds represents a key issue (eg, ecological impact assessments of large scale proposals), then it is likely that further work be required in relation to this uncertainty.

9. Recommendations For Further Work

9.1 In the absence of more detailed information regarding how Natural England and others may wish to make use of this study and apply its findings in the future, it is difficult to make firm recommendations regarding the requirement for, and scope of, any further work that could be appropriate. As such this section of the report does not make specific recommendations in this regard, but highlights those circumstances when information gaps and/or limitations within the study may need to be addressed by additional survey and/or assessment work.

Roost Locations & Habitats

9.2 The study is considered to provide a relatively robust characterisation of waterbird high tide roost site locations and the associated habitat(s) that are present. However, given the dynamic nature of the Severn Estuary, it is possible that roost locations (and therefore habitats) will change over time. Whilst it is not possible to specify a timeframe over which the study findings will remain valid, consideration should be given to carrying out future desk- and/or field-based studies to update the baseline information, as appropriate. This could be achieved, for example, by repeating the WeBS interviews and/or undertaking updated surveys within the study area.

Roost Composition

9.3 In certain cases it may be appropriate to carry out further survey work in relation to the waterbird composition at the roost sites within the study area. Whilst the study appears to have been relatively effective in identifying roost site locations, there remains some uncertainty regarding the accuracy of the study findings regarding the frequency with which certain waterbird species are present at a given roost site, and (when present) the numbers of birds which typically occur (see Chapter 8, paragraphs 8.3 to 8.10). In the event that this information were of particular importance (for example, where it would be used to underpin a subsequent impact assessment, such as a Habitat Regulation Assessment), then it would likely be appropriate to undertake targeted bird survey work to gain a more accurate understanding of the baseline conditions in this regard.

9.4 In any event, the study would likely represent a useful impact assessment scoping tool. This could be used, for example, to help ascertain whether any ornithological resources of particular nature conservation importance could be affected by a proposed plan or project, and what (if any) further baseline information would be required in order to enable a robust ornithological impact assessment to be carried out.

Roost Disturbance

9.5 The study provides useful contextual information regarding the apparent nature, extent and effects of existing human disturbance upon specific waterbird roost sites within the study area. However, it does not provide a definitive characterisation of the existing baseline conditions with regard to disturbance, nor how this may change in the future. Where detailed information pertaining to the

effects of existing/future disturbance upon waterbird high tide roost sites were required (for example, where it would be used to inform a subsequent impact assessment, such as a Habitat Regulation Assessment), then it would likely be appropriate to undertake targeted desk- and/or field-based bird survey work to gain a more accurate understanding of the baseline conditions in this regard, and to enable more accurate predictions regarding the likely effects of future increases in human disturbance.

9.6 The study would, however, likely represent a useful impact assessment scoping tool. This could be used, for example, to help ascertain whether any ornithological resources of particular nature conservation importance could be affected by increases in human disturbance associated with a proposed plan or project, and what (if any) further baseline information would be required in order to enable a robust ornithological impact assessment to be carried out.

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Figures

Appendices

Appendix 1: WeBS Interview Recording Form Template

Natural England Project - Identification of wintering waterfowl high tide roosts on the Severn Estuary SSSI/SPA (Brean Down to Clevedon) Interview with WeBS Counter: Recording Form		
Name of WeBS Counter:	**WeBS Count Area:**	**Date of Interview:**
1.0 Roost Site Location & Extent (See Note 1 overleaf)		
Roost Site ID: (see map)	**Approximate OS Grid Reference:** (where known)	

2.0 Roost Site Habitat & Substrate (See Note 2 overleaf)				
Habitat/Substrate (where known)	**Target Note**	**Description**	**Association with Pill (Y/N)**	**Association with Outfall (Y/N)**
Mudflats			If 'yes', please describe:	If 'yes', please describe:
Sandflats				
Upper Saltmarsh				
Lower Saltmarsh				
Rock outcrop				
Boulder/shingle shore				
Artificial structure				
Open water				

3.0 Species Composition & Abundance (See Note 3 overleaf)					
Species	**Typical High Tide WeBS Count (Approx)**		**Peak High Tide WeBS Count (Approx)**		**Comments** (e.g. frequency with which typical and peak counts are/were recorded, habitat associations, etc)
	Last 5 years	**5-10 years (if known)**	**Last 5 years**	**5-10 years (if known)**	

4.0 Roost Site Usage: Bird Behaviours & Fidelity (See Note 4 overleaf)				
Species	**Typical Roost Site Behaviours**	**Roost Site Fidelity**	**Tide-Related Patterns of Roost Site Usage (if any/where known)**	**Weather-Related Patterns of Roost Site Usage (if any/where known)**

5.0 Disturbance (See Note 5 overleaf)				
Species	**Sources of Potential Disturbance (if any/where known)**	**Description of Potential Disturbance**	**Frequency & Duration of Potential Disturbance Events**	**Effects of Potential Disturbance Event Upon Roosting Birds**
	Presence of WeBS Counter			
Potential Measures to Mitigate Disturbance				

6.0 WeBS Count Coverage: Constraints	
WeBS survey route/roost site viewing locations annotated on accompanying map (Y/N):	
Target Note (see map)	**Description of Constraint (land access, health & safety, etc)**

7.0 Any Other Information

Notes:

1. The Roost Site ID will be assigned at the interview to cross-refer with the accompanying field map showing the approximate location/extent of each roost site.
2. The roost site habitat/substrate-type will be identified (where known) along with any apparent associations between the roost site location and nearby pills/outfalls (which could, for example, offer high tide feeding/bathing opportunities for roosting birds). The approximate location and extent of each roost site habitat/substrate-type will be mapped and identified using a Target Note.
3. The waterfowl species which form part of the roost site will be recorded, along with their approximate typical monthly WeBS count totals and the approximate peak monthly WeBS count total (if different/known) based upon the WeBS Counter's own field experience. If possible, typical/peak counts to be identified for the previous 5 years, and a further five years thereafter (i.e. 10 years in total).
4. For each waterfowl species, information pertaining to the behaviours normally associated with the roost site will be recorded based upon the WeBS Counter's own field experience. This could include, for example, roosting, feeding, bathing, preening, loafing, etc. Information pertaining to each waterfowl species' fidelity to the roost site and how this may be affected by prevailing tidal and/or weather conditions will also be recorded.
5. Information pertaining to any human activities which the WeBS Counter considers to cause (or have the potential to cause) disturbance to waterfowl using the roost site will be recorded. Where possible, disturbance events will be characterised in terms of their nature, frequency, duration and the effects upon waterfowl using roost sites. As starting point, a subjective assessment of the WeBS counters own presence is to be made. The WeBS Counter will also be asked to propose any measures which could be effective in mitigating any adverse effects caused by human disturbance.
6. The optimum access routes and survey locations for undertaking waterfowl counts at each known roost site area will be recorded. This will enable any 'gaps' in survey coverage and constraints (e.g. land access, health & safety, etc) to be identified, and enable and refinements to the approach to the site visits to be made.

Appendix 2: Site Visit Recording Form Template

Natural England Project - Identification of wintering waterfowl high tide roosts on the Severn Estuary SSSI/SPA (Brean Down to Clevedon) Roost Site Survey Visit: Recording Form			
WeBS Count Area:	**Surveyors:**	**Date of Survey Visit:**	
Weather Conditions:		**Start time:**	**End Time:**
		Time of High Water:	**Time of Low Water:**
1.0 Roost Site Location & Extent (See Note 1 overleaf)			
Roost Site ID: (see map)		**Approximate OS Grid Reference:**	

2.0 Roost Site Habitat & Substrate (See Note 2 overleaf)				
Habitat/Substrate	**Target Note**	**Description**	**Association with Pill (Y/N)**	**Association with Outfall (Y/N)**
Mudflats			If 'yes', please describe:	If 'yes', please describe:
Sandflats				
Upper Saltmarsh				
Lower Saltmarsh				
Rock outcrop				
Boulder/shingle shore				
Artificial structure				
Open water				
Description of sightlines around roost site:				

3.0 Species Composition & Abundance (See Note 3 overleaf)				
Time of Count	**Target Note**	**Species**	**Count Total**	**Description of behaviour**

4.0Factors Affecting Bird Behaviour/Roost Site Usage (e.g. tides, weather, habitats, etc)

4.0 Disturbance (See Note 4 overleaf)				
Species	**Sources of Nearby Disturbance (if any/where known)**	**Description of Disturbance**	**Frequency & Duration of Disturbance Events**	**Effects of Disturbance Event Upon Roosting Birds**

Potential Measures to Mitigate Disturbance

5.0 WeBS Count Coverage: Constraints	
WeBS survey route/roost site viewing locations annotated on accompanying map (Y/N):	
Target Note (see map)	**Description of Constraint (land access, health & safety, etc)**
6.0 Any Other Information	

Notes:

1. The Roost Site ID will allow cross-reference to an accompanying field map showing the approximate location and extent of each roost site.
2. The roost site habitat/substrate-type will be identified along with any apparent associations between the roost site location and nearby pills/outfalls (which could, for example, offer high tide feeding/bathing opportunities for roosting birds). The approximate location and extent of each roost site habitat/substrate-type will be mapped and identified using a Target Note. A subjective assessment regarding the extent of sightlines around the roost site will be carried out, particularly in relation to the sightline distance thresholds identified within the conservation objectives for the SPA Qualifying Species & Assemblage.
3. The presence and numbers of any waterfowl at the roost site during the survey visit be recorded. For each waterfowl species present, a description of their behaviours (e.g. roosting, feeding, bathing, preening, loafing, etc) will be taken, and any factors which appear to be influencing their behaviour/presence will also be recorded.
4. Information pertaining to any human activities which appear to cause (or have the potential to cause) disturbance to waterfowl using the roost site will be recorded. Any disturbance events will be characterised in terms of their nature, frequency, duration and the effects upon waterfowl using roost sites. Measures which could be effective in mitigating any adverse effects caused by human disturbance will also be identified, where possible.
5. The access routes and survey locations/coverage for undertaking waterfowl counts at each known roost site will be recorded. In particular, any ‘gaps’ in survey coverage due to field constraints (e.g. land access, health & safety, etc) will be identified and mapped.

Further information

Natural England evidence can be downloaded from our **Access to Evidence Catalogue**. For more information about Natural England and our work see **Gov.UK**. For any queries contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk** .

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