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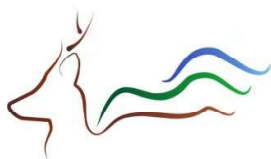
Severnside & Avonmouth Wetland Habitat Project

Stage 2: Review of Consent at Severnside and
Avonmouth Impact Assessment



6th December 2011

Report no: C1453/Final/V7



Cresswell Associates
a Hyder Consulting group company





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1.0 Executive Summary

- 1.1.1 This document has been prepared by Cresswell Associates (the ecological division of Hyder Consulting) on behalf of South Gloucestershire Council (SGC), Bristol City Council (BCC) and Natural England (referred to collectively as ('The Project Partnership')) and comprises:
- (i) A review of the 1957/58 Severnside Planning Consent (as required under The Conservation of Habitats and Species Regulations, 2010) to enable the competent authority (SGC) to undertake an Appropriate Assessment; and
 - (ii) An impact assessment of likely development which could take place within the Avonmouth employment area and potentially feasible wind farm sites identified within the Bristol Citywide Sustainable Energy Strategy (BCSES) (referred to as the 'Avonmouth impact assessments').
- 1.1.2 These impact assessments (referred to collectively as 'the Stage 2 assessments') have been undertaken in relation to the on-going loss and degradation of coastal floodplain at Severnside and Avonmouth (see Figure 1 for the extent of study area) associated with the footprints of the above development zones (see Figures 2 & 3). Specifically, the likely effects upon over-wintering and migratory wildfowl and waders which are listed as Qualifying Species and/or form part of the Qualifying Assemblage for the Severn Estuary Special Protection Area (SPA) and Ramsar site.
- 1.1.3 The Stage 2 assessments address direct habitat loss and bird disturbance/displacement potentially affecting SPA Qualifying Species and the Qualifying Assemblage at locations within the study area which lie outside the Severn Estuary SPA and Ramsar site boundary. The consideration of these impacts potential affecting SPA Qualifying Species and the Qualifying Assemblage at locations within the Severn Estuary SAC, SPA and Ramsar site falls outside the scope of this study. Furthermore, the consideration of a wider range of potentially adverse impacts upon the qualifying interests of the Severn Estuary SAC, SPA and Ramsar site also falls outside the scope of this study.
- 1.1.4 The Review of Consent has identified that predicted future development-related habitat losses and associated disturbance events at Severnside could represent potentially significant impacts upon wintering gadwall (a Qualifying Species for the Severn Estuary SPA), and several other waterfowl species forming part of the Qualifying Assemblage (specifically gadwall, teal, tufted duck, curlew, mallard, lapwing and common snipe), which are considered to use a network of existing wetland and grazing pasture habitats. These potential impacts could occur through development at Severnside alone, or in combination with other plans and projects in the wider surrounds. Consequently, it is predicted that these impacts could give rise to potentially significant effects upon the integrity of the SPA and Ramsar site.
- 1.1.5 The Avonmouth impact assessments have identified that future development-related habitat losses, bird disturbance and bird displacement at Avonmouth could also represent potentially significant impacts upon wintering gadwall and several species forming part of the Qualifying Assemblage (specifically gadwall, teal, tufted duck, curlew, mallard, lapwing and common snipe), which are considered to use a network of existing wetland and grazing pasture habitats. This finding is based upon the potential effects of habitat loss and disturbance upon waterfowl as a result of future development within the footprint of the Avonmouth employment area. The potential effects of displacement upon waterfowl within the assessment relate to potentially



feasible wind farm sites only (as identified within the Bristol Citywide Sustainable Energy Strategy (BCSES)). Further discussion regarding this principle is provided in Section 9.5. It is predicted that these potential impacts could also give rise to potentially significant effects upon the integrity of the SPA and Ramsar site, either alone or in combination with other plans and projects in the wider surrounds.

- 1.1.6 A mitigation strategy has been developed to identify land for habitat creation/enhancement as a means of addressing these potentially significant impacts. The mitigation strategy has been informed by a number of key assumptions/decisions, as follows:
- *Assumption 1:* Measures to avoid impacts cannot be guaranteed.
 - *Assumption 2:* Potential mitigation sites are considered across the study area (and beyond).
 - *Assumption 3:* The creation of an Ecological Refuge Area (which forms part of a S106 Agreement associated with the development of the Western Approaches Park (WAP1)) represents a priority mitigation site for this study.
 - *Assumption 4:* Addressing habitat loss forms a key principle of the mitigation strategy.
 - *Assumption 5:* The mitigation strategy aims to remain proportionate to the scale of impacts predicted.
- 1.1.7 The mitigation strategy identifies that the following amounts of new wetland habitat would need to be created to off-set the potential impacts which have been predicted in relation to gadwall and the other wildfowl species forming part of the SPA Qualifying Assemblage: **21,990m²** (Sevenside) and **41,000m²** (Avonmouth) (i.e. a total of **62,990m²** of new wetland habitat). The following potential mitigation sites have been identified for further investigation in relation to future wetland habitat creation (as shown on Figure 12): the former Berwick Land fill site (Area D) and the former Northwick Landfill Site (Area E); and the Ecological Refuge Area (F).
- 1.1.8 The mitigation strategy also identifies that the following amounts of habitat for waders forming part of the SPA Qualifying Assemblage would need to be created/enhanced to off-set the potential future habitat losses which have been predicted: **465,900m²** (Sevenside) and **275,500m²** (Avonmouth) (i.e. a total of **732,400m²**). The following potential mitigation sites have been identified for further investigation in relation to future wetland habitat creation in relation to waders (as shown on Figure 12): Hallen Marsh (Area C); the former Berwick Land fill site (Area D) and the former Northwick Landfill Site (Area E); and the Ecological Refuge Area (F).
- 1.1.9 The predicted habitat loss at Sevenside could affect numbers of lapwing which equate to approximately 1% of the total SPA Qualifying Assemblage. In view of this, it is proposed that measures to create/enhance 465,900m² of habitat for waders be targeted specifically towards lapwings (albeit these mitigation proposals would also be expected to confer benefits to curlew and common snipe, given the degree of overlap between these species' habitat requirements).
- 1.1.10 Depending upon the nature and extent of mitigation works that are delivered in relation to habitat loss, it is possible that newly-created/enhanced habitats may be available to accommodate any waders from the following areas of land (which are predicted could be subject to development-related disturbance): 267,400m² (Sevenside); and 275,500m² (Avonmouth).
- 1.1.11 It is predicted that, in the event that the requisite levels of mitigation are delivered, significant impacts upon the integrity of the Severn Estuary SPA and Ramsar site would be unlikely to occur. However this is dependent upon;



-
- The feasibility of habitat creation/enhancement works at the potential mitigation sites, which should be subject to further investigation, and;
 - The location and extent of future wind farm development at Avonmouth, which could significantly compromise the effectiveness of the proposed mitigation sites, and would need to be carefully reviewed.



2.0 Introduction

2.1 Background to the Project

- 2.1.1 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.
- 2.1.2 The SPA and Ramsar site designations are based upon the presence of populations of over-wintering and migratory water birds of international and national nature conservation importance. In particular, the site 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*), and 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*). In addition, the site also qualifies under Article 4.2 of the EC Wild Birds Directive, since it supports an internationally important assemblage of waterfowl (wildfowl and waders) during the winter and migratory periods.
- 2.1.3 The Severn Estuary's usage by waterbirds varies according to a wide range of factors; however, the areas of saltmarsh and mudflats situated between New Passage and Avonmouth are known to support substantial concentrations of wildfowl and waders during the winter months and migratory periods. In particular, several 'qualifying bird species', as well as a proportion of the 'qualifying bird assemblage' upon which the SPA and Ramsar site designations are based (see Section 4 for further details) have previously been recorded within estuarine habitats at this location. The estuary's bird communities are primarily associated with saltmarsh and intertidal areas; however, a number of other habitats (such as improved grassland and open standing water within coastal floodplain, adjacent to parts of the estuary) are also known to represent (high-tide) roosting and/or feeding sites for wildfowl and waders. Although situated outwith the boundaries of the SPA and Ramsar site designations, previous studies have identified that certain species of wildfowl and waders also use parts of coastal floodplain between New Passage and Avonmouth on occasions (Wessex Ecological Consultancy 2002, 2006, 2007 & 2009).
- 2.1.4 Despite the importance of Severnside and Avonmouth for wildfowl and waders, this section of coastline and the adjacent areas of coastal floodplain have been, and remain, subject to intensive historic development pressure. In particular, planning permission was granted for industrial, office, warehouse and other ancillary uses on 1030 hectares of land at Severnside in 1957 (hereafter referred to as the '1957/58 Severnside Planning Consent'), which remains extant for future development. In addition, the Avonmouth area has been subject to extensive development, including a large-scale port, and 650 hectares of industrial/commercial land, and this area remains under consideration for future development in relation to specific planning policies (see Section 3 for further details).
- 2.1.5 The Project Partnership (South Gloucestershire Council (SGC), Bristol City Council (BCC) and Natural England) has identified that the continued loss of estuarine habitat and coastal floodplain, as a result of on-going development within Severnside and Avonmouth, could have potentially significant impacts upon the estuary's bird communities, which, in turn, could result in a reduction in the favourable conservation status of the Severn Estuary SPA and Ramsar site.



Cresswell Associates (the ecological division of Hyder Consulting) has been commissioned to assess the significance of further development-related habitat loss and bird disturbance/displacement at Severnside and Avonmouth (where possible), with a view to identifying mitigation measures to safeguard populations of waterbirds associated with the SPA and Ramsar site designations in the long-term.

- 2.1.6 The Project Partnership considered the legal and policy basis for the assessment of likely effects on the Severn Estuary SPA/Ramsar to determine the scope of the study. The understanding of the Project Partnership is that legal protection is afforded only to those species listed in the original 1995 SPA Citation and to the overall assemblage of all waterbirds. Natural England and the Countryside Council for Wales refer to this in the most recent Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009) as follows:

“it should be noted that since designation changes in bird numbers have occurred in relation to the qualifying thresholds, which have themselves changed. These changes are highlighted by the SPA review published by the JNCC and details are also shown in Table 3. These changes are likely to be the subject of formal changes to the SPA designation in due course, however at present the legally protected species remain those in the original 1995 citation. (Note: Further information on the peak counts of the SPA species and waterfowl assemblage between 1988/9 and 2006/07 are given in Appendix 11.)”

- 2.1.7 However, Natural England advised the Project Partnership to take into account UK government policy for pSPAs and to apply this to species identified in the 2001 SPA Review and to treat them in the same way as those which have been formally notified, in terms of the conservation objectives to maintain the bird populations and their supporting habitats in favourable condition. In addition, it was recognised that legal and national policy protection is afforded to all regularly occurring water birds under the provisions of the SSSI, and while it is understood such species are not specifically afforded protection under the provisions of The Conservation of Habitats and Species Regulations, 2010 (hereafter referred to as ‘the Habitats Regulations’) in the same way that listed species are, it was agreed to include those that were recorded in nationally significant numbers.

2.2 Project Scope

- 2.2.1 The Project has been carried out in two Stages:

- 2.2.2 Stage 1 of the project comprised a review of desk-based information to identify those parts of the study area which have previously been found to support substantial aggregations of wintering and migratory waterfowl. The Stage 1 findings are presented in Cresswell Associates’ (March 2010) report ‘Severnside & Avonmouth Wetland Habitat Project. Stage 1: Distribution of Wetland Birds within the Study Area’.

- 2.2.3 Stage 2 of the project (this report) has comprised a series of impact assessments to determine the significance of future habitat losses which could arise as a result of development associated with:

- (iii) The 1957/58 Severnside Consent;
- (iv) The Avonmouth employment area; and
- (v) The Bristol Citywide Sustainable Energy Study (BCSES).



2.2.4 The areas of land covered by these development zones are shown on Figures 2 & 3 and further details of these development zones are described in Section 3. The potential impacts of future habitat losses have been assessed in relation to the baseline wintering and migratory bird populations within the study area. These population estimates have been derived from the findings of the Stage 1 desk study exercise and this document should therefore be read in conjunction with the Stage 1 report (see Cresswell Associates, 2010). In particular, Stage 2 of the project has included a Review of the 1957/58 Severnside Consent (as required under 'the Habitats Regulations') on behalf of South Gloucestershire Council (the 'competent authority'). The Habitats Regulations require the review of outstanding decisions, permissions, consents and other authorisations, not yet completed, which would be likely to have a significant effect on a European site (either individually, or in combination with other plans and projects), and which would not be directly connected with, or necessary to the management of the site (English Nature, 1997).

2.2.5 In addition, an assessment of potential future habitat losses and bird disturbance/displacement from development associated with Avonmouth employment area, and the Bristol City Sustainable Energy Study at inland sites within the study area has also been carried out (where possible), to determine the significance of these impacts in relation to the qualifying bird species and qualifying bird assemblage for the Severn Estuary SPA and Ramsar site designations.

The scope of the Stage 2 assessments (described above) covers potential impacts upon the qualifying species and qualifying assemblage for the Severn Estuary SPA and Ramsar site which could arise as a result of the following potential impacts:

Severnside

- The loss of habitat from inland areas which are known (or considered likely) to support waterfowl through future land-take within the footprint of the 1957/58 Severnside Consent Area; and
- increased levels of disturbance in inland areas which are known (or considered likely) to support waterfowl (giving rise to the displacement of these birds) due to the close proximity of the 1957/58 Severnside Consent Area.

Avonmouth

- The loss of habitat from inland areas which are known (or considered likely) to support waterfowl through future land-take within the footprint of the Avonmouth employment area;
- increased levels of disturbance in inland areas which are known (or considered likely) to support waterfowl (giving rise to the displacement of these birds) due to the close proximity of the Avonmouth employment area; and
- displacement of birds from inland areas which are known (or considered likely) to support substantial concentrations of waterfowl due to the close proximity of potentially feasible wind farm sites which could be installed in the future (as identified by the Bristol City Sustainable Energy Study).

2.2.6 Based upon the findings of the assessment, a series of options were explored to address the on-going loss of coastal floodplain habitat, and/or bird disturbance/displacement. As a result, a strategic network of wetland habitat as strategic mitigation is proposed, to off-set impacts arising as a result of the above developments (subject to further consideration of issues such as flood risk, land use/ownership, existing hydrological conditions, other ecological/protected species issues, etc).



2.2.7 The Stage 2 assessments only address direct habitat loss and bird disturbance/displacement potentially affecting SPA Qualifying Species and the Qualifying Assemblage at locations within the study area which lie outwith the Severn Estuary SPA and Ramsar site boundary. The consideration of a wider range of potentially adverse impacts (for example, habitat loss and bird disturbance/displacement within the Severn Estuary SPA and Ramsar site boundary, bird mortality through collisions with wind farms, pollution from aquatic or aerial discharges, lighting etc) upon the qualifying interests of the Severn Estuary SAC, SPA and Ramsar site falls outwith the scope of this study. Notwithstanding the outcomes of the Stage 2 assessments, future development proposals which could give rise to any such impacts would still require consideration within a project-specific Habitats Regulations Assessment (alone and in combination with other relevant plans and projects under the provisions of The Conservation of Habitats and Species Regulations, 2010). This approach has been developed in consultation and agreement with the Project Partnership.

2.3 Objectives of this document

2.3.1 The objectives of this report (in conjunction with the findings of the Stage 1 report (see Cresswell Associates, 2010)) are to provide:

- An indication of the likely distributions and abundances of qualifying species and the assemblage for the Severn Estuary SPA and Ramsar site, particularly in relation to those areas which could be affected by future development associated with: The 1957/58 Severnside Consent; the Avonmouth employment area; and the Bristol Citywide Sustainable Energy Study (Section 5).
- An indication of the likely proportions of the populations of qualifying species (and the qualifying assemblage) associated with the Severn Estuary SPA and Ramsar site which could potentially be affected by habitat loss within the above development zones (Section 5).
- A Review of the 1957/58 Severnside Consent, in determining the scale of the impacts on the Severn Estuary SPA and Ramsar site, to allow an Appropriate Assessment to be carried out by the competent authority (South Gloucestershire Council) (Section 7).
- An assessment of the impacts on the Severn Estuary SPA and Ramsar site associated with future developments at Avonmouth (Section 8).
- A review of the range of mitigation options to address potentially significant impacts which could arise upon the integrity of the Severn Estuary SPA and Ramsar site, and consideration of the preferred mitigation option(s) (Section 9).
- Consideration of the potential habitat creation and/or enhancement measures that could be used to deliver specific aspects of a mitigation strategy, as well as a review of further information requirements (Section 10).
- A review of the possible financial mechanisms to fund the mitigation strategy and associated management in the long-term (Section 11).



3.0 Description of the Study Area

3.1 Overview

- 3.1.1 The study area for the project equates to approximately 30km² of land, encompassing the stretch of coastline between New Passage and Avonmouth, and extending inland up to 3km from the coast at its eastern limit. The extent of the study area is shown on Figure 1.
- 3.1.2 The study area supports a combination of habitat types and land uses. The foreshore largely comprises a linear strip of unmanaged saltmarsh habitat, which narrows towards the southern end of Chittening Warth, due to land reclamation works for future development proposals. At the northern end of the study area, the foreshore supports a small area of shingle beach, which becomes rocky with limited saltmarsh between Severn Beach and New Passage.
- 3.1.3 Immediately inland of the saltmarsh, extensive development has taken place and is primarily associated with: large-scale industrial developments (such as the Severnside Works, Seabank Power Station, the Chittening Industrial Estate and the Avonmouth Docks); transport infrastructure (in particular, the M4, M49 and M5 motorway corridors, as well as various railway lines); and urban development at Severn Beach, Pilning, Easter Compton and Avonmouth.
- 3.1.4 The remaining areas (primarily within the central and eastern parts of the study area) consist of low-lying agricultural land which, in many cases, is surrounded by tall, unmanaged hedgerows. The majority of this farmland comprises horse-grazed pasture; however, a limited amount of arable land is also present. A number of water bodies are located within the study area, including Orchard Pools and Avonmouth Pools (a former Avon Wildlife Trust Reserve).
- 3.1.5 For the purposes of the Stage 2 assessments the study area has been sub-divided into: (i) Severnside; and (ii) Avonmouth. These areas broadly correspond with those covered by the 1957/58 Severnside Planning Consent; and Avonmouth employment area and Bristol Sustainable Energy Strategy at Avonmouth respectively (see Figures 2 and 3 respectively). In order to provide further contextual information for the subsequent impact assessments, more detailed descriptions of the Severnside and Avonmouth areas are provided in the following sections. These include descriptions pertaining to the nature and extent of existing operational development, as well as greenfield land and any disused brownfield land, which could represent potentially suitable habitat for wildfowl and waders.
- 3.1.6 In addition, proposed developments which have received planning consent but which have not been implemented (at the time of commencing the Stage 2 report (March 2010)) have also been identified (particularly where specific impacts or mitigation measures have been identified which could influence the future distributions and abundances of the qualifying species/assemblages associated with the SPA and Ramsar site designations).

3.2 Severnside

- 3.2.1 Severnside forms the northern half of the study area. It extends along the edge of the Severn Estuary from the New Passage (to the north of the M4/M49 motorway interchange) as far as the county boundary between South Gloucestershire and Bristol, and inland to Easter Compton. The extent of the Severnside study area is shown on Figure 1.



The 1957/58 Severnside Planning Consent

- 3.2.2 The 1957/58 Severnside Planning Consent covers approximately one third (9km²) of Severnside, and extends into the Severn Estuary Natura 2000 site to include approximately 0.2km² of saltmarsh, and 1.7km² of intertidal and sub-tidal mudflats (see Figure 2). This consent has in part been modified by a Section 106 Agreement signed by ICI accompanying the granting of planning permission for the development of the first phase of the Western Approaches Business Park, (P94/400/8) (hereafter referred to as WAP1). The principle elements of this agreement are the implementation of an Ecological Masterplan setting aside 38 hectares of land for ecology, the creation of a number of green corridors within the 1957-58 consented land, and the revocation of elements of the 1957 consent in respect of land along the foreshore and extending into the estuary.
- 3.2.3 Intensive terrestrial development has already taken place under the 1957/58 Severnside Planning Consent. This has extended up to 1km inland from the edge of the Severn Estuary Natura 2000 site, and has comprised industrial, office, warehouse and other ancillary developments. Whilst much of the developed land remains operational, a substantial part of the former Severnside Works now comprises a large area of disused brownfield land (i.e. approximately 0.3km² of concrete hardstanding and gravel (see Figure 2)).
- 3.2.4 The 1957/58 Severnside Planning Consent remains extant and is currently only partly implemented; a substantial amount (approximately 3.6km²) of undeveloped land remains, particularly to the east of the M49 motorway corridor, between the Severnside Works and the M49 motorway corridor (including the area known as Dyer's Common and Crook's Marsh). This land predominantly comprises a network of improved grassland fields, which are currently subject to heavy grazing by horses and sheep. In general, the size of these fields does not exceed 4ha. The area is bisected by a network of interconnected drainage ditches. These watercourses do not appear to cause particular flooding issues; however, the adjacent fields appear to be marshy in places and are considered likely to contain small amounts of standing water at times.
- 3.2.5 Orchard Pools (two freshwater bodies with an interconnecting ditch network) are located adjacent to the northern boundary of the 1957/58 Severnside Planning Consent Area. This water feature was created as mitigation for habitat loss associated with the construction of the first phase of the Western Approach Business Park at Severnside and was secured as part of the (WAP1) Ecological Masterplan referred to above. A small number of other freshwater bodies are also located in the vicinity of the Avlon Works and adjacent to the M49 motorway corridor.
- 3.2.6 In addition, the linear strip of foreshore and extensive area of intertidal/sub-tidal mudflats within the footprint of the 1957/58 Severnside Planning Consent remains undeveloped, The (WAP1) Section 106 agreement excludes this area of foreshore and intertidal mudflats from the 1957 consent and the Ecological Masterplan makes provision for appropriate management of this area during the life of the plan. The foreshore (located between the Mean High Water Mark and the Avonmouth to Severn Beach railway) comprises two areas of unmanaged saltmarsh at the northern end of Chittening Warth and to the south of Severn Beach, which are sub-divided by an area of rough grassland, ruderal herbs and scattered hawthorn and bramble scrub within an area of tipped ground (Wessex Ecological Consultancy, 2007).
- 3.2.7 The extent of the foreshore and intertidal/subtidal habitats located within the 1957/58 Severnside Planning Consent was reviewed by the Project Partnership during a project progress meeting on 19th March 2010. At this meeting it was agreed that the foreshore and



intertidal/subtidal habitat should be excluded from the Review of Consent under Section 63 as the (WAP1) Section 106 Agreement safeguarded this land from any direct habitat loss which could potentially arise in future under the 1957/58 Severnside Planning Consent since it:

- fell within the boundaries of the Severn Estuary SSSI, SAC, SPA and Ramsar site;
- represented interest features for the SAC designation;
- supported substantial concentrations of waterfowl which are qualifying species and/or form part of the qualifying assemblage for the SPA and Ramsar site designations (see Cresswell Associates, 2010); and
- represented supporting habitats for the SPA/Ramsar site qualifying species and assemblage (Natural England & Countryside Council for Wales, 2009).

3.2.8 Furthermore, any future development proposals which could give rise to bird disturbance/displacement affecting the SPA and Ramsar Qualifying Species and Qualifying Assemblage at locations within the Severn Estuary SPA and Ramsar site, would require separate consideration within project-specific Habitat Regulation Assessments (see Paragraph 2.2.7 for further details).

3.2.9 During a project progress meeting on 13th May 2011, the Project Partnership also identified that the (WAP1) Section 106 Agreement safeguarded an area of land which forms part of the 1957/58 Severnside Planning Consent to the south of Severn Beach (denoted by the area referred to as the 'Estuary Buffer Zone' on Figure 2). The following waterbodies are located within the Estuary Buffer Zone: Orchard Pools; and one of the pools to the East of Grove Farm. In view of this, it was agreed direct habitat loss of these waterbodies, which could have potentially arisen in future under the 1957/58 Severnside Planning Consent, should be excluded from the Review of Consent. However, it was agreed that the potential for increased levels of disturbance to arise at these waterbodies in the future as a result of the implementation of the 1957/58 Severnside Planning Consent remains a valid issue for consideration as part of the Review of Consent.

Other land within Severnside

3.2.10 The remaining land in Severnside predominantly comprises a network of improved grassland fields, which are subject to a heavy grazing regime and bisected by a network of interconnected drainage ditches, and mature hedgerows. The most extensive areas of grazing pasture are located in the north-eastern corner of the study area, and along its eastern boundary.

3.2.11 The following small-scale settlements are located to the north and east of the 1957/58 Severnside Planning Consent boundary: Severn Beach; Pilning; and Easter Compton. In addition, these areas are also bisected by the M4 and M49 motorway corridors, the South Wales Main Line and the Avonmouth to Severn Beach railway line.

3.2.12 The section of foreshore between Severn Beach and New Passage comprises a combination of vegetated shingle beach and a rocky substrate, with only a limited amount of saltmarsh vegetation present (Wessex Ecological Consultancy, 2007).

3.3 Avonmouth

3.3.1 Avonmouth extends along the edge of the Severn Estuary from the South Gloucestershire/Bristol county boundary as far as the River Avon, and inland to the M5 motorway corridor. The extent of the Avonmouth study area is shown on Figure 3.



The Avonmouth employment area

- 3.3.2 A large proportion of Avonmouth is occupied by employment land. Much of this land is designated as Principal Industrial and Warehousing Areas in the Bristol Local Plan 1997. As such, it is safeguarded for industry, warehousing and similar or associated uses. The boundaries of the Principal Industrial and Warehousing Areas are currently being revised to incorporate new development whilst avoiding, where possible, features which have value for nature conservation and flood risk alleviation.
- 3.3.3 For the purpose of this study, the widest possible extent of the employment area has been used, incorporating the Adopted 1997 Principal Industrial and Warehousing Areas and Sewage Works Expansion area, new development since adoption of the plan and current planning permissions. The employment area covers approximately 7km² (as shown on Figure 3) and houses a variety of land uses including industrial processing, manufacturing and assembly; storage and distribution / logistics; open storage; waste management; energy production; and sewage treatment. There has been a recent trend for redundant heavy industrial operations to be re-developed for new large-scale distribution warehouses and the environmental technologies sector, including waste management and renewable energy schemes (of which a number have received planning consent but not been constructed at the time of commencing the Stage 2 report (March 2010) - see below for further details). The south-west section of the employment area also includes Avonmouth Docks where the Bristol Port Company has permission to construct a Deep Sea Container Terminal (see below for further details).
- 3.3.4 The majority of the Avonmouth employment area houses operational industrial and commercial sites. However, to the south of the Sewage Works there is an area of greenfield land which is designated in the Bristol Local Plan 1997 for Sewage Works Expansion. This land comprises a series of improved and unmanaged grassland fields bisected by a number of ditches which support reedbed vegetation and mature hedgerows (see 'Land to the south of the Avonmouth Sewage Works' on Figure 3).
- 3.3.5 The footprint of the Avonmouth employment area does not encroach into the Severn Estuary SPA and Ramsar site, and therefore, no direct habitat loss within the Natura 2000 site would be expected as a result of future development. However, the potential exists for future development taking place along the western fringes of the Avonmouth employment area to result in disturbance/displacement to waterfowl within adjacent parts of the Natura 2000 site. As described in Paragraph 3.2.7, the consideration of these impacts do not form part of the Stage 2 assessments and they would, therefore, require consideration in their own right (alone and in combination with other relevant plans and projects) within project-specific Habitats Regulations Assessments.

Consented Development Proposals

- 3.3.6 At the time of commencing the Stage 2 report (March 2010), the Project Partnership provided details of a number of development projects which had received planning consent, but which had not been constructed. These are described in the following paragraphs.

Bristol Deep Sea Container Terminal

- 3.3.7 In March 2010, the Department for Transport awarded consent for Bristol's Deep Sea Container Terminal (as shown on Figure 3). This facility will accommodate the largest container vessels currently in operation, as well as Ultra Large Container Ships (ULCS) of up to 14,000 TEU (twenty foot equivalent units) and 16 metre draught. There will be facilities for deep water



berths at all tides, extensive container handling and storage space, and links to the Port's existing rail and road connections. The existing estuary approach channel will be widened and deepened and a turning area created for manoeuvring container vessels. Bristol Port Company's website indicates that construction works could start in 2010), and the terminal could be operational in three to four years.

3.3.8 The Environmental Statement (ES) and its supporting documents for the development proposals have identified the following significant impacts in relation to the Severn Estuary SPA and Ramsar site designations (Bristol Port Company 2008), which could be of relevance to the Stage 2 assessments:

- The direct loss of 2ha of intertidal habitat within the boundary of the Severn Estuary SPA, which provides habitat for waterfowl.
- The direct loss of 20ha of intertidal habitat (including 0.5ha of saltmarsh) within the reclamation footprint. This area has previously been found to support small numbers of waterbirds that may form part of the SPA populations.
- Potential reductions in foraging opportunities for waterfowl arising through a significant increase in the rate of fine sediment accretion and deposition over an area of approximately 65ha of intertidal mudflat and saltmarsh, upstream of the reclamation area and within the SPA and Ramsar site.
- The loss of three man-made structures which provide high-tide roosting sites for waterfowl, particularly redshank.

3.3.9 The ES for the development proposal indicates that the construction of a new breakwater as part of the Deep Sea Container Terminal would be expected to mitigate for the loss of the man-made structures used as high tide roost sites by redshank and other waterfowl. However, it is understood that mitigation for the loss and degradation of intertidal habitats within the SPA and its surroundings is not possible. Therefore, to compensate for these impacts, new areas of intertidal habitat will be created at locations elsewhere within the Severn Estuary SPA at Bridgewater Bay.

Eastern Access Road, Avonmouth

3.3.10 Planning consent has been granted for the construction of the Eastern Access Road to the Access 18 site at Kings Weston, Avonmouth (see Figure 3). A review of the ES for the development indicates that no significant impacts or associated mitigation were identified in relation to the Severn Estuary SPA/Ramsar site qualifying species and assemblage. In view of these findings, the ES does not prescribe any specific mitigation or compensatory measures in relation to the SPA and Ramsar site. However, ecological mitigation and enhancement measures have been included within the proposals to address potential impacts which could arise in relation to other ecological receptors.

3.3.11 In particular, an Ecological and Landscape Management Plan (ELMP) has been prepared to satisfy a condition of the planning permission. The ELMP includes the creation of new wetland features, such as an area of reedbed and two bird 'scrapes', as well as a commitment for the favourable management of the adjacent ditch network. These measures could deliver secondary benefits for some of the qualifying species (e.g. gadwall) and the qualifying assemblage of the SPA and Ramsar site.



Land identified within the Bristol Citywide Sustainable Energy Study

- 3.3.12 The Bristol Citywide Sustainable Energy Study (BCSES) states that the Avonmouth area has significant potential for large-scale low or zero carbon energy generation, such as wind and biomass plant (Centre for Sustainable Energy, 2009). Furthermore, the BCSES recommends that Avonmouth's wind power resource should also continue to be developed as far as possible, as it represents the vast majority of Bristol's potential for wind power (Centre for Sustainable Energy, 2009).
- 3.3.13 The BCSES has identified a range of technically feasible wind farm development sites in the Avonmouth study area (see Figure 3). These include a number of industrial sites (particularly to the north of the Avonmouth study area), as well as the following areas of estuarine and greenfield land, for future consideration in relation to possible wind farm proposals:
- Saltmarsh at Chittening Warth, within the Severn Estuary Natura 2000 site;
 - Brownfield land (including Avonmouth Docks) immediately adjacent to the Severn Estuary Natura 2000 site;
 - Avonmouth Sewage Works and Pools (the latter comprising an Avon Wildlife Trust Reserve); and
 - The central part of Hallen Marsh (an area of grazing pasture and arable farmland).
- 3.3.14 The inclusion of Chittening Warth within the BCSES as a technically feasible wind farm site was reviewed by the Project Partnership during a project progress meeting on 19th March 2010. For the purposes of the Stage 2 impact assessment at Avonmouth, it was agreed that existing areas of intertidal habitat (including saltmarsh) at Chittening Warth should be safeguarded from any potential future development associated with the BCSES. Furthermore, it was also agreed that this should form a recommendation of the Stage 2 report, since Chittening Warth:
- falls within the boundaries of the Severn Estuary SSSI, SAC, SPA and Ramsar site;
 - supports habitats which represent interest features for the SAC designation;
 - supports substantial concentrations of waterfowl which are qualifying species and/or form part of the qualifying assemblage for the SPA and Ramsar site designations (see Cresswell Associates, 2010); and
 - represents supporting habitats for the SPA/Ramsar site qualifying species and assemblage (Natural England & Countryside Council for Wales, 2009).
- 3.3.15 Furthermore, any future wind energy development proposals which could give rise to bird mortality and disturbance/displacement affecting the SPA and Ramsar Qualifying Species and Qualifying Assemblage at locations within the Severn Estuary SPA and Ramsar site, would require separate consideration within project-specific Habitat Regulation Assessments (see Paragraph 2.2.7 for further details).

Consented Development Proposals

- 3.3.16 At the time of commencing the Stage 2 Avonmouth impact assessments (March 2010), a number of wind energy development proposals, as well as an Energy Generation Facility had received planning consent, but had not yet been constructed. Further details regarding these proposals are provided below.



Bristol City Council Wind Farm at Chittening

- 3.3.17 Planning consent has been granted for the construction and operation of two wind turbines within a brownfield site (known as the former Shell Tanker Site) at Chittening (see Figure 3 for location). The ES for the proposed development did not identify that any significant impacts upon the SPA/Ramsar qualifying bird species and qualifying bird assemblage would be likely to occur, either alone or in combination with other plans or projects (Landmark Practice, 2008). In view of these findings, the ES does not prescribe any specific mitigation or compensatory measures in relation to these birds (albeit that they may receive some secondary benefits as a result of other ecological mitigation which is proposed).

Wessex Water Wind Farm at Avonmouth Sewage Works and Pools

- 3.3.18 Planning consent has been granted for the construction and operation of four wind turbines within Avonmouth Sewage Works and the adjacent area of land surrounding Avonmouth Pools (see Figure 3 for location). A review of the ES for the development proposal (Wessex Water, 2008) identified that significant impacts upon the SPA/Ramsar site and its qualifying species/assemblage are not predicted. The ES did, however, identify the following impacts:

- Construction-related disturbance could have a significant impact upon wildfowl (including tufted duck (*Aythya fuligula*), shoveler (*Anas clypeata*), pochard (*Aythya ferina*) and gadwall) using Avonmouth Pools, although, this would be mitigated by timing the construction works to avoid the peak winter period.
- The operation of the turbines could give rise to collision-related mortality in relation to the following species of wildfowl and wader (annual collision-related mortality rates are presented in brackets): lapwing (*Vanellus vanellus*) (5.9-29.4 birds); teal (*Anas crecca*) (2.3-11.5 birds); mallard (*Anas platyrhynchos*) (1.7-8.4 birds); shoveler (0.8-3.5 birds); total waterbirds (11.1-54.5 birds). These predicted collision rates were not considered to be significant in relation to the integrity of the SPA and Ramsar sites; however, significant impacts at the 'County' level (and below) were predicted.
- The operation of the proposed wind farm would give rise to potentially significant disturbance-related impacts in relation to gadwall, tufted duck, shoveler and pochard, which are considered to be of 'County/Regional' nature conservation importance, although these were not predicted to give rise to a significant effect on the integrity of the SPA and Ramsar sites.

Avonmouth Resource Park

- 3.3.19 Planning consent has been granted for the construction of a Materials Recycling Facility and an Energy Generation Facility at Avonmouth Resource Park. The ES for the proposed development does not identify that any significant impacts upon the SPA/Ramsar qualifying bird species and qualifying bird assemblage would be likely to occur, either alone or in combination with other plans or projects (Encia Environmental, 2009). In view of these findings, the ES does not prescribe any specific mitigation or compensatory measures in relation to these birds.

Other land within Avonmouth

- 3.3.20 A small proportion of Avonmouth falls outside of the areas covered by footprints of the employment area and the BCSES, albeit that these development areas are located in close proximity (see Figure 3). Specifically, these are:
- The margins of Hallen Marsh;
 - An area of situated between the M49 and M5 motorway corridors;



-
- Avonmouth Pools; and
 - An area of grazing pasture/marsh to the south of the Avonmouth Sewage Works, adjacent to King's Weston Lane (see area denoted by 'Land to the south of Avonmouth Sewage Works on Figure 3)
 - An area of grazing pasture to the west of King's Weston Lane (although the Eastern Access Road and its associated ecological enhancement area would be located within a proportion of this site - see area denoted by 'Land to the west of King's Weston Lane on Figure 3).



4.0 Bird Populations within the Study Area Associated With the Severn Estuary SPA and Ramsar Site

4.1 Severn Estuary SPA and Ramsar site qualifying interests

4.1.1 The Severn Estuary SPA and Ramsar site supports internationally important assemblages of waterfowl and waders during the winter months and migratory periods. These designations are based on:

- internationally important populations of the Annex 1 species Bewick's swan; and
- internationally important populations of regularly occurring migratory species (gadwall, shelduck, redshank, dunlin and European white-fronted goose).

4.1.2 The site also qualifies as an SPA since it regularly supports in excess of 60,000 waterfowl during the winter. The species listed on the original 1995 SPA citation as forming part of the assemblage include wigeon (*Anas penelope*), teal, pintail (*Anas acuta*), pochard, tufted duck, ringed plover (*Charadrius hiaticula*), grey plover (*Pluvialis squatarola*), curlew (*Numenius arquata*), whimbrel (*Numenius phaeopus*) and spotted redshank (*Tringa erythropus*). Mallard, lapwing and shoveler have also been added as a result of the 2001 SPA review, and further species also meet the criteria for inclusion within the qualifying assemblage, based upon 2003/4 – 2007/8 WeBS 5 year peak mean count data (which was the most up-to-date WeBS dataset that was available at the time of commencing the Stage 2 report in March 2010).

4.1.3 The boundary of the SPA and Ramsar site in relation to the study area and the development zones at Severnside and Avonmouth is shown on Figures 1 to 3.

Bewick's swan

4.1.4 The Severn Estuary supports internationally important numbers of Bewick's swans over winter. During Stage 1 of the project, virtually no records of Bewick's swan were identified within the study area over recent years (the key area for this species within the Severn Estuary SPA being the upper estuary at Slimbridge (over 10 km to the north)). The only recent record of Bewick's swan relates to two birds which were present at Severn Beach in December 2004 (Avonmouth Ornithological Group, 2005). Based upon these findings, it is proposed that Bewick's swan be 'scoped out' from further consideration within this document.

European white-fronted goose

4.1.5 The Severn Estuary supports internationally important numbers of wintering and migratory European white-fronted goose. However, as described for Bewick's swan (above), the key area of the Severn Estuary SPA for European white-fronted goose is the sandbanks in the upper estuary at Slimbridge. During Stage 1 of the project, the only recent records of this species within the study area were identified from the Avon Bird Report for 2003 to 2006 (inclusive). These related to small flocks of up to 17 birds which were recorded at Severn Beach on a sporadic basis. Given the apparent absence of this species within or immediately adjacent to the development zones at Severnside and Avonmouth, it is proposed that European white-fronted goose be 'scoped out' from further consideration within this document.



Shelduck

- 4.1.6 The Severn Estuary supports internationally important numbers of wintering and migratory shelduck. Shelduck are distributed widely throughout the estuary during the winter months, feeding in groups on extensive areas of intertidal mudflats, with major concentrations on Bridgwater Bay, and around the mouth of the Rhymney River.
- 4.1.7 The Regulation 33 Advice provides a population estimate for shelduck of 2,892 birds within the Severn Estuary SPA and Ramsar site, based on the 5 year peak mean 1988/9-1992/3. This represents 1.2% of the population of birds in North-West Europe. More recent WeBS data suggest that this population has increased to 4,431 birds (based on the 5 year peak mean 2003/4-2007/8).
- 4.1.8 The Stage 1 report findings indicate that the intertidal habitats (particularly at Chittening Warth and Severn Beach and its surroundings) support the largest concentrations of shelduck within the study area with peak counts of up to 44 birds (i.e. approximately 1% of the entire Severn Estuary SPA population) recorded at multiple locations during previous surveys (Cresswell Associates, 2010). A small number of birds (up to six individuals) have also previously been recorded at a limited number of inland sites (Crook's Marsh; Hallen Marsh; Avonmouth Pools and BCC's proposed wind farm development site) on an occasional basis during the winter period (Cresswell Associates, 2010). However, in accordance with the findings of the Severnside bird surveys (Wessex Ecological Consultancy, 2003, 2006, 2007 & 2008), this species' winter distribution tends to favour coastal sites, since it feeds predominantly upon the saltwater snail *Hydrobia ulvae*, as well as crustaceans, shelled molluscs and polychaete worms (Cabot, 2009), and tends to roost within saltmarsh, or the estuary (Wessex Ecological Consultancy, 2007). In view of this, it is considered unlikely that the proposed habitat losses and bird disturbance/displacement which could take place at inland sites within the study area would lead to direct significant effects upon the wintering and migratory shelduck population. It is therefore proposed that this species be 'scoped out' from further consideration within the Review of Consent and impact assessments at Avonmouth in relation to direct impacts upon wintering birds. Nevertheless, depending upon the nature and extent of mitigation which may be required in relation to other waterfowl, it may be possible to deliver secondary benefits to this species.

Gadwall

- 4.1.9 The Severn Estuary supports internationally important numbers of wintering and migratory gadwall. Gadwall prefer the freshwater wetland habitats that occur within the SPA behind the flood defences, particularly at Slimbridge and Bridgwater Bay. Within the estuary itself, gadwall are largely restricted to areas where freshwater flows enter it, particularly larger rivers and pills, most notably at Avonmouth, between the two Severn Bridges, and at Woodspring and Weston Bay.
- 4.1.10 The Regulation 33 Advice provides a population estimate for gadwall of 330 birds, based on the 5 year peak mean 1988/9-1992/3. This represents 2.8% of the population of birds in North-West Europe (Natural England and Countryside Council for Wales, 2009). More recent WeBS data suggest that this population has decreased to 253 birds (based on the 5 year peak mean 2003/4-2007/8).
- 4.1.11 The conservation objective for gadwall is to maintain the population and its supporting habitats in favourable condition. The relevant conditions to maintaining favourable condition status in the



context of this project, as set out in the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009) are:

- the 5 year peak mean population size for the wintering gadwall population is no less than 330 individuals (i.e. the 5 year peak mean between 1988/9 - 1992/3); and
- aggregations of gadwall at feeding and roosting sites are not subject to significant disturbance.

4.1.12 The Stage 1 report findings indicate that the intertidal habitats at the southern end of the site (particularly in the vicinity of the saltmarsh 'pills') have previously held counts of up to 62 birds within the study area (Cresswell Associates, 2010). However, desk study records also indicate that counts of up to 40 birds have previously been recorded at the following inland freshwater bodies: Orchard Pools, Avonmouth Pools, Salt Rhyne Balancing Pool and Disused Reservoir Pools (Cresswell Associates, 2010).

Redshank

4.1.13 The Severn Estuary supports internationally important numbers of wintering and migratory redshank. Redshank are distributed widely throughout the estuary, favouring areas with abundant invertebrate prey species and unrestricted views for predator detection. Feeding redshank are relatively thinly distributed and often found in small groups in the creeks and sub-estuaries, with particular concentrations at the mouths of the Rhymney, Wye, Avon and Parrett.

4.1.14 The Regulation 33 Advice provides a population estimate for redshank of 2,013 birds within the Severn Estuary SPA and Ramsar site, based on the 5 year peak mean 1988/9-1992/3. This represents 1.3% of the population of birds within the East Atlantic Flyway. More recent WeBS data suggest that this population has increased to 2,269 birds (based on the 5 year peak mean 2003/4-2007/8). The findings of the Stage 1 report indicate that the distribution of redshank within the study area relates exclusively to estuarine sites. Peak winter counts of up to 200 birds have been recorded at multiple locations at Chittening Warth (particularly roosting aggregations associated with saltmarsh 'pills'), as well as Severn Beach and adjacent areas of saltmarsh (Cresswell Associates, 2010).

4.1.15 The Avon Bird Reports for the period 2004-2008 classify redshank as 'uncommon' at inland sites. In addition, the Stage 1 report identified that the only recent desk study record of redshank at any inland sites within the study area relates to a single bird recorded to the south of the Avonmouth Sewage Works (Cresswell Associates, 2010). Furthermore, the results of the habitat assessment within the study area have (to some extent) validated these findings, since the majority of undeveloped land comprises pasture which is enclosed by mature hedgerows and tree lines, which would not be considered to provide sufficiently extensive sight lines to wintering coastal waders foraging or roosting in these areas. Based upon this information (and given that the intertidal areas within the study area which support key aggregations of this species are to be safeguarded from further habitat loss (see Paragraphs 3.2.7 and 3.3.12)), it is considered unlikely that redshank would be significantly affected by habitat loss and bird disturbance/displacement occurring at inland sites within the study area. Consequently, it is proposed that this species be 'scoped out' for consideration within the Review of Consent and impact assessments at Avonmouth. Depending upon the nature and extent of mitigation which may be required in relation to other waterfowl, it may be possible to deliver secondary benefits to this species.



Dunlin

- 4.1.16 The Severn Estuary supports internationally important numbers of wintering and migratory dunlin; the estuary supports the third largest wintering population of dunlin in Britain (Natural England and Countryside Council for Wales, 2009). Dunlin are distributed widely throughout the estuary, favouring areas with abundant invertebrate prey species and unrestricted views for predator detection. Feeding dunlin are found most commonly on the mid-shore, with particular concentrations at Rhymney/Peterstone, Uskmouth, Welsh Grounds, Undy, Clevedon and Bridgwater Bay.
- 4.1.17 The Regulation 33 Advice provides a population estimate for dunlin of 41,683 birds, based on the 5 year peak mean 1988/9-1992/3. This represents 2.9% of the population of birds within the East Atlantic Flyway. More recent WeBS data suggest that this population has decreased to 19,996 birds (based on the 5 year peak mean 2003/4-2007/8).
- 4.1.18 The findings of the Stage 1 report indicate that the distribution of dunlin within the study area relates exclusively to estuarine sites. Peak winter counts of up 1900 birds have been recorded at multiple locations at Severn Beach and adjacent areas of saltmarsh, Chittening Warth, and the area of intertidal habitat within the southern part of the study area (with a number of roost sites identified within these areas) (Cresswell Associates, 2010).
- 4.1.19 The Avon Bird Reports for the period 2004-2008 identify that only small numbers of dunlin occur at inland sites on passage. In addition, the Stage 1 report did not identify any recent desk study records of this species at any inland sites within the study area (Cresswell Associates, 2010). Furthermore, the results of a habitat assessment within the study area have (to some extent) validated these findings, since the majority of undeveloped land comprises pasture which is enclosed by mature hedgerows and tree lines, which would not be considered to provide sufficiently extensive sight lines to wintering coastal waders foraging or roosting in these areas. Based upon this information (and given that the intertidal areas within the study area which support key aggregations of this species are to be safeguarded from further habitat loss (see Paragraphs 3.2.7 and 3.3.12)), it is considered unlikely that dunlin would be significantly affected by habitat losses taking place at inland sites within the study area. Consequently, it is proposed that this species be 'scoped out' from further consideration within the Review of Consent and impact assessments at Avonmouth. Depending upon the nature and extent of mitigation which may be required in relation to other waterfowl, it may be possible to deliver secondary benefits to this species.

4.2 The Qualifying Assemblage

- 4.2.1 The Severn Estuary supports an internationally important assemblage of waterfowl, comprising those species listed above, as well as several other species which occur in nationally important numbers. The species considered to form part of the assemblage as set out in the Regulation 33 Advice includes the qualifying species listed above and the following species: wigeon; teal; pintail; pochard; tufted duck; ringed plover; grey plover; curlew; whimbrel; and spotted redshank. In addition, the following species were included within the SPA assemblage as a result of JNCC's Severn Estuary SPA Review in 2001: mallard; lapwing; and shoveler. As described in paragraphs 2.1.6 and 2.1.7, Natural England advised the Project Partnership to take into account UK government policy for pSPAs and to apply this to species identified in the 2001 SPA Review and to treat them in the same way as those which have been formally notified, in terms of the conservation objectives to maintain the bird populations and their supporting habitats in favourable condition. Therefore, for the purposes of the Review of the 1957/58 Severnside



Consent and the Avonmouth impact assessments, the 2001 SPA Review species (mallard, lapwing and shoveler) have been included within the SPA Qualifying Assemblage.

- 4.2.2 Furthermore, the following species warrant inclusion in the SPA/Ramsar site qualifying assemblage, as the Severn Estuary either supports more than 2,000 individuals, or more than 1% of the national population (based upon the 5 year peak mean count data for 2003/04 and 2007/08): grey heron (*Ardea cinerea*); little egret (*Egretta garzetta*); mute swan (*Cygnus olor*); snipe (*Gallinago gallinago*); black-tailed godwit (*Limosa limosa islandica*); bar-tailed godwit (*Limosa lapponica*); knot (*Calidris canutus*); turnstone (*Arenaria interpres*), golden plover (*Pluvialis apricaria*) and water rail (*Rallus aquaticus*).
- 4.2.3 Many of these species are mobile, and feed and roost in different areas depending on food availability, weather and tides, favouring areas with abundant prey species and unrestricted views for predator detection.
- 4.2.4 The conservation objective is to maintain the waterfowl assemblage and its supporting habitats in favourable condition. The relevant conditions to maintaining favourable condition status, in the context of this project are:
- the 5 year peak mean population size for the waterfowl assemblage is no less than 68,026 individuals (i.e. the 5 year peak mean between 1988/9 - 1992/3); and
 - waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.
- 4.2.5 The most recent WeBS data available (2003/4-2007/8) suggest some significant changes in population sizes for the species listed above. A comparison between the WeBS 5 year peak mean counts for 1988/9 -1992/3 (upon which the original SPA designation is based) and the more recent WeBS 5 year peak mean counts (2003/43-2007/8) (where applicable) is shown in Appendix II, which also provides an indication of the distributions and abundances of those species included within the qualifying assemblage, within Severnside and Avonmouth (based upon the findings of the Stage 1 report (Cresswell Associates, 2010)).
- 4.2.6 The findings of the Stage 1 report (Cresswell Associates, 2010), indicate that the following species are either largely absent, or are likely to be present in sufficiently low numbers, or that the impacts under consideration as part of this study would not be considered to give rise to significant effects on the integrity of the SPA, in the context of the total number of birds within the entire assemblage: Bewick's swan; European white-fronted goose; pintail; wigeon; ringed plover; spotted redshank; grey plover; grey heron; little egret; knot and water rail. In addition, the following species are considered to have a distribution which predominantly relates to intertidal habitats (and a general absence from inland sites within the study area): redshank; dunlin; grey plover; spotted redshank; black-tailed godwit; knot; turnstone. As described previously within Paragraph 3.2.7 and 3.2.8, it is understood that existing intertidal habitats which are located within any of the development zones should be safeguarded from direct habitat loss from any future associated development. Therefore, based upon this, it is proposed that habitat loss would not represent a significant impact upon any of these species, or in the context of the entire qualifying assemblage. Furthermore, it has been agreed with the Project Partnership that any future developments which could give rise to impacts upon waterfowl at locations within the Severn Estuary SPA and Ramsar site, should be subject to a separate Habitats Regulations Assessment in their own right (notwithstanding the findings of the Stage 2 assessments). On this basis, it is proposed that these species be 'scoped out' from further



consideration in relation to impacts upon the qualifying assemblage during the Stage 2 impact assessments.

4.2.7 The population size for the species of birds listed as part of the qualifying assemblage (based upon the 5 year winter peak mean: 2003/4 – 2007/8) is 69,803 birds. The latest 5 year mean peak count data indicate that the following species are present in larger numbers during the passage periods:

- Spring passage: whimbrel; and bar-tailed godwit.
- Autumn passage: mallard; grey heron; little egret; and black-tailed godwit.

4.2.8 However, the numbers of these species are relatively small compared to over-wintering numbers of other species in the assemblage (for example dunlin) and, therefore, the over-wintering assemblage is larger. It is therefore considered that an assessment of impacts on the much larger over-wintering assemblage is also likely to represent a precautionary assessment of impacts on the passage assemblage.

4.2.9 It is possible that mitigation measures which are proposed in relation to species of waterfowl associated with potentially significant impacts, could also deliver secondary benefits for some of those species which have been 'scoped out' from further consideration within this document. For example, measures to off-set potentially significant levels of habitat loss in relation to lapwing and curlew could also represent habitat creation and/or enhancement for golden plover and whimbrel, respectively. Therefore, the existing conservation status of these species could be improved upon as a result of these impact assessments, despite not being given detailed consideration within the scope of this document.

4.3 Summary of receptors

4.3.1 Based upon the descriptions of bird abundance and distribution in the previous section, a summary of those qualifying species, and species within the qualifying assemblage which will be given further consideration/'scoped out' from the impact assessments, is provided in the following paragraphs.

Qualifying species

4.3.2 As described previously, gadwall is considered to be present in sufficiently large numbers throughout the study area (particularly at inland wetland sites at Severnside and Avonmouth), and could be subject to potentially significant development-related impacts to warrant inclusion within the Review of the 57/58 Severnside Planning Consent and the Avonmouth impact assessments.

4.3.3 Bewick's swan and European white-fronted goose have been scoped out from inclusion within the Review of the 57/58 Severnside Planning Consent and the Avonmouth impact assessments, due to these species largely being absent from the study area. Shelduck, redshank and dunlin have also been scoped out from inclusion within the Review of the 57/58 Severnside Planning Consent and the Avonmouth impact assessments, due to their distributions being predominantly associated with estuarine sites within the Severn Estuary SPA and Ramsar site (see Paragraphs 2.2.7 and 3.2.7).



Species to be considered as part of the qualifying assemblage

- 4.3.4 The following species are considered to be present in sufficiently large numbers throughout the study area (particularly at inland wetland sites at Severnside and Avonmouth) to warrant inclusion within the Review of the 57/58 Severnside Planning Consent and the Avonmouth impact assessments, in relation to the qualifying assemblage: gadwall; teal; pochard; tufted duck; curlew; mallard; lapwing; shoveler; and common snipe.
- 4.3.5 The remaining species which form part of the qualifying assemblage have been scoped out from further consideration, due to either: (a) being present in insufficiently large numbers for significant impacts on the total SPA qualifying assemblage to arise; (b) being predominantly associated with estuarine sites within the study area, which fall outside of the scope of the Stage 2 assessments; or (c) having a seasonal presence during the spring/autumn migratory periods, which is accounted for by the impact assessments focussing upon the winter months when the peak numbers of birds are present.



5.0 Baseline Conditions

5.1 Summary of baseline information sources

5.1.1 A summary of the information sources and the associated assumptions which have been adopted to determine the baseline numbers and distributions of waterfowl for the Review of the 1957/58 Severnside Consent and the Avonmouth impact assessments is set out below. Further details regarding the desk-based baseline bird conditions are described in 'Severnside & Avonmouth Wetland Habitat Project. Stage 1: Distribution of Wetland Birds within the Study Area' (Cresswell Associates, 2010). This document should be read in conjunction with Sections 5.2 to 5.3 of this report.

Information sources

- The most up-to-date Wetland Bird Survey (WeBS) data for the corresponding sections of coastline within the study area (Count areas: 14451 Severn Beach; Avonmouth; 14409 Severn – M5 Bridge; and 14407 Royal Portbury Dock), as well as Avonmouth Sewage Works (14320); and the entire Severn Estuary.
- Desk-based waterfowl records for the study area supplied by Bristol Regional Environmental Records Centre (BRERC) in February 2010.
- The findings of the Severnside Bird Surveys within Severnside and the northern section of Avonmouth, carried out by Wessex Ecological Consultancy over the following periods: December 2001 and January 2002; February and March 2006; December 2006 to March 2007; and December 2008 to March 2009 (Wessex Ecological Consultancy 2002, 2006, 2007 and 2009).
- The findings of the Severnside Wintering Bird Surveys carried out during winter 2006/07 and winter 2009/10 by Environ UK Ltd for Severnside Distribution Land Ltd.
- The Avon Bird Reports, 1977-2008 (inclusive).
- Scientific papers/reports relating to historic population changes of wildfowl and waders within the Severn Estuary.
- The findings of ecological impact assessments for various proposed/consented development projects within the study area (see Paragraphs 3.3.6 to 3.3.11 for further details).

5.1.2 In addition, a habitat assessment survey was carried out in relation to this study in March 2010 to:

- (a) ground truth the findings of the Stage 1 desk-based study, in terms of the likely abundances and distributions of wintering waterfowl throughout the study area (particularly within areas of grazing pasture within each of the development zones under consideration as part of this study; and
- (b) determine (to some extent) how existing wetland areas, or areas with potential to be used for wetland creation (in particular areas of degraded wetland habitat), currently function, and what measures would be necessary to achieve the required wetland characteristics (and at the required scale).

5.1.3 Further details regarding the habitat assessment survey are presented in Appendix III of this document.



Assumptions regarding the baseline bird conditions

- 5.1.4 Whilst a range of information sources have been used to obtain baseline bird conditions for the study area, there are certain gaps, weaknesses and uncertainties which exist in the dataset (further details can be found in '*Severnside & Avonmouth Wetland Habitat Project. Stage 1: Distribution of Wetland Birds within the Study Area*' (Cresswell Associates, 2010)). To account for these, a number of assumptions have been made, which are considered to be representative of a reasonable worst-case scenario. These have been discussed on a species-specific basis within Sections 5.2 and 5.3 of this report (as appropriate); however, in general they are as follows:
- The baseline bird information for the footprint of the 1957/58 Severnside Consent Area is considered to be relatively robust and representative (since it is underpinned by the Severnside Bird Surveys (Wessex Ecological Consultancy 2002, 2006, 2007 and 2009)); however, it is considered feasible that the number/distribution of common snipe, mallard and teal may have been under-recorded (due to their cryptic habits and/or their tendencies to use enclosed wetland sites with dense vegetation (such as stands of reedbed, heavily-vegetated rhynes, neglected field corners, etc)).
 - It is considered feasible that the baseline bird information for the footprint of the Avonmouth employment area could be relatively incomplete (since it does not appear that any coordinated survey effort has been carried out at inland wetland sites, with the exception of WeBS surveys at Avonmouth Sewage Works/Pools)).
 - There could be a degree of interchange between birds using estuarine areas and inland freshwater sites.
 - The possibility that brownfield sites within the study area may support flocks of roosting waders (such as lapwings) cannot be discounted.
 - Given the weaknesses/assumptions described above, bird numbers and distributions at inland wetland sites have been estimated subjectively on the basis of the best available data for these sites, a review of the bird/numbers distributions at nearby estuarine sites (particularly where count data for certain species appear to be more robust) and an assessment of the potential suitability of greenfield land and water bodies for waterfowl.

5.2 Gadwall

- 5.2.1 The table overleaf presents the most recent 5 year peak mean WeBS data for gadwall within the study area, in the context of the entire Severn Estuary population.
- 5.2.2 Based upon the WeBS count data shown (and taking into consideration the weaknesses in applying these data to the study area), it is considered reasonable to assume that the intertidal habitats within the study area are likely to support a significant proportion of the Severn Estuary's gadwall population. This assumption is validated further by the findings of the Severnside bird surveys (Wessex Ecological Consultancy, 2002, 2006, 2007 & 2008), which recorded peak winter counts of up to 37 birds (i.e. up to approximately 14.5% of the entire Severn Estuary population) throughout the study area's intertidal zone on a regular basis in previous years (Cresswell Associates, 2010). Furthermore, wintering bird surveys carried out in relation to Bristol Port Company's Deep Sea Container Terminal proposals identified peak counts of up to 62 birds associated with the intertidal zone within the southern half of the study area (Cresswell Associates, 2010). Gadwall tends to favour freshwater sites and, therefore, their presence within saltwater habitats in the Severn Estuary is unusual. However, a comparison of the count data from estuarine areas and inland freshwater sites indicates that the numbers of birds which have previously been recorded in these areas is broadly comparable (see Cresswell Associates, 2010).



WeBS Core Count Zone	Five year peak mean count	Proportion of the entire SPA population of gadwall (%)	Proportion of the entire SPA assemblage count (%) ¹
14451: Severn Beach (2003/04-2007/08)*	24	9.4	0.03
14408: Severn-Avonmouth (2008/09 only) [†]	38	15	0.06
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	16	6.3	0.02
The entire Severn Estuary (2003/04-2007/08)	253	-	0.4

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

† This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

Severnside

5.2.3 At Severnside, gadwall has previously been recorded at Orchard Pools (two pools of approximately 17,400m² combined surface area) and its immediate surroundings, with desk study records of up to 21 birds at this location on occasions (Cresswell Associates, 2010). In view of this, and based upon the abundance and distribution of this species elsewhere within the study area (particularly nearby estuarine areas), a reasonable worst-case estimate that this water body may support up to 25 birds on occasions has been predicted (see Target Notes 2 to 4 on Figure 4a for location).

5.2.4 In addition, a review of the OS map for the study area indicates that the footprint of the 57/58 Severnside Consent Area contains the following additional water bodies (see Figure 4a for locations):

- pools to the south of the Avlon Works (three pools and associated channels, of approximately 11,100m² combined surface area) (Target Note 2);
- pools to the east of Grove Farm (three pools, of approximately 7,000m² combined surface area) (Target Note 3); and
- pools adjacent to the M49 motorway corridor (two pools, of approximately 5,370m² combined surface area) (Target Note 4).

5.2.5 No existing survey information has been identified to confirm whether gadwall utilise these habitats during the winter months. However, as a precautionary approach it has been assumed that these water bodies may support an additional 15 birds. Therefore, an estimated total wintering population of 40 birds (i.e. 15.8% of the total Severn Estuary population and 0.06% of the entire Severn Estuary Qualifying Assemblage) has been assumed to utilise 10 pools (and associated ditches) across all five of the wetland sites (listed above and shown on Figure 4a) during the winter



months. Collectively, this equates to approximately 40,870m² of wetland habitat. In addition, it has also been assumed that there is likely to be a degree of interchange of birds between the individual waterbodies described above, as well as other freshwater sites and nearby estuarine sites within the study area and its surroundings. It is considered that these freshwater and estuarine habitats collectively comprise a network of feeding and roosting sites for gadwall during the winter months.

Avonmouth

5.2.6 At Avonmouth, there are desk study records of gadwall at the following locations (see Figure 4b for locations):

- Avonmouth Pools (four pools, of approximately 35,350m² combined surface area) (Target Note 1);
- the Disused Reservoir Pools (two existing pools, of approximately 8200m² combined surface area (and one former pool)(Target Note 2)); and
- Salt Rhyne Balancing Pool (four pools of approximately 18,800m² combined surface area, plus associated rhynes) (Target Note 3).

5.2.7 A peak count of up to 40 birds was recorded at Avonmouth Pools in January 2004 (see Cresswell Associates, 2010).

5.2.8 Furthermore, a review of the OS map for the study area indicates that the combined footprint of the Avonmouth employment area and the areas which could be affected by BCSES potentially feasible wind farm sites encompasses the following additional water bodies (see Figure 4b for locations):

- pools in the vicinity of Lawrence Weston Road (five pools plus associated ditches, of approximately 14,000m² combined surface area) (Target Note 4); and
- a pool at the eastern end of Hallen Marsh (one pool of approximately 600m² combined surface area) (Target Note 5).

5.2.9 Based upon this information it has been assumed that, for the purposes of the impact assessment, up to 40 birds (i.e. 15.8% of the total Severn Estuary population and 0.001% of the entire Severn Estuary SPA Qualifying Assemblage) may utilise 15 pools (and associated ditches) across all five of the wetland sites (listed above and shown on Figure 4b) during the winter months. Collectively, this equates to approximately 76,950m² of wetland habitat. It should be noted that only a limited amount of existing survey information has been identified to validate this; however, this assumption is considered to represent a reasonable precautionary approach. These water bodies are considered likely to form part of a wider network of freshwater and estuarine sites (including those described for Severnside in Paragraphs 5.2.3 and 5.2.4) within the study areas and its surroundings, which collectively represent feeding and roosting sites for gadwall during the winter months.

5.3 The Qualifying Assemblage

5.3.1 The scoping outcomes for the qualifying assemblage (described in Paragraphs 4.3.4 and 4.3.5) indicate that the following species require consideration in relation to the Review of Consent and impact assessments at Avonmouth: gadwall; teal; pochard; tufted duck; curlew; mallard; lapwing; shoveler; and common snipe.

5.3.2 The baseline conditions for gadwall are described above; descriptions for the remaining species are set out in the following paragraphs.



Teal

5.3.3 The following table presents the most recent 5 year peak mean WeBS data for teal within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Proportion of the entire SPA population of teal (%)	Proportion of the entire SPA assemblage count (%) ¹
14451: Severn Beach (2003/04-2007/08)*	208	4.9	0.3
14408: Severn-Avonmouth (2008/09 only) [†]	30	0.7	0.04
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	61	1.4	0.09
The entire Severn Estuary population (2003/04-2007/08)	4,251	-	6.2

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009)

Severnside

5.3.4 Based upon the WeBS count data shown above (and taking into consideration the weaknesses in applying these data to the study area), it is considered reasonable to assume that the intertidal habitats within Severnside are likely to support a significant proportion of the Severn Estuary's teal population. This assumption is validated further by the findings of the Severnside bird surveys (Wessex Ecological Consultancy, 2002, 2006, 2007 & 2008), which recorded peak winter counts of up to 75 birds (i.e. up to approximately 1.7% of the entire Severn Estuary population) foraging and roosting at multiple locations throughout intertidal habitats at Severnside on a regular basis in previous years. In addition to estuarine habitats, teal are associated with freshwater and also tend to use smaller and more enclosed water features (such as rhynes and ditches) than other species of wildfowl. The findings of the Severnside bird surveys indicate that teal have been recorded at the following inland sites, in numbers which do not exceed 16 birds (see Target Notes 1, 2, 5 and 7 on Figure 5a for locations):

- Orchard Pools (two pools, of approximately 17,400m² combined surface area) (Target Note 1)
- Red Rhyme (ditch network bisecting grazing pasture) (Target Note 5)
- Astra Zeneca Fields (ditch network bisecting grazing pasture) (Target Note 6); and
- Dyer's Common ditch (ditch network bisecting grazing pasture) (Target Note 7).



5.3.5 In addition, given this species' tendency to use smaller water features, often with dense vegetation (e.g. heavily vegetated ditches), it is possible that birds using rhynes, ditches and vegetated pools may have gone undetected during these surveys, resulting in this figure being under-representative. In particular, a review of the OS map for the study area indicates the following additional water features are present within the footprint of the 1957/58 Severnside Planning Consent which could also support wintering teal (although no survey information has been identified to confirm this) (see Target Notes 5 to 7 on Figure 5a for locations):

- pools to the south of the Avlon Works (three pools, of approximately 11,100m² combined surface area) (Target Note 2);
- pools to the east of Grove Farm (three pools, of approximately 7,000m² combined surface area) (Target Note 3); and
- pools adjacent to the M49 motorway corridor (two pools, of approximately 5,370m² combined surface area) (Target Note 4).

5.3.6 In view of these factors, it is assumed that a population of 50 birds (i.e. 1.2% of the total Severn Estuary population and 0.07% of the entire Severn Estuary Qualifying Assemblage) is likely to use 10 pools across these wetland sites, as well as a network of rhynes/ditches bisecting areas of grazing pasture. Collectively, the pools equate to at least approximately 40,870m². Parts of the rhyme network within the 1957/58 Severnside Consent Area also support feeding and roosting teal (e.g. Red Rhyme); however, it is not considered possible to accurately quantify the extent of rhyme habitat which is used by this species, due to underlying uncertainties regarding the abundance and distribution of birds which may be present at any given time. Therefore surface areas for the rhyme network have not been included.

Avonmouth

5.3.7 At Avonmouth, the abundance and distribution of teal using estuarine habitats appears to be broadly comparable with those of Severnside (although counts of up to 160 birds have previously been recorded from these areas during bird surveys associated with Bristol Port Company's Deep Sea Container Terminal (Bristol Port Company, 2008)). Teal have also previously been recorded at a number of inland sites. As shown in the previous table, a mean peak WeBS count of 61 birds has previously been recorded at Avonmouth Pools; however, data supplied by BRERC indicate that up to 200 birds have been recorded at this site in recent years (Cresswell Associates, 2010). In addition, BRERC data also indicate that small numbers of birds may use a wider network of wetland sites, including: Disused Reservoir Pools; Merebank; Seabank Power Station; and Salt Rhyme Balancing Pool. Furthermore, a review of the OS map for the study area indicates the following additional water bodies are present within the footprint of the Avonmouth employment area and land identified within the BCSES (although no survey information has been identified to confirm this): pools at King's Weston Road; a pool at the eastern end of Hallen Marsh; and the remaining rhyme and ditch network within Avonmouth employment area and land associated with the BCSES.

5.3.8 Based upon this information, it is assumed that a population of 100 birds (i.e. 2.4% of the total Severn Estuary population and 0.15% of the entire Severn Estuary Qualifying Assemblage) is likely to use the inland freshwater bodies within the footprint of the Avonmouth employment area and land identified within the BCSES. Whilst this figure is likely to be an under-estimate of the numbers of birds which could potentially be present at Avonmouth Pools, it is also likely to be over-representative of the abundance of teal at the other inland wetland sites and, therefore, is considered to represent a reasonable worst-case scenario in relation to the Avonmouth area as a whole. Specifically, teal are considered to be distributed across the following wetland sites for the



purposes of the impact assessments at Avonmouth (see Target Notes 1 to 7 on Figure 5b for locations):

- Disused Reservoir Pools (two pools, of approximately 8,200m² combined surface area) (Target Note 1);
- Avonmouth Pools (four pools of approximately 35,350m² combined surface area) (Target Note 2);
- Salt Rhyne Balancing Pool (four pools of approximately 18761m² combined surface area, plus associated rhynes) (Target Note 3);
- pools in the vicinity of Lawrence Weston Road (five pools of approximately 14,000m² combined surface area) (Target Note 4);
- a pool at the eastern end of Hallen Marsh (one pool of approximately 600m² combined surface area) (Target Note 5);
- Merebank (Target Note 6);
- Seabank Power Station (two pools, of approximately 2350m² combined surface area) (Target Note 7); and
- the remaining rhyne and ditch network within Avonmouth employment area and land associated with the BCSES.

5.3.9 Collectively, these sites equate to at least approximately 79,350m² of wetland habitat. Parts of the rhyne network within the 1957/58 Severnside Consent Area have also been assumed to support feeding and roosting teal; however, it is not considered possible to accurately quantify the extent of rhyne habitat which is used by this species, due to the underlying uncertainties of the abundance and distribution of birds which may be present at any given time and, therefore, surface areas of rhyne habitat/grazing pasture have not been included. It should be noted that only a limited amount of existing survey information has been identified to validate this; however, this assumption is considered to represent a reasonable precautionary approach. These waterbodies are considered likely to form part of a wider network of freshwater and estuarine sites (including those described for Severnside in Paragraphs 5.3.4 and 5.3.5) within the study areas and its surroundings, which collectively represent feeding and roosting sites for teal during the winter months.



Pochard

The following table presents the most recent 5 year peak mean WeBS data for pochard within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA population of pochard (%)	Count as a proportion of the entire SPA assemblage count (%)¹
14451: Severn Beach (2003/04-2007/08)*	-	0	0
14408: Severn-Avonmouth (2008/09 only) [†]	-	0	0
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	6	0.8	0.009
The entire Severn Estuary population (2003/04-2007/08)	735	-	1.1

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment, it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

Severnside

The WeBS count data shown above, and the findings of the Severnside bird surveys appear to indicate that pochard is largely absent from the estuarine habitats and inland freshwater sites within Severnside (the only records relating to a count of five birds recorded on an occasional basis at a former pool in Crook's Marsh). In view of this, it is proposed that this species be excluded from consideration within the qualifying assemblage in relation to the Review of the 57/58 Severnside Planning Consent.

Avonmouth

5.3.10 The WeBS count data (shown above) also appear to indicate that pochard is absent from the estuarine habitats within Avonmouth, and only present in low numbers at Avonmouth Sewage Works/Pools (Cresswell Associates, 2010). However, desk study data supplied by BRERC suggest that this species has had a historic presence at the latter site (as well as Disused Reservoir Pools). In particular, counts of over 100 birds have previously been recorded at this site in the late-1980s and 1990s, although more recent count data from the Avon Bird Reports indicate that numbers have declined substantially in recent years (Cresswell Associates, 2010). In addition, BRERC records for the Disused Reservoir Pools include counts of up to 60 birds over the last decade during the winter months and migratory periods, with smaller numbers of birds (fewer than five individuals) also recorded at Crook's Marsh and Merebank (Cresswell Associates, 2010). It is not possible to confirm the degree to which these count data are representative of pochard usage



at these sites, or to make accurate assessments of the likely significance of these count sizes in the context of wider SPA populations for this species. In addition, a review of the OS map for the study area indicates the pools in the vicinity of Lawrence Weston Road are present within the footprint of the employment area and land identified within the BCSES, and these could support wintering pochard on occasions (although no survey information has been identified to validate this assumption).

5.3.11 Therefore, as a precautionary approach for the purposes of the subsequent impact assessments, it has been assumed that aggregations of up to 60 pochard could be present across the following inland freshwater sites (see Target Notes 1 to 5 on Figure 6 for locations):

- Avonmouth Pools (four pools of approximately 35,350m² combined surface area) (Target Note 1);
- Disused Reservoir Pools (two existing pools of approximately 8,200m² combined surface area (and one former pool)) (Target Note 2);
- Merebank (Target Note 3);
- Salt Rhyne Balancing Pool (four pools of approximately 18,800m² combined surface area, plus associated rhynes) (Target Note 4); and
- Pools in the vicinity of Lawrence Weston Road (five pools of approximately 14,000m² combined surface area, plus associated rhyne network) (Target Note 5).

5.3.12 Collectively, this equates to at least approximately 76,350m² of wetland habitat. It should be noted that only a limited amount of existing survey information has been identified to validate this; however, this assumption is considered to represent a reasonable precautionary approach.

5.3.13 Given the close juxtaposition of these water bodies, it has been assumed that the same individuals are common to all sites. Although small numbers of birds have also previously been recorded at Crook's Marsh, these birds are likely to have been associated with a freshwater body which has previously been drained (Wessex Ecological Consultancy, 2007) and, therefore, this site will not be given further consideration in relation to this species.



Tufted duck

5.3.14 The following table presents the most recent 5 year peak mean WeBS data for tufted duck within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA tufted duck population (%)	Count as a proportion of the entire SPA assemblage count (%)¹
14451: Severn Beach (2003/04-2007/08)*	3	0.5	0.004
14408: Severn-Avonmouth (2008/09 only) [†]	-		0
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	39	7	0.06
The entire Severn Estuary population (2003/04-2007/08)	554	-	0.8

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

Severnside

5.3.15 The WeBS count data (shown above), the species-specific information within previous Avon Bird Reports for Severnside, and the Severnside bird surveys for the estuarine parts of the study area appear to be indicative that tufted duck is largely absent from the intertidal zone within Severnside (see Cresswell Associates, 2010). Furthermore, the only record of this species relating to Severnside's remaining inland wetland habitats relates to a peak count of 10 birds at Orchard Pools (two pools of approximately 17,400m² combined surface area) (Cresswell Associates, 2010) (See Target Note 1 on Figure 7a). However, a review of the OS map for the study area indicates the following additional waterbodies are present within the footprint of the 1957/58 Severnside Planning Consent which could also support wintering tufted duck (although no survey information has been identified to confirm this) (see Target Notes 2 to 4 on Figure 7a for locations):

- pools to the south of the Avlon Works (three pools of approximately 11,100m² combined surface area, plus associated rhyme network) (Target Note 2);
- pools to the east of Grove Farm (three pools of approximately 7,000m² combined surface area); and
- pools adjacent to the M49 motorway corridor (two pools of approximately 5,370m² combined surface area) (Target Note 4).



5.3.16 In view of this, it is proposed that the Review of the 57/58 Severnside Planning Consent gives consideration to potential impacts upon 10 birds (i.e. 1.8% of the entire Severn Estuary population and 0.01% of the entire Severn Estuary Qualifying assemblage) associated with 10 pools across these wetland sites. Collectively, this equates to approximately 40,870m² of wetland habitat. In addition, it has also been assumed that there is likely to be a degree of interchange of birds between the individual waterbodies described above, as well as other freshwater sites within the study area and its surroundings. It is considered that these freshwater habitats collectively comprise a network of feeding and roosting sites for tufted duck during the winter months.

5.3.17 The findings of the Severnside bird surveys indicate that a count of 13 birds has been recorded at Crook's Marsh in December 2001. However, this record is likely to relate to a water body which has subsequently been drained. Therefore, this site will not be given any further consideration in relation to this species during the Review of Consent.

Avonmouth

5.3.18 As described above for Severnside, existing data sources indicate that tufted duck is largely absent from the intertidal zone at Avonmouth (Cresswell Associates, 2010). However, the most recent WeBS data for Avonmouth Sewage Works/Pools identifies a mean peak count of 39 birds at this site (see previous table). In addition, a review of the Avon Bird Reports suggests that Avonmouth Pools (four pools of approximately 35,350m² combined surface area) have regularly supported aggregations of up to 68 tufted ducks since the mid-1980s, with the largest counts occurring in recent years (see Target Note 1 on Figure 7b for location). Data supplied by BRERC are also indicative of comparable counts having been recorded at Disused Reservoir Pools (three pools, approximately 8,200m² combined surface area) (see Target Note 2 on Figure 7b for location). Furthermore, a review of the OS map for the study area indicates the following additional waterbodies are present within the footprint of the Avonmouth employment area and land identified within the BCSes which could represent potentially suitable feeding/roosting habitat (although no survey information has been identified to confirm the presence/absence of tufted ducks from these sites) (see Target Notes 3 to 5 on Figure 7b for locations):

- Merebank (Target Note 3);
- Salt Rhyne Balancing Pool (four pools, approximately 18,800m² combined surface area, plus associated rhyne network) (Target Note 4); and
- Pools in the vicinity of Lawrence Weston Road (five pools, approximately 14,000m² combined surface area, plus associated rhyne network) (Target Note 5).

5.3.19 Therefore, for the purposes of the impact assessments at Avonmouth, it has been assumed that aggregations of up to 68 tufted ducks (i.e. 12.2% of the entire Severn Estuary population and 0.1% of the entire Severn Estuary Qualifying Assemblage) could be present at all of the waterbodies described above. Collectively, this equates to at least approximately 76,350m² of wetland habitat. It should be noted that only a limited amount of existing survey information has been identified to validate this; however, this assumption is considered to represent a reasonable precautionary approach. These waterbodies are considered likely to form part of a wider network of freshwater sites (including those described for Severnside in Paragraph 5.3.15) within the study areas and its surroundings, which collectively represent feeding and roosting sites for tufted ducks during the winter months.

5.3.20 Given the close juxtaposition of these waterbodies, it has been assumed that the same individuals are common to all sites. Although small numbers of birds have also previously been recorded at Crook's Marsh, these birds are likely to have been associated with a freshwater body which has



previously been drained (Wessex Ecological Consultancy, 2007) and, therefore, this site will not be given further consideration in relation to this species.

Curlew

5.3.21 The following table presents the most recent 5 year peak mean WeBS data for curlew within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA curlew population (%)	Count as a proportion of the entire SPA assemblage count (%)¹
14451: Severn Beach (2003/04-2007/08)*	164	6.1	0.24
14408: Severn-Avonmouth (2008/09 only) [†]	8	0.29	0.01
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	-	-	-
The entire Severn Estuary population (2003/04-2007/08)	2690	-	4.0

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

5.3.22 Based upon the WeBS count data shown above (and taking into consideration the weaknesses in applying these data to the study area), it is considered reasonable to assume that the study area supports a significant proportion of the Severn Estuary's curlew population. This assumption is validated further by the findings of the Severnside bird surveys (Wessex Ecological Consultancy, 2002, 2006, 2007 & 2008). In particular, the Severnside bird surveys indicate that the largest concentrations of birds occur throughout the study area's intertidal zone, with winter peak counts of up to 104 birds (i.e. up to approximately 3.8% of the entire Severn Estuary population) recorded on a regular basis.

Severnside

5.3.23 The Stage 1 desk study findings appear to indicate that a number of Severnside's inland areas represent important feeding and roosting sites for curlew (Cresswell Associates, 2010). In particular, the Severnside bird surveys (Wessex Ecological Consultancy 2002, 2006, 2007 and 2009) have recorded peak winter counts of up to 58 birds foraging and/or roosting at the following sites within the footprint of the 1957/58 Severnside Consent Area (see Target Notes 1 and 2 on Figure 8a for locations):



- fields to the east of the M49 motorway (grazing pasture of approximately 263,800m² in area); (albeit that approximately 50,400m² of land at the eastern end of this site has already been 'lost' under the footprint of a warehouse development) (Target Note 1); and
- the Astra Zeneca Fields (grazing pasture of approximately 200,250m² in area) (Target Note 2).

5.3.24 In addition, the following areas of grazing pasture are also known to have previously supported significant concentrations of feeding and roosting birds; however, they are located outwith the footprint of the 1957/58 Severnside Consent Area (see Target Notes 3 to 5 on Figure 8a for locations):

- grazing pasture at Whitehouse Farm (approximately 66,000m² in area) (Target Note 3);
- grazing pasture known as the 'Horse Fields' (81,250m² in area) (Target Note 4); and
- grazing pasture at Crook's Marsh (86,000m² in area) (Target Note 5).

5.3.25 The Severnside bird surveys indicate that there is interchange of birds between inland sites, as well as nearby coastal areas. In view of this (and based upon the extent of potentially suitable feeding/roosting habitat for this species), it is considered that all of the birds previously recorded within study areas estuarine areas could feasibly be accommodated within the adjacent areas of inland foraging/roosting habitat (described above). Therefore, for the purposes of the Review of the 57/58 Severnside Planning Consent, it is assumed that up to 104 (i.e. 3.9% of the entire Severn Estuary population and 0.15% of the Severn Estuary Qualifying Assemblage) birds associated with a total of 697,309m² of grazing pasture could potentially be affected by development-related habitat loss and/or displacement effects.

Avonmouth

5.3.26 With a few notable exceptions, the majority of Avonmouth's inland area comprises built development land associated with the employment area, or other development types (e.g. housing) and, therefore, comprises either unsuitable or sub-optimal habitat for use by curlew. However, Hallen Marsh at the northern end of the Avonmouth area comprises an extensive area (approximately 1,114,000m²) of pasture and arable land with foraging and/or roosting opportunities for this species (see Target Note 1 on Figure 8b for location and extent). The findings of the Severnside bird surveys indicate that the degree to which Hallen Marsh is used by curlew varies between years (with no apparent factors to explain this inter-annual variation) (Cresswell Associates, 2010). However, a peak winter count of 35 birds was recorded at Hallen Marsh in March 2006.

5.3.27 In addition, the following sites also comprise grazing pasture which represents potentially suitable habitat for this species:

- land to the south of Avonmouth Sewage Works (approximately 333,000m²) (see Target Note 2 on Figure 8a); and
- an area of grazing pasture to the west of King's Weston Lane (approximately 332,000m²) (see Target Note 3 on Figure 8a).

5.3.28 No existing information regarding (likely) levels of curlew usage in these areas is available.

5.3.29 In the light of these findings, it is assumed that up to 50 birds (i.e. 1.9% of the entire Severn Estuary population and 0.07% of the entire Severn Estuary Qualifying Assemblage) associated with a total of 1,234,702m² of grazing pasture could potentially be affected by development-related habitat loss and/or displacement effects in Avonmouth.



Mallard

5.3.30 The following table presents the most recent 5 year peak mean WeBS data for mallard within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA mallard population (%)	Count as a proportion of the entire SPA assemblage count (%) ¹
14451: Severn Beach (2003/04-2007/08)*	132	4.9	0.2
14408: Severn-Avonmouth (2008/09 only) [†]	42	1.5	0.001
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	35	1.3	0.001
The entire Severn Estuary population (2003/04-2007/08)	2713	-	4.0

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

5.3.31 Based upon the WeBS count data shown above (and taking into consideration the weaknesses in applying these data to the study area), it is considered reasonable to assume that the intertidal habitats within the study area are likely to support a significant proportion of the Severn Estuary's mallard population. This assumption is validated further by the findings of the Severnside bird surveys (Wessex Ecological Consultancy, 2002, 2006, 2007 & 2008), which recorded peak winter counts of up to 80 birds (i.e. up to approximately 2.9% of the entire Severn Estuary's mallard population) throughout the study area's intertidal zone on a regular basis in previous years. Furthermore, wintering bird surveys carried out in relation Bristol Port Company's Deep Sea Container Terminal proposals identified peak winter counts of up to 110 birds (i.e. up to approximately 4.1% of the entire Severn Estuary's mallard population) associated with the intertidal zone within the southern half of the study area (Cresswell Associates, 2010).

5.3.32 In addition, the WeBS count data for Avonmouth Sewage Works (shown in the previous table above) identifies a mean peak count of 35 birds. This is comparable with BRERC count data from other inland sites, which confirms that counts of up to 40 birds have previously been recorded at: Orchard Pools, Red Rhyne; Hallen Marsh; land to the south of Avonmouth Sewage Works; and the Disused Reservoir Pools (Cresswell Associates, 2010). Due to the weaknesses which arise in applying these data to the study area, it is difficult to determine an accurate estimate for the peak number of mallard which could be present throughout the study area's inland wetland sites. Furthermore, a review of the OS map for the study area indicates that additional water features are present which could also support wintering mallard (although no survey information has been



identified to confirm this). On the basis of the desk study findings (above), it is considered reasonable to assume that 110 birds (i.e. the peak winter count identified during the Stage 1 desk study exercise) could be distributed between the following grazing pasture/wetland sites at Severnside (see Target Notes 1 to 5 on Figure 9a) and at Avonmouth (see Target Notes 1 to 6 on Figure 9b).

Severnside

- Orchard Pools (two pools of approximately 17,400m² combined surface area) (Target Note 1),
- pools to the south of the Avlon Works (three pools of approximately 11,100m² combined surface area) (Target Note 2);
- pools to the east of Grove Farm (three pools of approximately 7,000m² combined surface area) (Target Note 3);
- pools adjacent to the M49 motorway corridor (two pools of approximately 5,370m² combined surface area) (Target Note 4);
- Red Rhyne (rhyne network bisecting grazing pasture) (Target Note 5); and
- the remaining rhyne and ditch network within the 1957/58 Severnside Consent Area.

Avonmouth

- Avonmouth Pools (four pools of approximately 35,350m² combined surface area) (Target Note 1);
- the Disused Reservoir Pools (three pools of approximately 8,200m² combined surface area) (Target Note 2);
- land to the south of Avonmouth Sewage Works (rhyne network bisecting grazing pasture) (Target Note 3);
- Salt Rhyne Balancing Pool (four pools of approximately 18,800m² combined surface area, plus the associated rhyne network) (Target Note 4);
- pools in the vicinity of Lawrence Weston Road (five pools of approximately 14,000m² combined surface area, plus the associated rhyne network) (Target Note 5);
- a pool at the eastern end of Hallen Marsh (one pool, approximately 600m² combined surface area) (Target Note 6); and
- the remaining rhyne and ditch network within Avonmouth employment area and land associated with the BCSES.

5.3.33 110 birds equates to 4.1% of the entire Severn Estuary mallard population and 0.16% of the entire Severn Estuary Qualifying Assemblage. Furthermore, the sites listed above equate to: 10 pools comprising at least approximately 40,870m² at Severnside; and 17 pools comprising at least 76,950m² of wetland habitat at Avonmouth. Parts of the rhyne network within the 1957/58 Severnside Consent Area and at Avonmouth also support (or are considered likely to support) feeding and roosting mallard (e.g. Red Rhyne); however, it is not considered possible to accurately quantify the extent of rhyne habitat which is used by this species, due to the underlying uncertainties of the abundance and distribution of birds which may be present at any given time. Therefore, surface areas for the rhyne network have not been included.



Lapwing

5.3.34 The following table presents the most recent 5 year peak mean WeBS data for lapwing within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA lapwing population (%)	Count as a proportion of the entire SPA assemblage count (%) ¹
14451: Severn Beach (2003/04-2007/08)*	354	2.7	0.52
14408: Severn-Avonmouth (2008/09 only) [†]	0	0	0
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	54	0.42	0.08
The entire Severn Estuary population (2003/04-2007/08)	12,919	-	19.0

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

Severnside

5.3.35 The WeBS count data (shown above) appear to indicate that the intertidal habitats at Severnside are likely to support a significant proportion of the Severn Estuary's lapwing population. However, the findings of the Severnside bird surveys (Wessex Ecological Consultancy 2002, 2006, 2007 & 2008) do not appear to be consistent with this, since virtually no lapwings were identified at coastal sites (Cresswell Associates, 2010). In contrast, the Severnside bird surveys appear to indicate that inland areas of pasture support larger numbers of lapwing during the winter months, than nearby areas of estuarine habitat (Cresswell Associates, 2010). In particular, during the winter 2008/09 bird surveys (Wessex Ecological Consultancy 2009), a peak winter count of up to 625 birds was recorded within fields to the east of the M49 (approximately 238,812m² in area) (see Target Note 1 on Figure 10a). This area was found to support flocks in excess of 100 birds on a regular basis during the course of these surveys; however, approximately 50,400m² at the eastern end of this site land has subsequently been 'lost' under the footprint of a warehouse development. In addition, peak winter counts of up to 45 birds were also recorded at the following inland sites during the course of the Severnside bird surveys (see Target Notes 2 to 4 on Figure 10a):

- Marsh Common (grazing pasture of approximately 48,000m² in area) (Target Note 2);
- Brook Farm (grazing pasture of approximately 155,000m² in area) (Target Note 3); and
- Red Rhyne (grazing pasture of approximately 30,200m² in area) (Target Note 4).



5.3.36 Given the close juxtaposition of these sites, it is possible that these records could involve birds which are common to all sites.

5.3.37 Based upon these findings, it is proposed that the Review of the 57/58 Severnside Planning Consent gives consideration to potential impacts upon a winter lapwing population of 707 birds (i.e. the sum of winter peak counts for all of the sites listed above) associated with 497,012m² of grazing pasture could potentially be affected by development-related habitat loss and/or disturbance impacts equates to 5.5% of the entire Severn Estuary Qualifying Assemblage.

Avonmouth

5.3.38 The WeBS count data (shown in the previous table) identify an absence of lapwings from the estuarine habitats at Avonmouth. Despite this, other desk study records indicate that these estuarine habitats support large numbers of birds on occasions, with peak winter counts of 570 birds (2001/02 Severnside bird surveys), and 630 and 200 birds (winter 2006/07 bird surveys for Bristol Port Company's Deep Sea Container Terminal) having previously been recorded (Cresswell Associates, 2010). In addition, desk study records of lapwing at inland sites comprise: 310 birds in the land to the south of Avonmouth Sewage Works (in the vicinity of the St Modwen's Development site (January 2008)); 200 birds at Merebank (February and March 2006); a peak mean WeBS count of 54 birds at Avonmouth Sewage Works (2003/04-2007/08); historic counts of up to 200 birds at Avonmouth Pools (the 1980s and 1990s); 36 birds at Hallen Marsh (March 2008); as well as smaller numbers of birds (generally fewer than five) at a variety of other sites (see Figure 16 in Cresswell Associates, 2010).

5.3.39 Due to the weaknesses which arise in applying these data to the study area, it is difficult to determine an accurate estimate for the peak number of lapwing which could be present throughout the inland sites at Avonmouth. However, on the basis of the desk study findings, it is considered reasonable to assume that 310 birds (i.e. the peak inland winter count identified during the Stage 1 desk study exercise) could be distributed between the following sites (as shown on Figure 10b:

- Hallen Marsh (grazing pasture 1,114,000m² in area) (Target Note 1);
- Merebank (approximately 33,500m² surface area) (Target Note 2);
- Avonmouth Sewage Works/Pools (four pools of approximately 35,350m² combined surface area) (Target Note 3);
- land to the south of Avonmouth Sewage Works (grazing pasture of approximately 333,000m² in area) (Target Note 4); and
- land to the west of King's Weston Lane (grazing pasture of approximately 332,000m² in area) (Target Note 5).

5.3.40 In the light of these findings, it is assumed that up to 310 birds potentially associated with a total of 1,812,500m² of grazing pasture, as well as four pools of approximate 35,350m² in combined surface area could potentially be affected by development-related habitat loss and/or displacement in Avonmouth. This equates to 2.4% of the Severn Estuary population and 0.45% of the Severn Estuary Qualifying Assemblage.



Shoveler

- 5.3.41 The following table presents the most recent 5 year peak mean WeBS data for shoveler within the study area in the context of the entire Severn Estuary shoveler population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA shoveler population (%)	Count as a proportion of the entire SPA assemblage count (%)¹
14451: Severn Beach (2003/04-2007/08)*	6	1.12	0.01
14408: Severn-Avonmouth (2008/09 only) [†]	0	0	0
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	43	8.3	0.06
The entire Severn Estuary population (2003/04-2007/08)	518	-	0.76

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

Severnside

- 5.3.42 The WeBS count data (shown in the previous table), and the findings of the Severnside bird surveys (fewer than five birds recorded on an occasional basis at saltmarsh to the south of Severn Beach, Orchard Pools, and Crook's Marsh) appear to be indicative that shoveler is present in low numbers and on a relatively sporadic basis at estuarine inland freshwater sites within Severnside. In view of this, it is proposed that this species be excluded from consideration within the qualifying assemblage in relation to the Review of the 57/58 Severnside Planning Consent.

Avonmouth

- 5.3.43 The combination of data sources indicate that relatively substantial concentrations of shoveler have previously been recorded from a number of estuarine and inland sites within Avonmouth. In particular, the 2006/07 Severnside bird surveys recorded a peak winter count of 21 birds at Hole's Mouth (Cresswell Associates, 2010). Furthermore, the most recent WeBS count data for Avonmouth Sewage Works (shown above) identify a mean peak count of 43 birds at this site. This count is broadly comparable with data from the Avon Bird Reports for the period 2003-2008. Records supplied by BRERC include: counts of 59 birds at Avonmouth Pools since 2000 (with records of up to 90 birds at this site prior to 2000); and a count of 34 birds at the Disused Reservoir Pools in December 2000 (Cresswell Associates, 2010).



5.3.44 Due to the weaknesses which arise in applying these data to the study area, it is difficult to determine an accurate estimate for the peak number of shoveler which could be present throughout Avonmouth's inland wetland sites. However, on the basis of the desk study findings (above), it is considered reasonable to assume that 59 birds (i.e. the peak winter count identified during the Stage 1 desk study exercise) could be distributed between the following wetland sites (see Target Notes 1 to 4, Figure 11):

- Disused Reservoir Pools (three pools of approximately 8,200m² combined surface area) (Target Note 1);
- Avonmouth Pools (four pools of approximately 35,350m² combined surface area) (Target Note 2);
- pools in the vicinity of Lawrence Weston Road (five pools of approximately 14,000m² combined surface area, plus associated rhyne network) (Target Note 3);
- a pool at the eastern end of Hallen Marsh (one pool of approximately 600m² combined surface area) (Target Note 4).

5.3.45 59 birds equates to 0.19% of the entire Severn Estuary population and 0.001% of the entire Severn Estuary Qualifying Assemblage. Furthermore, the sites listed above equate to 13 pools comprising at least approximately 58,150m² of surface area. Parts of the rhyne network within the 1957/58 Severnside Consent Area and at Avonmouth also support (or are considered likely to support) feeding and roosting shoveler; however, it is not considered possible to accurately quantify the extent of rhyne habitat which is used by this species, due to the underlying uncertainties of the abundance and distribution of birds which may be present at any given time. Therefore, the surface area of the rhyne network has not been included.

Common snipe

5.3.46 The following table presents the most recent 5 year peak mean WeBS data for common snipe within the study area in the context of the entire Severn Estuary population.

WeBS Core Count Zone	Five year peak mean count	Count as a proportion of the entire SPA snipe population (%)	Count as a proportion of the entire SPA assemblage count (%)¹
14451: Severn Beach (2003/04-2007/08)*	14	3.23	0.02
14408: Severn-Avonmouth (2008/09 only) [†]	0	0	0
14320: Avonmouth Sewage Works (2003/04-2007/08) ^Δ	5	1.16	0.01
The entire Severn Estuary population (2003/04-2007/08)	434	-	0.64

* This count zone encompasses the entire intertidal habitat at Severnside, and also extends further north as far as the original Severn Bridge crossing (approximately 5km to the north of the study area) (see Figure 1c within Cresswell Associates, 2010). Therefore, this count is likely to be over-representative of the numbers of birds present at Severnside.

[†] This count zone corresponds largely with the intertidal areas within Avonmouth (see Figure 1c within Cresswell Associates, 2010); however, the only recent WeBS core count data relates to 2008/09.

^Δ Although this count zone is situated approximately 1km inland from the Severn Estuary SPA and Ramsar site boundary (see Figure 1c within Cresswell Associates, 2010), it is considered to fall within the ranging distances of



most waterfowl species. Therefore, for the purposes of this assessment it is assumed that the count data for this site comprise birds which form part of the SPA and Ramsar site designations.

- ¹ The total number of birds within the SPA assemblage is assumed to be 68,026 birds (cited within the Regulation 33 Advice (Natural England & Countryside Council for Wales, 2009).

- 5.3.47 The numbers of common snipe identified during the Stage 1 desk study are considered likely to be an under-estimate of the existing conditions, due to this species' cryptic habits and low detectability. There are desk study records of relatively low numbers of snipe (generally involving fewer than 10 birds) for a variety of sites within Severnside and Avonmouth over the last decade. However, a peak count of up to 53 birds was recorded from Dyer's Common during winter 2008/09 (see Figure 17 in Cresswell Associates, 2010).
- 5.3.48 Due to the weaknesses which arise in applying these data to the study area, it is difficult to determine an accurate estimate for the peak number of snipe which could be present throughout Avonmouth's inland wetland sites. However, on the basis of the desk study findings (above), it is considered reasonable to assume that 53 birds (i.e. the peak winter count identified during the Stage 1 desk study exercise) could be distributed throughout the Avonmouth and Severnside areas. This equates to 12.2% of the entire Severn Estuary population and 0.08% of the entire Severn Estuary Qualifying Assemblage.



Summary of baseline conditions

For species marked * it is not possible to quantify accurately the extent of rhyme network used by this species and, therefore this information has not been included.

Summary of Breeding Conditions								
Severnside				Avonmouth				
Species	Site Name (and Figure reference)	Number / Area (m ²)	Number of birds	Species	Site Name (and Figure reference)	Number/Area (m ²)	Number of birds	
Qualifying species								
Gadwall (Figure 4a)	Orchard Pools (1)	2 / 17,400	40 (15.8% of the Severn Estuary population and 0.06% of the Qualifying Assemblage)	Gadwall (Figure 4b)	Avonmouth Pools (1)	4 / 35,350	40 (15.8% of the Severn Estuary population and 0.06% of the Qualifying Assemblage)	
	Pools to the south of the Avon Works (2)	3 / 11,100			Disused Reservoir Pools (2)	3 / 8,200		
	Pools to the east of Grove Farm (3)	3 / 7,000			Salt Rhyme Balancing Pool (3)	4 / 18,800		
	Pools adjacent to the M49 corridor (4)	2 / 5,370			Pools in the vicinity of Lawrence Weston Road (4)	5 / 14,000		
	The rhyme and ditch network within the 1957/58 Severnside Consent Area (n/a)	-			Pools at the eastern end of Hallen Marsh (5)	7 / 600		
Total		10 pools / 40,870*		Total		7 pools / 76,950*		
Qualifying assemblage								
Teal (Figure 5a)	Orchard Pools (1)	2 / 17,400	50 (1.2% of the Severn Estuary population and 0.07% of the Qualifying Assemblage)	Teal (Figure 5b)	Disused Reservoir Pools (1)	2 / 8,200	100 (2.4% of the Severn Estuary population and 0.15% of the Qualifying Assemblage)	
	Astra Zeneca Fields (ditch network bisecting grazing pasture) (2)*	-			Avonmouth Pools (2)	4 / 35,350		
	Dyer's Common (ditch network bisecting grazing pasture) (3)*	-			Salt Rhyme Balancing Pool (3)	4 / 18,800		
	Red Rhyme (ditch network bisecting grazing pasture) (4)*	-			Pools in the vicinity of Lawrence Weston Road (4)	5 / 14,000		
	Pools to the south of the Avon Works (5)	3 / 11,100			Pool at the eastern end of Hallen Marsh (5)	1 / 600		
Pools to the east of Grove Farm (6)	3 / 7,000	Merebank (6)	-	Seabank Power Station (7)	2 / 2,400	(2.4% of the Severn Estuary population and 0.15% of the Qualifying Assemblage)		
Pools adjacent to the M49 corridor (7)	2 / 5,370	The rhyme and ditch network within the 1957/58 Severnside Consent Area (n/a)						
Total		10 pools / 40,870*	Total		18 pools / 79,350			
Pochard	Desk study records are indicative of pochard being largely absent from the estuarine habitats and inland freshwater sites within Severnside.	n/a	0	Pochard (Figure 6)	Avonmouth Pools (1)	4 / 35,350	60 (8.1% of the Severn Estuary population and 0.14% of the Qualifying Assemblage)	
Tufted duck (Figure 7a)	Orchard Pools (1)	2 / 17,400	10 (1.8% of the Severn Estuary population and 0.01% of the Qualifying Assemblage)	Tufted duck (Figure 7b)	Disused Reservoir Pools (2)	3 / 8,200	68 (12.2% of the Severn Estuary population and 0.14% of the Qualifying Assemblage)	
	Pools to the south of the Avon Works (2)	3 / 11,100			Merebank (3)	-		
	Pools to the east of Grove Farm (3)	3 / 7,000			Salt Rhyme Balancing Pool (4)	4 / 18,800		
	Pools adjacent to the M49 corridor (4)	2 / 5,370			Pools in the vicinity of Lawrence Weston Road (5)	5 / 14,000		
	Total				10 pools - 40,870*	Total		16 pools / 76,350
Curlew (Figure 8a)	Fields to the east of the M49 motorway (1)	236,812	104 (3.9% of the Severn Estuary population and 0.15% of the Qualifying Assemblage)	Curlew (Figure 8b)	Hallen Marsh (1)	1,114,000	50 (1.9% of the Severn Estuary population and 0.07% of the Qualifying Assemblage)	
	The Astra Zeneca Fields (2)	200,147			Land to the south of Avonmouth Sewage Works (2)	333,000		
	Grazing pasture at Whitehouse Farm (3)	66,000			Land to the west of King's Weston Lane (3)	332,000		
	The Horse Fields (4)	81,250			Total			1,779,000
	Grazing pasture at Crook's Marsh	86,000			Avonmouth Pools (1)			4 / 35,350
Mallard (Figure 9a)	Orchard Pools (1)	2 / 17,400	110 (4.1% of the Severn Estuary population and 0.16% of the Qualifying Assemblage)	Mallard (Figure 9b)	Disused Reservoir Pools (2)	3 / 8,200	110 (4.1% of the Severn Estuary population and 0.16% of the Qualifying Assemblage)	
	Pools to the south of the Avon Works (2)	3 / 11,100			Land to the south of Avonmouth Sewage Works (3)*	-		
	Pools to the east of Grove Farm (3)	3 / 7,000			Salt Rhyme Balancing Pool (4)	4 / 18,800		
	Pools adjacent to the M49 corridor (4)	2 / 5,370			Pools in the vicinity of Lawrence Weston Road (5)	5 / 14,000		
	Red Rhyme (ditch network bisecting grazing pasture) (5)*	-			Pool at the eastern end of Hallen Marsh (6)	1 / 600		
The rhyme and ditch network within the 1957/58 Severnside Consent Area (n/a)*	-	The rhyme and ditch network within the Avonmouth employment area and areas affected by the BCSES (n/a)*			Total		17 pools / 76,950*	
Lapwing (Figure 10a)	Fields to the east of the M49 motorway (1)	263,812	707 (5.5% of the Severn Estuary population and 1% of the Qualifying Assemblage)	Lapwing (Figure 10b)	Hallen Marsh (1)	570,000	310 (2.4% of the Severn Estuary population and 0.45% of the Qualifying Assemblage)	
	Marsh Common (2)	48,000			Merebank (2)	33,500		
	Brook Farm (3)	155,000			Avonmouth Sewage Works/Pools (3)	4 / 35,350		
	Red Rhyme (4)	30,200			Land to the south of Avonmouth Sewage Works (4)	333,000		
	Total				497,012	Total		4 pools / 35,350 Pasture - 1,812,500m ²
Shoveler	Desk study records are indicative of pochard being largely absent from the estuarine habitats and inland freshwater sites within Severnside.	n/a	0	Shoveler (Figure 11)	Disused Reservoir Pools (1)	3 / 8,200	59 (11.3% of the Severn Estuary population and 0.09% of the qualifying assemblage)	
Common snipe	Assumed to be present throughout areas of grazing pasture and wetland features sites; however, not possible to quantify land area	-	53 (12.2% of the Severn Estuary population and 0.08% of the Qualifying Assemblage)	Common snipe	Avonmouth Pools (2)	4 / 35,350	53 (12.2% of the Severn Estuary population and 0.08% of the Qualifying Assemblage)	
					Pools in the vicinity of Lawrence Weston Road (3)	5 / 14,000		
					Pool at the eastern end of Hallen Marsh (4)	1 / 600		
					Total			13 pools / 58,150
					Total waterfowl	1074		



6.0 Impact Assessment Assumptions

6.1 Habitat loss

6.1.1 The following assumptions have been adopted in carrying out the Review of Consent and Avonmouth impact assessment in relation to habitat loss:

- All land within the footprints of the 1957/58 Severnside Consent Area and the Avonmouth employment area would be 'lost' due to land-take (excluding those parts of the 1957/58 Severnside Consent Area which lie within the Severn Estuary SPA and Ramsar site boundary, and land identified as the 'reserve area' and/or 'green infrastructure' within the (WAP1) Section 106 Agreement (see Paragraphs 2.2.7 and 3.2.9, respectively for further details));
- The areas of waterbodies which are predicted to be subject to habitat loss have been calculated from aerial photographs and Ordnance Survey (OS) maps for the area. In some cases, it has not been possible to undertake a ground-truthing exercise to validate the continued presence of individual waterbodies, due to land access restrictions. Therefore, their continued presence has been inferred on the basis of the latest aerial photographs and Ordnance Survey (OS) maps available for the area.
- For the purposes of the Review of Consent, the areas of grazing pasture at Severnside which are predicted to be subject to habitat loss have been calculated from the findings of the Severnside Bird Surveys, carried out by Wessex Ecological Consultancy over the following periods: December 2001 and January 2002; February and March 2006; December 2006 to March 2007; and December 2008 to March 2009 (Wessex Ecological Consultancy 2002, 2006, 2007 and 2009).
- In the absence of accurate spatial information pertaining to distributions of waders in Avonmouth (see Section 5.1 and Cresswell Associates (2010) for further details), the areas of grazing pasture which are predicted could be subject to habitat loss at Avonmouth have been subjectively estimated based upon a combination of: (i) the numbers of birds recorded at a given location (based upon the Stage 1 report outcomes (Cresswell Associates, 2010); and (ii) the extent of grazing pasture (or other terrestrial habitat) which appears to be available for use by these birds at that location (as indicated by the latest aerial photographs and Ordnance Survey (OS) maps available for the area).
- In the event that either habitat loss, disturbance or (in the case of Avonmouth) displacement could affect an inland wetland/grazing pasture site (depending upon the nature and extent of future development proposals), it has been assumed that habitat loss would occur and no further consideration is given to the remaining impact types, to avoid 'double counting' potential impacts.
- Habitat loss would lead to the complete displacement of waterfowl from each wetland/grazing site (where birds have been identified as being present within the baseline conditions); and
- Displaced birds may not necessarily be accommodated at other nearby wetland areas (e.g. estuarine habitats or other inland wetland sites).

6.1.2 In the absence of any specific details regarding how any future development proposals could affect existing habitats, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).



6.2 Disturbance

6.2.1 The following assumptions have been adopted in carrying out the Review of Consent and Avonmouth impact assessment in relation to disturbance:

- Disturbance impacts could occur in relation to any areas of inland (wetland/grazing pasture) habitat which: (i) have been found/assumed to support wintering waterfowl; and (ii) are located within approximately 250m of the 1957/58 Severnside Consent Area and the Avonmouth employment area.
- The areas of waterbodies which are predicted to be subject to disturbance have been calculated from aerial photographs and Ordnance Survey (OS) maps for the area. In some cases, it has not been possible to undertake a ground-truthing exercise to validate the continued presence of individual waterbodies, due to land access restrictions. Therefore, their continued presence has been inferred on the basis of the latest aerial photographs and OS maps available for the area.
- For the purposes of the Review of Consent, the areas of grazing pasture at Severnside which are predicted to be subject to habitat loss have been calculated from the findings of the Severnside Bird Surveys, carried out by Wessex Ecological Consultancy over the following periods: December 2001 and January 2002; February and March 2006; December 2006 to March 2007; and December 2008 to March 2009 (Wessex Ecological Consultancy 2002, 2006, 2007 and 2009).
- In the absence of accurate spatial information pertaining to distributions of waders in Avonmouth (see Section 5.1 and Cresswell Associates (2010) for further details), the areas of grazing pasture which are predicted could be subject to bird disturbance at Avonmouth have been subjectively estimated based upon a combination of: (i) the numbers of birds recorded at a given location (based upon the Stage 1 report outcomes (Cresswell Associates, 2010)); and (ii) the extent of grazing pasture (or other terrestrial habitat) which appears to be available for use by these birds at that location (as indicated by the latest aerial photographs and Ordnance Survey (OS) maps available for the area).
- In the event that either habitat loss, disturbance or (in the case of Avonmouth) displacement could affect a wetland/grazing pasture site (depending upon the nature and extent of future development proposals), it has been assumed that habitat loss would occur and no further consideration is given to disturbance, to avoid 'double counting' potential impacts.
- Where relevant, disturbance would lead to the complete displacement of waterfowl from each (wetland/grazing pasture) site.
- Displaced birds may not necessarily be accommodated at other nearby wetland areas (e.g. estuarine habitats or other inland wetland sites).
- Disturbance impacts could be generated by a number of potential sources (e.g. noise and vibration, human presence, artificial lighting, etc).
- Disturbance could relate to the construction and/or operational phases of nearby development and would remain on-going in perpetuity.
- Waterfowl would not become habituated to levels of development-related disturbance over the course of time.
- The effects of screening and/or buffers to disturbance would not be factored in to the impact assessments (unless otherwise stated).



6.3 Displacement

6.3.1 The following assumptions have been adopted in carrying out the Avonmouth impact assessment in relation to the BCSES:

- Displacement of waterfowl could arise through activities associated with the construction, operation and/or decommissioning of wind turbines. Essentially, this impact entails the displacement of birds due to noise, visual and human disturbance associated with the construction and operational disturbance of wind turbines. To avoid confusion with disturbance impacts associated with the Avonmouth employment area, the term displacement has been adopted in relation to the BCSES.
- Displacement impacts could occur in relation to any areas of inland (wetland/grazing pasture) habitat which: (i) have been found/assumed to support wintering waterfowl; and (ii) are located within approximately 600m of the any areas identified as having potential for wind turbine proposals (as identified by the BCSES). This displacement distance has been adopted based upon the findings of (Drewitt & Langstone, 2006).
- The areas of waterbodies which are predicted to be subject to disturbance have been calculated from aerial photographs and Ordnance Survey (OS) maps for the area. In some cases, it has not been possible to undertake a ground-truthing exercise to validate the continued presence of individual waterbodies, due to land access restrictions. Therefore, their continued presence has been inferred on the basis of the latest aerial photographs and OS maps available for the area.
- In the absence of accurate spatial information pertaining to distributions of waders in Avonmouth (see Section 5.1 and Cresswell Associates (2010) for further details), the areas of grazing pasture which are predicted could be subject to bird displacement at Avonmouth have been subjectively estimated based upon a combination of: (i) the numbers of birds recorded at a given location (based upon the Stage 1 report outcomes (Cresswell Associates, 2010); and (ii) the extent of grazing pasture (or other terrestrial habitat) which appears to be available for use by these birds at that location (as indicated by the latest aerial photographs and Ordnance Survey (OS) maps available for the area).
- For the purposes of the Review of Consent, the areas of grazing pasture at Severnside which are predicted to be subject to habitat loss have been calculated from the findings of the Severnside Bird Surveys, carried out by Wessex Ecological Consultancy over the following periods: December 2001 and January 2002; February and March 2006; December 2006 to March 2007; and December 2008 to March 2009 (Wessex Ecological Consultancy 2002, 2006, 2007 and 2009).
- In the event that either habitat loss, disturbance or (in the case of Avonmouth) displacement could affect a wetland/grazing pasture site (depending upon the nature and extent of future development proposals), it has been assumed that habitat loss would occur and no further consideration is given to displacement, to avoid 'double counting' potential impacts.
- Waterfowl would not become habituated to the operation of turbines over the course of time.
- All birds using (wetland) sites would be displaced.
- Displaced birds may not necessarily be accommodated at other nearby wetland areas (e.g. estuarine habitats or other inland wetland sites).

6.4 Cumulative impacts

6.4.1 The following assumptions have been adopted when taking into consideration other relevant plans and projects during the Review of Consent and Avonmouth impact assessment:



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- Consideration has been given to a number of development proposals in Avonmouth which had received planning consent (but were not yet constructed) at the time of commencing the Stage 2 assessments (March 2010). Further details of these projects are provided in Paragraphs 3.3.6 to 3.3.11. The Stage 2 assessments take some account of the predicted impacts associated with these projects, in determining whether with the impacts under consideration for the Review of Consent and Avonmouth impact assessment could have a significant effect upon the integrity of the Severn Estuary SPA and Ramsar site.
 - Consideration has not been given to other relevant plans and projects outwith the study area, which could also affect the Severn Estuary SPA/Ramsar site Qualifying Species and Qualifying Assemblage in combination with development associated with the 1957/58 Severnside Consent Area, the Avonmouth employment area and the BCSES. Such plans/projects could include development proposals located upstream/downstream of the study area (e.g. Bridgewater Bay), or at estuarine locations along the Welsh coastline. Whilst these plans/projects remain relevant to the Stage 2 assessments, their inclusion has been deemed to fall outwith the scope of this study due to the complexity of the impact assessments that would be required. This approach has been development in consultation and agreement with the Project Partnership.



7.0 Review of the 1957/58 Severnside Planning Consent

7.1 Introduction

- 7.1.1 The Review of the 1957/58 Severnside Consent is required under The Conservation of Habitats and Species Regulations, 2010 (hereafter referred to as 'the Habitats Regulations'), and is being undertaken on behalf of South Gloucestershire Council (the 'competent authority'). The Habitats Regulations require the review of outstanding decisions, permissions, consents and other authorisations, not yet completed, which would be likely to have a significant effect on a European site (either individually, or in combination with other plans and projects), and which would not be directly connected with, or necessary to the management of the site (English Nature, 1997).

7.2 Qualifying Species: Gadwall

- 7.2.1 As described in Section 5.2 and shown on Figure 4a, an estimated total wintering population of 40 birds (i.e. 15.8% of the total Severn Estuary population) has been assumed to use the following waterbodies within the footprint of the 1957/58 Severnside Planning Consent: Orchard Pools; pools to the south of the Avlon Works; pools to the east of Grove Farm; and pools adjacent to the M49 motorway corridor.
- 7.2.2 The following table summarises the potential impacts under consideration in relation to gadwall, as a result of the 1957/58 Severnside Planning Consent.

<i>Estimated wintering number: 40 birds (15.8% of the total Severn Estuary population and 0.06% of the Qualifying Assemblage)</i>	1957/58 Severnside Consent Area Impacts	
	Habitat loss	Disturbance
Site Name (and Figure 4a reference)	Number / Area (m²)	Number / Area (m²)
Orchard Pools (1)	-	2 / 17,400
Pools to the south of the Avlon Works (2)	3 / 11,100	-
Pools to the east of Grove Farm (3)	2 / 5,520	1 / 1,480
Pools adjacent to the M49 corridor (4)	2 / 5,370	-
The rhyne and ditch network within the 1957/58 Severnside Consent Area (n/a)	*	*
Total	7 / 21,990*	3 / 18,800*

- No impact predicted.
- It is not possible to quantify accurately the extent of rhyne network used by this species and, therefore this information has not been included when quantifying areas of wetland habitat which could be affected.

Habitat loss

- 7.2.3 For the purposes of this Review of Consent, it has been assumed that the implementation of the 1957/58 Planning Consent could give rise to development proposals which result in the permanent 'loss' of seven freshwater bodies, collectively equating to approximately 21,990m² of wetland habitat (as summarised in the previous table, above). In the absence of any specific details regarding how any future development proposals could affect these water bodies, this



approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

- 7.2.4 As described in Paragraph 3.2.8, Orchard Pools would be safeguarded from any direct habitat loss associated with the implementation of the 1957/58 Planning Consent, as a result of the (WAP1) Section 106 Agreement. In determining the baseline conditions for gadwall within the Severnside study area, it was assumed that Orchard Pools may support up to 25 birds (see Section 5.2 for further details). Therefore, the retention of this wetland site could result in continued provision of foraging and/or roosting habitat for a relatively substantial proportion of Severnside's gadwall population.
- 7.2.5 Nevertheless, it is still considered possible that the 'loss' of the remaining seven freshwater bodies within the footprint of the 1957/58 Planning Consent could represent a potentially significant impact in relation to foraging (and potentially roosting) gadwall. In determining the baseline conditions for gadwall within the Severnside study area, it was assumed that these waterbodies collectively may support up to 15 birds (see Section 5.2 for further details), which represents approximately 6% of the Severn Estuary's wintering gadwall population. Therefore, the displacement of an apparent small number of birds from these waterbodies would still be considered to represent a potentially significant impact in the context of the entire estuary population.
- 7.2.6 It is also feasible that the significance of this potential impact may increase further, when considered in combination with the potential ecological effects of other consented development proposals in the study area. In particular, the Severnside bird surveys have identified this species' usage of intertidal areas within the study area tends to focus on specific locations. The Severnside Bird Surveys have shown that gadwall tend to feed on either the middle saltmarsh, or (more often) on the lower saltmarsh particularly around the 'pills' and smaller inlets within the study area (Wessex Ecological Consultancy, 2007). The Stage 1 report findings indicate that the intertidal habitats at the southern end of the study area (particularly in the vicinity of the saltmarsh 'pills') have previously held counts of up to 62 birds (i.e. approximately 25% of the Severn Estuary's wintering gadwall population). As described previously in Paragraph 3.3.6, the construction of the consented Deep Sea Container Terminal at Avonmouth is predicted to give rise to a number of impacts, which include:
- the permanent loss of up to 20ha of intertidal habitat within the footprint of the reclamation area (including 2ha of intertidal habitat within the boundary of the Severn Estuary SPA and Ramsar site); and
 - the degradation of up to 65ha of intertidal mudflat and saltmarsh, upstream of the reclamation area and within the SPA and Ramsar site, as a result of sediment accretion.
- 7.2.7 The ES for the Deep Sea Container Terminal at Avonmouth does not identify significant impacts upon gadwall through habitat loss within the footprint of the reclamation area (Bristol Port Company, 2008). However, potentially significant impacts could occur in relation to sediment accretion (albeit that a level of uncertainty surrounding the likelihood of effects and significance of these potential impacts is acknowledged (Bristol Port Company, 2008)). Based upon a worst case scenario, it is possible that this impact could result in the permanent displacement of gadwall from up to 65ha of intertidal mudflat and saltmarsh, upstream of the proposed Deep Sea Container Terminal footprint.
- 7.2.8 Whilst the study area contains a range of other wetland sites with potentially suitable habitat for this species, which would not be directly affected by the Deep Sea Container Terminal (e.g. the areas of saltmarsh at the northern end of Chittening Warth and at Severn Beach, as well as



Orchard Pools, Avonmouth Pools and other nearby freshwater bodies), it is possible that they could be indirectly affected by increased levels of foraging pressure, due to birds being displaced from the affected areas of intertidal habitat the southern and central sections of Chittering Warth. As a result, it is considered feasible that these areas could reach their carrying capacity in relation to this species (if this is not already the case) following construction of the Deep Sea Container Terminal.

- 7.2.9 In addition, the operation of proposed wind farm developments at Avonmouth Sewage Works and Chittering (see Figure 4b) could generate further cumulative impacts upon this species. Potentially significant impacts upon the integrity of the Severn Estuary SPA and Ramsar site have not been predicted as a result of these developments, when considered in isolation (see Paragraphs 3.3.14 and 3.3.15, Wessex Water, 2008, and Landmark Practice, 2008 for further details). However, it is considered feasible that further in combination displacement effects could arise, as a result of operational disturbance to feeding (and potentially roosting) gadwall in the vicinity of these sites.
- 7.2.10 Furthermore, it is also predicted that a total of 11 pools (which equate to 41,000m² of wetland habitat) could be affected by habitat loss through potential future development taking place within the Avonmouth employment area, which could lead to additional displacement effects upon gadwall in the study area (see Section 8.2 for further details).
- 7.2.11 When considered in the context of other potential and consented development proposals within the study area (described above), it is considered feasible that birds which are displaced from freshwater bodies (as a result of land-take associated with 1957/58 Severnside Planning Consent) may not necessarily be accommodated within other areas of suitable estuarine and freshwater habitat due to: (a) possible displacement effects at other nearby wetland sites within the study area, which (although not found to be significant in isolation) could reduce the overall carrying capacity of these wetland areas; and (b) the potential for increased levels of foraging pressure at these sites. Therefore, in the context of these consented development proposals, the loss of the freshwater sites identified within the footprint of the 1957/58 Severnside Planning Consent could represent a potentially significant impact upon gadwall.
- 7.2.12 The Severn Estuary SPA's conservation objective for gadwall is to maintain the population and its supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining this species' favourable condition status include a five year peak mean population size, which is no less than 330 birds (Natural England & Countryside Council for Wales, 2009). Five year peak mean WeBS data for the period 2003/4-2007/8 suggest that the Severn Estuary's wintering gadwall population has declined to 253 birds and, therefore, the Severn Estuary could be regarded as failing to meet its conservation objective for this species at present. In view of this, and given the number of gadwall which could be affected by land-take associated with the 1957/58 Planning Consent (alone and in combination with other consented developments), habitat loss could be regarded as having potentially significant effect upon the favourable condition status of the gadwall population within the SPA, as well as the integrity of the Severn Estuary SPA and Ramsar site. Further mitigation measures would, therefore, be required (see Section 6.3 for further details).

Disturbance

- 7.2.13 Orchard Pools and a pool to the east of Grove Farm would be subject to land-take associated with the 1957/58 Planning Consent. However, they are considered to be located sufficiently close to the consented area such that any gadwall present could be subject to increased levels of noise and visual disturbance, which could give rise to these birds being displaced from these



wetland sites (either on a short-term, or a more prolonged/permanent basis). In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership). As a worst case scenario, it has been assumed that the seven water bodies within the footprint of the 1957/58 Planning Consent would only be subject to direct habitat loss. For the purposes of the Review of Consent, it has therefore been assumed that none of these waterbodies could also be subject increased levels of disturbance. In view of this assumption, it is only considered appropriate to make an assessment of potential disturbance impacts upon gadwall at the two wetland sites. Further details pertaining to the potential for disturbance-related impacts at each of these wetland sites are provided in the following paragraphs.

- 7.2.14 Orchard Pools would be safeguarded from any direct habitat loss associated with the implementation of the 1957/58 Planning Consent, as a result of the (WAP1) Section 106 Agreement. However, it is feasible that future development works could take place immediately adjacent to this wetland site (as shown on Figure 4a). Under these circumstances, there is considered to be potential for this wetland site to be subject to increased levels of noise and visual disturbance through the construction and/or operation of any future development (depending upon the timing, nature and extent of any development proposals in this area (e.g. wind farm development)). In determining the baseline conditions for gadwall within the Severnside study area, it was assumed that Orchard Pools may support up to 25 birds, based upon the findings of the Severnside Bird Surveys (see Paragraph 5.2.3 and Cresswell Associates, 2010 for further details). This represents approximately 10% of the Severn Estuary's wintering population of this species (based upon five year peak mean data for the period 2003/4 to 2007/8), which could be affected by this impact.
- 7.2.15 The water body to the east of Grove Farm is located outwith the 1957/58 Severnside Consent Area and, therefore, would not be directly affected by development proposals associated with this planning consent. However, the northern boundary of the 1957/58 Severnside Consent Area is situated approximately 25m to the south of this water body and depending upon the timing, nature and extent of any development proposals in this area (e.g. wind farm development), it is possible that gadwall (if present) could be subject to increased levels of noise and visual disturbance, which could give rise to these birds being displaced from this water body (either on a short-term, or a more prolonged/permanent basis). In determining the baseline conditions for gadwall within the Severnside study area, it was assumed that this water body (in combination with a further seven water bodies located within the footprint of the 1957/58 Planning Consent Area (see Figure 4a)) could support a wintering population of 15 birds. Based upon this assumption, this would represent approximately 6% of the Severn Estuary's wintering gadwall population. Therefore, the displacement of an apparent small number of birds from these waterbodies would still be considered to contribute to a potentially significant impact in the context of the entire estuary population, in particular when considered in the context of the potential effects of increased levels of disturbance at Orchard Pools.
- 7.2.16 Given the numbers of birds which could be affected at these wetland sites (and, in particular, when these are considered in the context of the Severn Estuary's entire wintering gadwall population), it is considered feasible that increased levels of disturbance could represent a potentially significant impact upon this species. Furthermore, it is possible that it could make a contribution to a larger and potentially significant cumulative impact, relating to the in combination effects of disturbance and/or habitat loss with development arising from: (a) the 1957/58 Severnside Planning Consent; (b) the Avonmouth employment area and the BCSes; and (c) other consented developments within the study area.



- 7.2.17 The Severn Estuary SPA's conservation objective for gadwall is to maintain the population and its supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining this species' favourable condition status, in the context of this project include:
- Aggregations of gadwall at feeding or roosting sites are not subject to significant disturbance.
- 7.2.18 It is considered feasible that the effects of increased levels of disturbance associated with the 1957/58 Planning Consent could involve the (permanent) displacement of (at least a) proportion of the gadwall from Severnside. In view of this, the Severn Estuary could be regarded as failing to meet its conservation objective for this species in the event that further development takes place under the 1957/58 Planning Consent.
- 7.2.19 Given the numbers of birds which have been identified within the Severnside, this potential impact is considered to affect a significant proportion of the entire SPA assemblage and, therefore, it is considered feasible that a potentially significant impact upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).



Summary of Impacts upon Gadwall

A summary of the potential impacts which have been assessed in relation to Gadwall (as a SPA/Ramsar Qualifying Species) is described in the following table.

Species and estimated wintering number	Impact type	Impact description	Potential Impact Significance (Y/N)		Justification	Mitigation required (Y/N)
			Stand-alone	Cumulative		
Gadwall (Figure 4a) 15 birds (6% of the Severn Estuary population)	Habitat loss	Potential loss of 7 pools with a combined surface area of 21,990m ²	Y	Y	Given the numbers of birds which could potentially be affected by habitat loss and disturbance, these impacts are considered to have the potential for significant effect upon the favourable condition status of this species' population, and the integrity of the Severn Estuary SPA and Ramsar site, on a stand-alone basis and in combination with other habitat loss/disturbance/displacement impacts.	Y
Gadwall (Figure 4a) 40 birds (15.8% of the Severn Estuary population)	Disturbance	Potential disturbance to Orchard Pools and a pool to the east of Grove Farm, with a combined surface area of 18,800m ²	Y	Y		Y



7.3 Qualifying Assemblage: Wildfowl

7.3.1 The following species of wildfowl are under consideration in relation to potentially significant impacts upon the SPA assemblage: gadwall; teal; tufted duck; and mallard. A detailed description of the impacts upon gadwall is presented in Section 7.2; the following paragraphs provide an assessment of the possible impacts in relation to the remaining species of wildfowl. The following table provides a summary of the potential scale of habitat loss and disturbance impacts in relation to these species, which could potentially arise as a result of the 1957/58 Severnside Planning Consent.

Species and estimated wintering number	Site Name (and Figure reference)	1957/58 Severnside Consent Area Impacts	
		Habitat loss	Disturbance
		Number / Area (m ²)	Number / Area (m ²)
Teal (Figure 5a) 50 birds (1.2% of the Severn Estuary population and 0.06% of the Qualifying Assemblage)	Orchard Pools (1)	-	2 / 17,400
	Pools to the south of the Avlon Works (2)	3 / 11,100	-
	Pools to the east of Grove Farm (3)	2 / 5,520	1 / 1,480
	Pools adjacent to the M49 corridor (4)	2 / 5,370	-
	Red Rhyne (5)	*	-
	Astra Zeneca Fields (6)	*	-
	Dyer's Common (7)	*	-
	The rhyne and ditch network within the 1957/58 Severnside Consent Area (n/a)	*	-
Total		7 pools / 21,990*	3 pools / 18,800*
Tufted duck (Figure 7a) 10 birds (1.8% of the Severn Estuary population and 0.01% of the Qualifying Assemblage)	Orchard Pools (1)	-	2 / 17,400
	Pools to the south of the Avlon Works (2)	3 / 11,100	-
	Pools to the east of Grove Farm (3)	2 / 5,520	1 / 1,480
	Pools adjacent to the M49 corridor (4)	2 / 5,370	-
	Total	7 pools – 21,990	3 pools / 18,800
Mallard (Figure 9a) 110 birds (4.1% of the Severn Estuary population and 0.16% of the Qualifying Assemblage)	Orchard Pools (1)	-	2 / 17,400
	Pools to the south of the Avlon Works (2)	3 / 11,100	-
	Pools to the east of Grove Farm (3)	2 / 5,520	1 / 1,480
	Pools adjacent to the M49 corridor (4)	2 / 5,370	-
	Red Rhyne (5)	*	*
	The rhyne and ditch network within the 1957/58 Severnside Consent Area (n/a)	*	*
	Total	7 pools / 21,990*	3 pools / 18,880*

- No impact predicted.

* It is not possible to quantify accurately the extent of rhyne network used by this species and, therefore this information has not been included when quantifying areas of wetland habitat which could be affected.

Habitat loss

7.3.2 For the purposes of this Review of Consent, it has been assumed that the implementation of the 1957/58 Planning Consent could give rise to development proposals which result in the permanent 'loss' of seven freshwater bodies, collectively equating to approximately 21,990m² of wetland habitat (as summarised in the previous table, above). All of these water bodies have been identified/assumed to support teal tufted duck and mallard during the winter months. In addition, parts of the rhyne network within the footprint of the 1957/58 Planning Consent Area have been identified/assumed to support these wildfowl species; however, it is not possible to



quantify the area of rhine habitat. In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

- 7.3.3 As described in Paragraph 3.2.8, Orchard Pools would be safeguarded from any direct habitat loss associated with the implementation of the 1957/58 Planning Consent, as a result of the (WAP1) Section 106 Agreement. The retention of this wetland site could result in continued provision of foraging and/or roosting habitat for at least a proportion of Severnside's wintering wildfowl population. In particular, Orchard Pools was identified as the only remaining inland wetland site in Severnside for which desk study records of tufted duck were identified during the preparation of the Stage 1 report (see Cresswell Associates, 2010 for further details). Furthermore, records of relatively small numbers of teal and mallard using this wetland site were also identified (see Cresswell Associates, 2010 for further details).
- 7.3.4 Notwithstanding the retention of Orchard Pools, it is still considered possible that the 'loss' of the remaining seven water bodies within the footprint of the 1957/58 Planning Consent could result in an associated reduction in foraging (and potentially roosting) opportunities for wildfowl, with possible displacement effects arising. Furthermore, the reclamation and/or culverting of rhynes under the footprint of the 57/58 Severnside Consent Area could increase the magnitude of this impact further, particularly in relation to teal and mallard, which are known to frequent smaller and less expansive water features, such as these (e.g. Red Rhine and Dyer's Common).
- 7.3.5 Information pertaining to the distribution of tufted duck indicates that this species does not frequent estuarine habitats within the study area (with Oldbury Power Station and Tortworth Lake identified as the only other sites in South Gloucestershire which regularly support this species (Wessex Ecological Consultancy, 2009)). Based upon a worst case scenario, it is considered reasonable to assume that the loss of these waterbodies could lead to the permanent displacement of at least a proportion of these birds from Severnside study area. In addition to inland freshwater habitats, teal and mallard are known to utilise estuarine habitats within the study area. Therefore, it is possible that the loss of inland water bodies could lead to the displacement of a proportion of these birds to other inland estuarine sites. The displacement of birds from the 1957/58 Severnside Consent Area could also lead to a number of cumulative impacts associated with potential and consented developments elsewhere within the study area. These are discussed in more detail in relation to gadwall (see Paragraphs 7.2.6 to 7.2.11) and are also applicable to the other relevant species of waterfowl under consideration as part of the Qualifying Assemblage within the Review of Consent.
- 7.3.6 In order to determine whether this level of habitat loss could represent a potentially significant impact upon the favourable condition status of the Severn Estuary SPA and Ramsar qualifying assemblage (either alone or in combination with other potential/consented development proposals within the study area), it is necessary to consider the effects of habitat loss upon curlew, lapwing and snipe (which also form part of the SPA Qualifying Assemblage under consideration within the impact assessment). Therefore, the significance of habitat loss in relation to all relevant wildfowl species within the Qualifying Assemblage is discussed in Section 7.5.

Disturbance

- 7.3.7 As described for gadwall, the potential also exists for increased levels of disturbance to occur at Orchard Pools and a water body to the east of Grove Farm (see Target Note 3 on Figures 5a, 7a & 9a), which could potentially give rise to displacement effects upon these species of



waterfowl (if present), depending upon the timing, nature and extent of any development proposals in this area. An assessment of this potential impact is provided in relation to gadwall and is considered to be applicable to the other relevant wildfowl species within the Qualifying Assemblage, given that all of these species have been confirmed or assumed to be present at these water bodies during the winter months.

- 7.3.8 In order to determine whether this potential impact could have a potentially significant effect upon the favourable conservation status of the Severn Estuary SPA and Ramsar qualifying assemblage, it is necessary to consider the effects of disturbance upon curlew, lapwing and snipe (which also form part of the waterfowl assemblage under consideration within the impact assessment). Therefore, the significance of disturbance in relation to all relevant species within the Qualifying Assemblage is discussed in Section 7.5.

7.4 Qualifying Assemblage: Waders

- 7.4.1 The following species of wader are under consideration in relation to potentially significant impacts upon the SPA assemblage: curlew; lapwing; and common snipe.

Curlew

- 7.4.2 The following table provides a summary of the potential scale of habitat loss and disturbance impacts in relation to curlew, which could potentially arise as a result of the 1957/58 Severnside Planning Consent.

<i>Estimated wintering number: 104 birds (3.9% of the Severn Estuary population and 0.15% of the Qualifying Assemblage)</i>	1957/58 Severnside Consent Area Impacts	
	Habitat loss	Disturbance
Site Name (and Figure 8a reference)	Number / Area (m²)	Number / Area (m²)
Fields to the east of the M49 motorway (1)	253,900	90,500
The Astra Zeneca Fields (2) ¹	200,150	-
Grazing pasture at Whitehouse Farm (3)	-	43,500
The Horse Fields (4)	-	73,700
Grazing pasture at Crook's Marsh (5)	-	59,700
Total	454,050	267,400

¹ although a small amount of the Astra Zeneca Fields would be safeguarded from future development under the (WAP1) S106 Agreement, this area of land is considered likely to be too small and fragmented to function as viable feeding and roosting habitat for curlew. Therefore, it has been assumed that land-take under the footprint of the 1957/58 Planning Consent would equate to the complete 'loss' of the Astra Zeneca fields.

- No impact predicted.

Habitat loss

- 7.4.3 As shown on Figure 8a, the following areas of grazing pasture are located within the footprint of the 57/58 Severnside Planning Consent Area, and collectively these are considered likely to support up to 104 curlews during the winter (based upon the findings of the Severnside Bird Surveys Study (Wessex Ecological Consultancy, 2002, 2006, 2007 and 2009):

- Approximately 253,900m² of grazing pasture within fields to the east of the M49 motorway (Target Note 1); and
- Approximately 200,147m² of grazing pasture within the Astra Zeneca fields (Target Note 2).



- 7.4.4 For the purposes of the Review of Consent, it has been assumed that the implementation of the 1957/58 Planning Consent could give rise to development proposals which result in the permanent 'loss' of these areas of grazing pasture. The 'loss' of these areas would be expected to result in reductions in foraging (and potentially roosting) opportunities for this species, possibly leading to associated displacement effects. In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).
- 7.4.5 These areas of grazing pasture have been found to represent a key feeding site for this species, with approximately 3.8% of the entire Severn Estuary curlew population using these areas (Cresswell Associates, 2010). Curlews have been recorded foraging continuously within these fields throughout the tidal cycle, as well as bathing in puddles of standing water which form over the winter months (Wessex Ecological Consultancy, 2002). Although the patterns of curlew usage within specific fields has been shown to vary between years (Wessex Ecological Consultancy, 2002, 2006, 2007 & 2009), a substantial amount of interchange has been shown to take place between birds using these fields, adjacent areas of pasture outwith the 1957/58 Severnside Consent Area and nearby estuarine areas. Furthermore, these fields have been found to represent important refuges for birds which have been displaced from estuarine roosting sites (such as the saltmarsh to the southern end of Severn Beach), as a result of human disturbance (Wessex Ecological Consultancy, 2002).
- 7.4.6 The potential for a significant impact to occur could increase further, when land-take associated with the 57/58 Severnside Planning Consent is considered in the context of impacts upon this species associated with:
- the Avonmouth employment area and BCSES;
 - the consented Deep Sea Container Terminal at Avonmouth; and
 - the consented wind farm developments at Avonmouth Sewage Works and Chittening.
- 7.4.7 As described for gadwall, the predicted loss and/or degradation of intertidal habitats arising from the construction of the Deep Sea Container Terminal at Avonmouth, in combination with possible displacement effects arising from the operation of the consented wind farm developments could place unsustainable levels of foraging (and possibly roosting) pressure upon unaffected areas of saltmarsh and intertidal mudflats in the vicinity of Severn Beach and the northern section of Chittening Warth. Under these conditions, it is anticipated that the importance of inland grazing pasture for curlew could increase substantially (given the extent of interchange of birds using the estuarine and inland sites which already exists, particularly in relation to human disturbance along the estuary). Further losses of habitat arising as a result of the 57/58 Severnside Consent could lead to associated reductions in the overall carrying capacity of these areas, which could result in the displacement of curlew from the Severnside area (and possibly the entire study area) altogether.
- 7.4.8 In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl species within Qualifying Assemblage. Therefore, the significance of disturbance in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Section 7.5.



Disturbance

7.4.9 In addition to habitat loss, it is also possible that significant numbers of curlew could become displaced from other areas of grazing pasture in close proximity to the boundary of the 1957/58 Severnside Consent Area. As shown on Figure 8a, these areas comprise:

- approximately 90,500m² of grazing pasture within fields to the east of the M49 motorway, which is located immediately adjacent to (and also extends across) the northern boundary of 1957/58 Severnside Consent Area (see Target Note 1);
- approximately 43,500m² of grazing pasture within fields at Whitehouse Farm, which is located approximately 275m to the west of the 1957/58 Severnside Consent Area (see Target Note 3);
- approximately 73,700m² of grazing pasture within 'the Horse Fields', which is located immediately adjacent to the northern boundary of the 1957/58 Severnside Consent Area (see Target Note 3); and
- approximately 59,700m² of grazing pasture within fields at Crook's Marsh, which is located immediately adjacent to the southern boundary of the 1957/58 Severnside Consent Area (see Target Note 5);

7.4.10 Given the close proximities of these areas of grazing pasture to the 1957/58 Severnside Consent Area, it is possible that significant numbers of curlew could be subject to increased levels of development-related noise and visual disturbance, depending upon the timing, nature and extent of any development proposals in this area. As a result, these areas of habitat could be rendered unavailable for use as feeding and roosting areas, either on a short-term basis (for example, the short-lived duration of nearby construction works), or for more prolonged periods/permanently (e.g. during the operational phase of a nearby wind farm development). In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

7.4.11 The potential for a significant impact to occur could increase further, when its effects are considered in combination with those associated with:

- the potential for habitat loss associated with the implementation of the 1957/58 Planning Consent;
- the Avonmouth employment area and BCSES;
- the consented Deep Sea Container Terminal at Avonmouth; and
- the consented wind farm developments at Avonmouth Sewage Works and Chittening.

In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of disturbance upon all relevant species within the Qualifying Assemblage. Therefore, the significance of disturbance in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Section 7.5.



Lapwing

- 7.4.12 The following table provides a summary of the potential scale of habitat loss and disturbance impacts in relation to lapwing, which could arise as a result of the 1957/58 Severnside Planning Consent.

<i>Estimated wintering number: 707 birds (5.5% of the Severn Estuary population and 1% of the Qualifying Assemblage)</i>	1957/58 Severnside Consent Area Impacts	
	Habitat loss	Disturbance
Site Name (and Figure 10a reference)	Number / Area (m ²)	Number / Area (m ²)
Fields to the east of the M49 motorway (1)	253,900	90,500
Marsh Common (2)	48,000	-
Brook Farm (3)	155,000	-
Red Rhyne (4)	-	-
Total	456,900	90,500

- no impact predicted

Habitat loss

- 7.4.13 As shown on Figure 10a, the following areas of grazing pasture are located within the footprint of the 1957/58 Planning Consent Area and (based upon existing desk-based records), collectively, these are considered to support flocks of up to 707 lapwings during the winter for the purposes of the Review of Consent:

- Approximately 253,900m² of grazing pasture within fields to the east of the M49 motorway (Target Note 1); and
- Approximately 48,000m² of grazing pasture within Marsh Common (Target Note 2); and
- Approximately 155,000m² of grazing pasture within Brook Farm (Target Note 3).

- 7.4.14 For the purposes of the Review of Consent, it has been assumed that the implementation of the 1957/58 Planning Consent could give rise to development proposals which result in the permanent 'loss' of these areas of grazing pasture. The 'loss' of these areas would be expected to result in reductions in foraging (and potentially roosting) opportunities for this species, possibly leading to associated displacement effects. In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

- 7.4.15 It is considered feasible that the 'loss' of these areas could result in an associated reduction in foraging (and potentially roosting) opportunities for this species, with associated displacement effects arising. In particular, these areas of pasture have been found to represent a key feeding site for this species, with approximately 5.5% of the entire Severn Estuary lapwing population using these areas (Cresswell Associates, 2010). Further contextual information pertaining to the patterns of this species' usage of this area has been obtained, which indicates that a degree of interchange takes place between birds at inland sites and estuarine sites (J. Martin, (Natural England) *pers comm.*).

- 7.4.16 The potential for a significant impact to occur could increase further, when land-take associated with the 57/58 Severnside Planning Consent is considered in the context of impacts upon this species associated with:



- the Avonmouth employment area and BCSES;
- the consented Deep Sea Container Terminal at Avonmouth; and
- the consented wind farm developments at Avonmouth Sewage Works and Chittening.

7.4.17 As described for gadwall, the predicted loss and/or degradation of intertidal habitats arising from the construction of the Deep Sea Container Terminal at Avonmouth, in combination with possible displacement effects arising from the operation of the consented wind farm developments could place unsustainable levels of foraging (and possibly roosting) pressure upon unaffected areas of saltmarsh and intertidal mudflats in the vicinity of Severn Beach and the northern section of Chittening Warth. Under these conditions, it is anticipated that the importance of inland grazing pasture for lapwing could increase substantially (given the likelihood of interchange of birds using the estuarine and inland sites). Further losses of habitat arising as a result of the 57/58 Severnside Consent could lead to associated reductions in the overall carrying capacity of these areas, which could result in the displacement of lapwing from the Severnside area (and possibly the entire study area) altogether.

7.4.18 In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl species within the Qualifying Assemblage. Therefore, the significance of habitat loss in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Section 7.5.

Disturbance

7.4.19 In addition to habitat loss, it is also possible that significant numbers of lapwings could become displaced from approximately 90,500m² of grazing pasture within fields to the east of the M49 motorway (see Target Note 1 on Figure 10a). This area of pasture is located immediately adjacent to (and also extends across) the northern boundary of 1957/58 Severnside Consent Area. As described for curlew (see Paragraphs 7.4.9 and 7.4.10), it is possible that this area of pasture could be rendered unavailable to significant numbers of lapwing, as a result of increased levels of development-related noise and visual disturbance (depending upon the timing, nature and extent of any development proposals in this area). In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

7.4.20 As described for gadwall, the predicted loss and/or degradation of intertidal habitats arising from the construction of the Deep Sea Container Terminal at Avonmouth, in combination with possible displacement effects arising from the operation of the consented wind farm developments could place unsustainable levels of foraging (and possibly roosting) pressure upon unaffected areas of saltmarsh and intertidal mudflats in the vicinity of Severn Beach and the northern section of Chittening Warth. Under these conditions, it is anticipated that the importance of inland grazing pasture for lapwing could increase substantially (given the likelihood of interchange of birds using the estuarine and inland sites). An increase in development-related disturbance as a result of the 57/58 Severnside Consent could lead to associated reductions in the overall carrying capacity of these areas, which could result in the displacement of lapwing from the Severnside area (and possibly the entire study area) altogether.



- 7.4.21 In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of disturbance upon all relevant waterfowl species within the Qualifying Assemblage. Therefore, the significance of disturbance in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Section 7.5.

Common snipe

- 7.4.22 The following table provides a summary of the potential scale of habitat loss and disturbance impacts in relation to common snipe, which could potentially arise as a result of the 1957/58 Severnside Planning Consent.

<i>Estimated wintering number: 53 birds (12.2 % of the Severn Estuary population and 0.08% of the Qualifying Assemblage)</i>	1957/58 Severnside Consent Area Impacts	
	Habitat loss	Disturbance
Site Name	Number / Area (m²)	Number / Area (m²)
Assumed to be present at specific locations within areas of grazing pasture and wetland features (e.g. neglected rhynes, reedbeds, rank field corners, waterlogged ground, etc); however, not possible to quantify land area.	*	*
Total	*	*

- * it is not possible to quantify an area of land which could support these birds due to the underlying uncertainties in this species' density and distribution at Severnside.

- 7.4.23 The abundance and distribution of common snipe, and their associated patterns of usage of the Severnside area are poorly understood, due to the cryptic nature and low detectability of this species resulting in a paucity of existing data being available. As a precautionary approach, it has been assumed that up to 53 birds (the peak winter count identified during the Stage 1 desk study exercise) could be present within the Severnside area; however, it has not been possible to quantify the area of land which could support these birds.

Habitat loss

- 7.4.24 For the purposes of the Review of Consent, it has been assumed that future land-take associated with new development within the 1957/58 Severnside Consent Area could have a potentially significant effect upon the number of common snipe which Severnside can support. The 'loss' of wetland habitats within the footprint of the 1957/58 Planning Consent Area would be expected to result in a reduction in foraging (and potentially roosting) opportunities for this species, possibly leading to associated displacement effects. In the absence of more quantitative information on snipe numbers and distributions, it is difficult to make a more accurate assessment of the impacts which could arise as result of the 57/58 Severnside Planning Consent.

- 7.4.25 The potential for a significant impact to occur could increase further, when land-take associated with the 57/58 Severnside Planning Consent is considered in the context of impacts upon this species associated with:

- the Avonmouth employment area and BCSES;
- the consented Deep Sea Container Terminal at Avonmouth; and



- the consented wind farm developments at Avonmouth Sewage Works and Chittening.

7.4.26 As described for gadwall, the predicted loss and/or degradation of intertidal habitats arising from the construction of the Deep Sea Container Terminal at Avonmouth, in combination with possible displacement effects arising from the operation of the consented wind farm developments could place unsustainable levels of foraging (and possibly roosting) pressure upon unaffected areas of saltmarsh and intertidal mudflats in the vicinity of Severn Beach and the northern section of Chittening Warth. Under these conditions, it is anticipated that the importance of inland grazing pasture for common snipe could increase substantially (given the potential interchange of birds using the estuarine and inland sites). Further losses of habitat arising as a result of the 57/58 Severnside Consent could lead to associated reductions in the overall carrying capacity of these areas, which could result in the displacement of common snipe from the Severnside area (and possibly the entire study area) altogether.

7.4.27 In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl species within the Qualifying Assemblage. Therefore, the significance of habitat loss in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Section 7.5.

Disturbance

7.4.28 In addition to habitat loss, the possibility of further disturbance impacts upon common snipe cannot be discounted, depending upon the distribution of this species roosting and feeding sites relative to the footprint of the 1957/58 Severnside Consent Area. However, in the absence of more detailed site-specific information, it is not possible to quantify this impact further, or determine whether it could be significant in the context of the Severn Estuary SPA and Ramsar qualifying species.

7.5 Significance of impacts upon the Qualifying Assemblage

Habitat Loss

7.5.1 The potential significance of habitat loss through potential future land-take within the footprint of the 1957/58 Planning Consent in relation to the Qualifying Assemblage is described in the following table.

Species and estimated wintering number	Impact description	Potential Impact Significance (Y/N)		Justification	Mitigation required (Y/N)
		Stand-alone	Cumulative		
Gadwall (Figure 4b) 15 birds (6% of Qualifying Assemblage)	Potential loss of 7 pools with a combined surface area of 21,990m ²	N*	Y	With the exception of lapwing, the remaining relevant Qualifying Assemblage species which could be affected by habitat loss associated with the 1957/58 Planning Consent are present in relatively low numbers (compared to the total number of wintering waterfowl supported by the Severn Estuary SPA and Ramsar site (68,026 birds)) and, therefore, predicted impacts for each of the individual waterfowl species under consideration would not be considered as potentially significant in their own right. However, when considered collectively, the potential exists for a total of 1,021 birds (i.e. 1.5% of the entire SPA Qualifying Assemblage) to be affected by habitat loss. This is considered to represent a significant proportion of the entire SPA Qualifying Assemblage and, therefore, it is considered feasible that potentially significant impacts upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas.	Y ²
Teal (Figure 5a) 50 birds (0.07% of Qualifying Assemblage)	Potential loss of 7 pools with a combined surface area of 21,990m ²	N	Y		Y ²
Tufted duck (Figure 7a) 10 birds (0.01% of Qualifying Assemblage)	Potential loss of 7 pools with a combined surface area of 21,990m ²	N	Y		Y ²
Mallard (Figure 8a) 110 birds (0.16% of Qualifying Assemblage)	Potential loss of 7 pools with a combined surface area of 21,990m ²	N	Y		Y ²
Curlew (Figure 8a) 104 birds (0.15% of Qualifying Assemblage)	Potential loss of grazing pasture in two locations, with a combined surface area of 454,050m ²	N	Y	The number of lapwings (707 birds) which could be affected by the predicted impacts equates to approximately 1% of the entire SPA Qualifying Assemblage. Therefore, it is considered that habitat loss and disturbance impacts upon this species alone could give rise to potentially significant impacts upon the favourable conservation status of the Qualifying Assemblage, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. The Severn Estuary SPA's conservation objective for the Qualifying Assemblage is to maintain the waterfowl population and it supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining favourable condition status in the context of this project include: • the 5 year peak mean population size for the waterfowl assemblage is no less than 68,026 individuals (i.e. the 5 year peak mean between 1988/9 - 1992/3).	Y ²
Lapwing (Figure 10a) 707 birds (1% of Qualifying Assemblage)	Potential loss of grazing pasture in four locations, with a combined surface area of 456,900m ²	Y	Y		Y
Common snipe 53 birds (0.08% of Qualifying Assemblage)	Impact not possible to quantify due to weaknesses in the underlying bird survey data	N	Y ¹	Five year peak mean WeBS data for the period 2003/4-2007/8 suggest that the Severn Estuary's wintering waterfowl population is 69,803 birds. Based upon these data, the Severn Estuary could be regarded as meeting its conservation objective for this species at present. Notwithstanding this, in view of the number of birds which could be affected by land-take associated with the 1957/58 Planning Consent (alone and in combination with other consented developments), future habitat loss could be regarded as having the potential for a significant effect upon the favourable condition status of the waterfowl populations within the SPA, as well as the integrity of the Severn Estuary SPA and Ramsar site. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).	Y ²

* This impact assessment outcome relates specifically to gadwall's contribution to the Qualifying Assemblage. Potential impacts upon gadwall as a Qualifying Species for the Severn Estuary SPA and Ramsar site have been dealt with in Section 7.2.

¹ In the absence of robust species-specific data to confirm otherwise, impacts on common snipe have been assumed to contribute to a potentially significant cumulative impact upon the favourable conservation status of Qualifying Assemblage for the Severn Estuary SPA and Ramsar site

² Mitigation required for a potential impact upon this species, in relation to its contribution to the Qualifying Assemblage for the Severn Estuary SPA and Ramsar site.

Disturbance

7.5.2 The potential significance of increased levels of disturbance through the construction and operation of future developments within the footprint of the 1957/58 Planning Consent in relation to the Qualifying Assemblage is described in the following table.

Species and estimated wintering number	Impact description	Potential Impact Significance (Y/N)		Justification	Mitigation required (Y/N)
		Stand-alone	Cumulative		
Gadwall (Figure 4b) 40 birds (0.06% of Qualifying Assemblage)	Potential disturbance to three pools with a combined surface area of 18,880m ²	N*	Y	With the exception of lapwing, the remaining relevant Qualifying Assemblage species which could be affected by habitat loss associated with the 1957/58 Planning Consent are present in relatively low numbers (compared to the total number of wintering waterfowl supported by the Severn Estuary SPA and Ramsar site (68,026 birds)) and, therefore, predicted impacts for each of the individual waterfowl species under consideration would not be considered as potentially significant in their own right. However, when considered collectively, the potential exists for a total of 1,021 birds (i.e. 1.5% of the entire SPA Qualifying Assemblage) to be affected by disturbance. This is considered to represent a significant proportion of the entire SPA Qualifying Assemblage and, therefore, it is considered feasible that potentially significant impacts upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas.	Y ²
Teal (Figure 5a) 50 birds (0.07% of Qualifying Assemblage)	Potential disturbance to three pools with a combined surface area of 18,880m ²	N	Y	The number of lapwings (707 birds) which could potentially be affected by disturbance impacts equates to approximately 1% of the entire SPA Qualifying Assemblage. Therefore, it is considered that the effect of this potential impact upon lapwing alone could affect a significant proportion of the SPA's entire Qualifying Assemblage.	Y ²
Tufted duck (Figure 7a) 10 birds (0.01% of Qualifying Assemblage)	Potential disturbance to three pools with a combined surface area of 18,880m ²	N	Y	The Severn Estuary SPA's conservation objective for the Qualifying Assemblage is to maintain the waterfowl population and its supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining favourable condition status in the context of this project include:	Y ²
Mallard (Figure 9a) 110 birds (0.16% of Qualifying Assemblage)	Potential disturbance to three pools with a combined surface area of 18,880m ²	N	Y	waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.	Y ²
Curlew (Figure 8a) 104 birds (0.15% of Qualifying Assemblage)	Potential disturbance of five areas of grazing pasture, with a combined surface area of 267,400m ²	N	Y	It is considered feasible that the effects of increased levels of disturbance associated with the 1957/58 Planning Consent could involve the (permanent) displacement of (at least a) proportion of these birds from Severnside and (in the case of certain species) possibly the entire study area. In view of this, the Severn Estuary could be regarded as failing to meet its conservation objective for this species in the event that further development takes place under the 1957/58 Planning Consent.	Y ²
Lapwing (Figure 10a) 707 birds (1% of Qualifying Assemblage)	Potential disturbance of one area of grazing pasture, with a surface area of 90,500m ²	Y	Y	Given the numbers of birds which have been identified, this potential impact is considered to affect a significant proportion of the entire SPA assemblage and, therefore, it is considered feasible that a potentially significant impact upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).	Y ²
Common snipe 53 birds (0.08% of Qualifying Assemblage)	Impact not possible to quantify due to weaknesses in the underlying bird survey data	N	Y ¹		

* This impact assessment outcome relates specifically to gadwall's contribution to the Qualifying Assemblage. Potential impacts upon gadwall as a Qualifying Species for the Severn Estuary SPA and Ramsar site have been dealt with in Section 7.2.

¹ In the absence of robust species-specific data to confirm otherwise, impacts on common snipe have been assumed to contribute to a potentially significant cumulative impact upon the favourable conservation status of Qualifying Assemblage for the Severn Estuary SPA and Ramsar site

² Mitigation required for a potential impact upon this species, in relation to its contribution to the Qualifying Assemblage for the Severn Estuary SPA and Ramsar site.



8.0 Avonmouth Impact Assessments

8.1 Introduction

8.1.1 In parallel with the Review of the 1957/58 Severnside Planning Consent, assessments of the following potential impacts have been undertaken in relation to gadwall and each of the relevant waterfowl species under consideration as part of the Qualifying Assemblage within the Avonmouth study area:

- The loss of habitat from areas which are known (or assumed as likely) to support waterfowl through future land-take within the footprint of the Avonmouth employment area;
- Increased levels of disturbance in areas which are known (or considered likely) to support waterfowl (giving rise to the displacement of these birds) due to the close proximity of the Avonmouth employment area; and
- Displacement of birds from areas which are known (or assumed as likely) to support substantial concentrations of waterfowl due to the close proximity of potentially feasible wind farm sites which could be installed in the future (as identified by the Bristol City Sustainable Energy Study (BCSES)).

8.2 Qualifying Species: Gadwall

8.2.1 As described in Section 5.2 and as shown on Figure 4b, an estimated total wintering population of 40 birds (i.e. 15.8% of the total Severn Estuary wintering population) has been assumed at the following inland waterbodies within the Avonmouth study area: Avonmouth Pools; Disused Reservoir Pools; Salt Rhyne Balancing Pool; Pools in the vicinity of Lawrence Westin Road; and Pools at the eastern end of Hallen Marsh.

8.2.2 The following table summarises the potential impacts under consideration in relation to gadwall, as a result of the Avonmouth employment area and BCSES.

<i>Estimated wintering number: 40 birds (15.8% of the total Severn Estuary population)</i>	Avonmouth Employment Area Impacts		BCSES Impacts
	Habitat loss	Disturbance	Displacement
Site Name (& Figure 4b Target Notes)	Number / Area (m²)	Number / Area (m²)	Number / Area (m²)
Avonmouth Pools (1)	-	4 / 35,350	4 / 35,350
Disused Reservoir Pools (2)	2 / 8,200	-	2 / 8,200
Salt Rhyne Balancing Pool (3)	4 / 18,800	-	4 / 18,800
Pools in the vicinity of Lawrence Weston Road (4)	5 / 14,000	-	5 / 14,000
Pools at the eastern end of Hallen Marsh (5)	-	-	1 / 600
The rhyne and ditch network within the Avonmouth employment area and areas affected by the BCSES (n/a)*	*	*	*
Total	11 pools / 41,000	4 pools / 35,350	16 pools - 76,950

- No impact predicted.

* It is not possible to quantify accurately the extent of rhyne network used by this species and, therefore this information has not been included when quantifying areas of wetland habitat which could be affected.



Avonmouth Employment Area: Habitat Loss

- 8.2.3 As shown in the table (above) and on Figure 4b, the Disused Reservoir Pools (Target Note 2), Salt Rhyne Balancing Pool (Target Note 3) and the pools in the vicinity of Lawrence Weston Road (Target Note 4) are located within the footprint of the Avonmouth employment area and, therefore, it has been assumed that future development could result in the permanent 'loss' of these wetland sites. This equates to a total of 11 pools with a combined surface area of 41,000m². In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).
- 8.2.4 The 'loss' of the Disused Reservoir Pools and Salt Rhyne Balancing Pool would equate to removal of approximately 27,000m² of foraging and/or roosting habitat; two out of the three 'core' inland sites for this species within Avonmouth (see Paragraph 5.2.6 for further details). Whilst the presence of gadwall at pools in the vicinity of Lawrence Weston Road remains uncertain, the loss of these waterbodies (which equate to a combined surface area of 14,000m²) could also increase the magnitude of this impact further, if this species were present. It is considered possible that the loss of these inland freshwater bodies could represent a potentially significant impact in relation to foraging (and potentially roosting) birds. The significance of this impact would be expected to increase further when considered in the context of other development-related impacts within the study area. In particular, it is considered that birds which are displaced from the above water bodies (as a result of development-related habitat loss associated with the Avonmouth employment area) may not be accommodated within other areas of suitable estuarine and freshwater habitat within the study area, due to the in combination effects of habitat loss and/or disturbance impacts associated with:
- future development due to the implementation of the 1957/58 Planning Consent;
 - future development within the Avonmouth employment area;
 - future wind farm development associated with the BCSes;
 - the consented Deep Sea Container Terminal at Avonmouth; and
 - the consented wind farm developments at Avonmouth Sewage Works and Chittening.
- 8.2.5 When considered in the context of other potential and consented development proposals within the study area (described above), it is considered feasible that birds which are displaced from freshwater bodies (as a result of land-take associated with the Avonmouth employment area) may not necessarily be accommodated within other areas of suitable estuarine and freshwater habitat due to: (a) possible displacement effects at other nearby wetland sites within the study area, which (although not found to be significant in isolation) could reduce the overall carrying capacity of these wetland areas; and (b) the potential for increased levels of foraging pressure at these sites. Therefore, in the context of these consented development proposals, the loss of the freshwater sites identified within the footprint of the Avonmouth employment area could represent a potentially significant impact upon gadwall.
- 8.2.6 The Severn Estuary SPA's conservation objective for gadwall is to maintain the population and its supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining this species' favourable condition status include a five year peak mean population size, which is no less than 330 birds (Natural England & Countryside Council for Wales, 2009). Five year peak mean data for the period 2003/4-2007/8 suggest that the Severn Estuary's wintering gadwall population has declined to 253 birds and, therefore, the Severn Estuary could be regarded as failing to meet its conservation objective for the species



based upon the existing situation. In view of this, and given the number of gadwall which could be affected by land-take associated with the Avonmouth employment area (when considered alone and/or in combination with other consented developments), habitat loss could be regarded as having a potentially significant effect upon the favourable condition status of the gadwall population within the SPA, as well as the integrity of the Severn Estuary SPA and Ramsar site. Further mitigation measures would be required in relation to this potential impact (see Section 9.7 for further details).

Avonmouth Employment Area: Disturbance

- 8.2.7 In addition to the potential 'loss' of 11 pools within the Avonmouth study area (described above), it is also considered possible that gadwall could become displaced from Avonmouth Pools (see Target Note 1 on Figure 4b), as a result of development-related disturbance arising from the Avonmouth employment area. As shown on Figure 4b, these waterbodies are situated outwith the Avonmouth employment area and, therefore, would not be subject to land-take associated with any future development. However, Avonmouth Pools are situated directly adjacent to the boundary of the Avonmouth employment area and, depending upon the timing, nature and extent of any development proposals in this area (e.g. the future expansion of Avonmouth Sewage Works (as indicated by the development boundary shown on Figure 4b)), it is possible that gadwall could be subject to increase levels of noise and visual disturbance, which could give rise to these birds being displaced from this water body (either on a short-term, or more prolonged/permanent basis). In the absence of any specific details regarding how any future development proposals could affect these waterbodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with Project Partnership).
- 8.2.8 Furthermore, it is possible that this potential impact could make a contribution to a larger and potentially significant cumulative impact, relating to the in combination effects of habitat loss and/or disturbance associated with development arising from: (a) existing consented developments within the Avonmouth study area, which have yet to be constructed; (b) future development associated with the 1957/58 Severnside Planning Consent; (c) future development associated with the Avonmouth employment area; and (d) future development associated with the BCSES.
- 8.2.9 Desk study records indicate that a peak count of 40 birds has previously been recorded at Avonmouth Pools, which equates to 15.8% of the Severn Estuary SPA's entire wintering gadwall population. The Severn Estuary SPA's conservation objective for gadwall is to maintain the population and its supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining this species' favourable condition status, in the context of this project, include:
- Aggregations of gadwall at feeding or roosting sites are not subject to significant disturbance.
- 8.2.10 It is considered feasible that the effects of increased levels of disturbance associated with possible future development within the Avonmouth employment area involve the (permanent) displacement of (at least a) proportion of the gadwall from Avonmouth pools. In view of this, the Severn Estuary could be regarded as failing to meet its conservation objective for this species in the event that further development takes place in the vicinity of this wetland site.
- 8.2.11 Given the numbers of birds which have been identified using Avonmouth Pools, this potential impact is considered to affect a significant proportion of the entire SPA assemblage. Therefore, it is considered feasible that potentially significant impact upon the favourable condition status



of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).

BCSES: Displacement

- 8.2.12 Notwithstanding the potential impacts of habitat loss and disturbance associated with future development in the Avonmouth employment area, there is considered to be the potential for gadwall to be displaced from a number of wetland sites within Avonmouth as a result of future wind farm development, which could take place based upon the findings of the BCSES.
- 8.2.13 Research into the impacts of wind farm proposals upon bird populations indicates that operational disturbance of wind farms can result in the displacement of birds from a radius of up to 600m from the turbines, which effectively amounts to habitat loss (since the affected areas are rendered unavailable to the birds) (Drewitt & Langstone, 2006). Although the likelihood and scale of any potential future wind farm development at Avonmouth is uncertain, it is considered reasonable to make the assumption that those water bodies within a 600m radius of any potentially suitable wind farm areas identified by the BCSES, could be subject to increased levels of noise and visual disturbance leading to the displacement of gadwall. As a result, there is the potential that significant numbers of gadwall could be displaced from the following wetland sites (as shown on Figure 4b):
- Avonmouth Pools (Target Note 1);
 - Disused Reservoir Pools (Target Note 2);
 - Salt Rhyne Balancing Pool (Target Note 3);
 - Pools in the vicinity of Lawrence Weston Road (Target Note 4); and
 - Pools at the eastern end of Hallen Marsh (Target Note 5).
- 8.2.14 Furthermore, it is possible that it could make a contribution to a larger and potentially significant cumulative impact, relating to the in combination effects of habitat loss and/or disturbance associated with development arising from: (a) existing consented developments within the Avonmouth study area, which have yet to be constructed; (b) future development associated with the 1957/58 Severnside Planning Consent; and (c) future development associated with the Avonmouth employment area.
- 8.2.15 This would equate to gadwall being displaced from all wetland sites within Avonmouth which have either been found to support significant numbers of birds, or where this is considered to be feasible. In the absence of any specific details regarding how any future development proposals associated with the BCSES could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with Project Partnership).
- 8.2.16 The Severn Estuary SPA's conservation objective for the Qualifying Assemblage is to maintain the waterfowl population and its supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining favourable condition status in the context of this project include:



- the 5 year peak mean population size for the waterfowl assemblage is no less than 68,026 individuals (i.e. the 5 year peak mean between 1988/9 - 1992/3); and
- waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.

8.2.17 Five year peak mean WeBS data for the period 2003/4-2007/8 suggest that the Severn Estuary's wintering gadwall population has declined to 253 birds and, therefore, the Severn Estuary could be regarded as failing to meet its conservation objective for this species.

8.2.18 Given the number of birds which have been identified/assumed as using these waterbodies, it is considered feasible that a potentially significant impact upon the favourable condition status of the gadwall population could occur, leading to potential significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).

8.3 Qualifying Assemblage: Wildfowl

8.3.1 The following species of wildfowl are under consideration in relation to potentially significant impacts upon the SPA assemblage: gadwall; teal; pochard; tufted duck; mallard; and shoveler. A detailed description of the impacts upon gadwall is presented in Section 8.2; the following paragraphs provide an assessment of the possible impacts in relation to the remaining species of wildfowl.

8.3.2 The following table summarises the potential impacts under consideration in relation to wildfowl, as a result of the Avonmouth employment area and BCSES.



Species and estimated wintering number	Site Name (& Figure reference)	Avonmouth Employment Area		BCSES
		Habitat loss Number / Area (m ²)	Disturbance Number / Area (m ²)	Displacement Number / Area (m ²)
Teal (Figure 5b) 100 birds (2.4% of the Severn Estuary population and 0.15% of the Qualifying Assemblage)	Disused Reservoir Pools (1)	2 / 8,200	-	2 / 8,200
	Avonmouth Pools (2)	-	4 / 35,350	4 / 35,350
	Salt Rhyne Balancing Pool (3)	4 / 18,800	-	4 / 18,800
	Pools in the vicinity of Lawrence Weston Road (4)	5 / 14,000	-	5 / 14,000
	Pools at the eastern end of Hallen Marsh (5)	-	-	1 / 600
	Merebank (6) *	*	-	*
	Seabank Power Station (7)	-	2 / 2,400	2 / 2,400
	The rhyne and ditch network within the Avonmouth employment area and areas affected by the BCSES (n/a)	*	*	*
	Total	11 pools / 41,000	6 pools / 37,750	18 pools / 79,350
Pochard (Figure 6) 60 birds (8.1% of the Severn Estuary population and 0.14% of the Qualifying Assemblage)	Avonmouth Pools (1)	-	4 / 35,350	4 / 35,350
	Disused Reservoir Pools (2)	2 / 8,200	-	2 / 8,200
	Merebank (3) *	*	-	*
	Salt Rhyne Balancing Pool (4)	4 / 18,800	-	4 / 18,800
	Pools in the vicinity of Lawrence Weston Road (5)	5 / 14,000	-	5 / 14,000
	Total	11 pools / 41,000	4 pools / 35,350	15 pools / 76,350
Tufted duck (Figure 7b) 68 birds (12.2% of the Severn Estuary population and 0.1% of the Qualifying Assemblage)	Avonmouth Pools (1)	-	4 / 35,350	4 / 35,350
	Disused Reservoir Pools (2)	2 / 8,200	-	2 / 8,200
	Merebank (3) *	*	-	*
	Salt Rhyne Balancing Pool (4)	4 / 18,800	-	4 / 18,800
	Pools in the vicinity of Lawrence Weston Road (5)	5 / 14,000	-	5 / 14,000
	Total	11 pools / 41,000	4 pools / 35,350	15 pools / 76,350
Mallard (Figure 9b) 110 birds (4.1% of the Severn Estuary population and 0.45% of the Qualifying Assemblage)	Avonmouth Pools (1)	-	4 / 35,350	4 / 35,350
	Disused Reservoir Pools (2)	2 / 8,200	-	2 / 8,200
	Land to the south of Avonmouth Sewage Works (3)*	*	*	*
	Salt Rhyne Balancing Pool (4)	4 / 18,800	-	4 / 18,800
	Pools in the vicinity of Lawrence Weston Road (5)	5 / 14,000	-	5 / 14,000
	Pools at the eastern end of Hallen Marsh (6)	1 / 600	-	1 / 600
	The rhyne and ditch network within the Avonmouth employment area and areas affected by the BCSES (n/a)	*	-	*
	Total	12 pools / 41,600	4 pools / 35,350	16 pools / 76,950
Shoveler (Figure 11) 59 birds (11.3% of the Severn Estuary population and 0.09% of the Qualifying Assemblage)	Disused Reservoir Pools (1)	2 / 8,200	-	2 / 8,200
	Avonmouth Pools (2)	-	4 / 35,350	4 / 35,350
	Pools at Lawrence Weston Road (3)	5 / 14,000	-	5 / 14,000
	Pool at the eastern end of Hallen Marsh (4)	1 / 600	-	1 / 600
	Total	8 pools / 22,800	4 pools / 35,350	12 pools / 58,150

- no impact predicted

* It is not possible to quantify accurately the extent of rhyne network used by this species and, therefore this information has not been included when quantifying areas of wetland habitat which could be affected.



Avonmouth Employment Area: Habitat Loss

- 8.3.3 As shown in the previous table (and as described previously for gadwall), it is considered possible that future land-take associated with the Avonmouth employment area could give rise to the 'loss' of wetland habitat, which could affect the relevant species of wildfowl listed within the Severn Estuary SPA and Ramsar site Qualifying Assemblage. It is predicted that up to 12 pools (equating to 41,600m²) of wetland habitat could be 'lost' under the footprint of future development proposals, which could be used by the range of wildfowl to varying degrees (i.e. Disused Reservoir Pools (2 pools/8,200m²), Salt Rhyne Balancing Pool (4 pools / 18,800m²), Pools in the vicinity of Lawrence Weston Road (5 pools / 14,000m²), and a pool at the eastern end of Hallen Marsh (1 pool / 600m²)). In addition, parts of the rhyne network within the footprint of the Avonmouth employment area have been identified/assumed to support these wildfowl species (e.g. Merebank, land to the south of the Avonmouth Sewage Works, etc); however, it is not possible to quantify this area of rhyne habitat. In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).
- 8.3.4 Whilst the nature and extent of possible future land-take is uncertain, the loss of these water features (in combination with other habitat losses arising as a result of future land-take associated with the 1957/58 Severnside Planning Consent, and existing consented development proposals which have yet to be constructed) could contribute to a potentially significant impact upon the Severn Estuary SPA and Ramsar site Qualifying Assemblage. In particular, information pertaining to the distribution of tufted duck and pochard indicates that these species do not frequent estuarine habitats within the study area. Therefore, the loss of inland freshwater features (particularly Avonmouth Pools, the Disused Reservoir Pools and Merebank) could lead to the permanent displacement of these species from Avonmouth.
- 8.3.5 Teal, mallard and (to a lesser extent) shoveler are known to utilise estuarine habitats within the study area. Therefore, it is possible that the loss of inland freshwater features could lead to the displacement of these birds to the estuary's intertidal zone. However, a potentially significant impact could still occur from possible future habitat losses arising as a result of land-take associated with the 1957/58 Severnside Planning Consent and, in particular, the following consented development proposals in the study area: the Deep Sea Container Terminal at Avonmouth; and wind farm developments at Avonmouth Sewage Works and Chittening.
- 8.3.6 In order to determine whether this level of habitat loss could represent a potentially significant impact upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone or in combination with other potential/consented development proposals within the study area), it is necessary to consider the effects of habitat loss in combination with curlew, lapwing and snipe (which also form part of the waterfowl assemblage under consideration within the impact assessment). Therefore, the significance of habitat loss in relation to all relevant species within the Qualifying Assemblage is discussed in Paragraph 8.4.29.

Avonmouth Employment Area: Disturbance

- 8.3.7 Based upon the rationale described for gadwall, it is considered reasonable to assume that the wildfowl assemblage could become displaced from Avonmouth Pools (see Target Note 1 on Figures 5b, 6, 7b, 9b and 11), as a result of development-related disturbance arising from the Avonmouth employment area (as shown in the previous table). An assessment of this potential impact is provided in relation to gadwall and is considered to be applicable to the other relevant



wildfowl species within the Qualifying Assemblage, given that all of these species have been confirmed or assumed to be present at these water bodies during the winter months. In addition, teal have also previously been recorded using two pools at Seabank Power Station (see Target Note 7 on Figure 5b) and, therefore, these waterbodies could also be subject to disturbance impacts based upon the same rationale described for gadwall at Avonmouth Pools. Collectively, these waterbodies equate to six pools with a combined surface area of 37,750m².

- 8.3.8 In order to determine whether these impacts could have a potentially significant effect upon the favourable conservation status of the Severn Estuary SPA and Ramsar qualifying assemblage, it is necessary to consider the effects of disturbance in combination with curlew, lapwing and snipe (which also form part of the waterfowl assemblage under consideration within the impact assessment). Therefore, the significance of disturbance in relation to all relevant species within the Qualifying Assemblage is discussed in Paragraph 8.4.30.

BCSES: Displacement

- 8.3.9 As described for gadwall, there is considered to be the potential for the relevant wildfowl species within the Qualifying Assemblage to be displaced from a number of wetland sites within Avonmouth as a result of possible future wind farm development, which could take place based upon the findings of the BCSES (notwithstanding the potential impacts of habitat loss and disturbance associated with future development in the Avonmouth employment area. The rationale behind this impact is discussed in relation to gadwall in Paragraphs 8.2.7 to 8.2.11; however, it is considered reasonable to assume that the remaining species of the Qualifying Assemblage could be subject to displacement effects across all wetland sites which: (i) have been found (or are assumed likely) to occur; and (ii) are located within a 600m radius of a potentially feasible wind farm site (as identified by the BCSES). Furthermore, it is possible that it could make a contribution to a larger and potentially significant cumulative impact, relating to the in combination effects of habitat loss and/or disturbance associated with development arising from: (a) existing consented developments within the Avonmouth study area, which have yet to be constructed; (b) future development associated with the 1957/58 Severnside Planning Consent; and (c) future development associated with the Avonmouth employment area.
- 8.3.10 In order to determine whether these impacts could have a potentially significant effect upon the favourable conservation status of the Severn Estuary SPA and Ramsar Qualifying Assemblage, it is necessary to consider the effects of displacement in combination with curlew, lapwing and snipe (which also form part of the waterfowl assemblage under consideration within the impact assessment). Therefore, the significance of displacement in relation to all relevant species within the Qualifying Assemblage is discussed in Paragraph 8.4.30.



8.4 Qualifying Assemblage: Waders

8.4.1 The following species of wader are under consideration in relation to potentially significant impacts upon the SPA Qualifying Assemblage: curlew; lapwing; and common snipe.

Curlew

8.4.2 The following table summarises the potential impacts under consideration in relation to curlew, as a result of the Avonmouth employment area and BCSES.

Species and estimated wintering number	Site Name (& Figure reference)	Avonmouth Employment Area		BCSES
		Habitat loss Number / Area (m ²)	Disturbance Number / Area (m ²)	Displacement Number / Area (m ²)
Curlew (Figure 8b) 110 birds (1.9% of the total Severn Estuary population and 0.07% of the Qualifying Assemblage)	Hallen Marsh (1)	-	1,114,000	1,114,000
	Land to the south of Avonmouth Sewage Works (2)	241,000	92,000	333,000
	Land to the west of King's Weston Lane (3)	-	332,000	332,000
	Total	241,000	1,538,000	1,779,000

- no impact predicted

Avonmouth Employment Area: Habitat Loss

8.4.3 As shown on Figure 8b, the following areas of grazing pasture within the Avonmouth study are collectively considered likely to support up to 50 curlews during the winter (based upon the findings of the Severnside Bird Surveys Study (Wessex Ecological Consultancy, 2002, 2006, 2007 and 2009):

- Grazing pasture within fields at Hallen Marsh (Target Note 1);
- Grazing pasture within land to the south of Avonmouth Sewage Works (Target Note 2); and
- Grazing pasture within land to the west of King's Weston Lane (Target Note 3);

8.4.4 For the purposes of the Avonmouth impact assessment, it has been assumed that future development within the footprint of the Avonmouth employment area could result in the permanent 'loss' of the grazing pasture within land to the south of Avonmouth Sewage Works. Although no records of curlew exist for this area, it has been assumed that it could be used by these birds on occasions (given its potential suitability and this species' distribution and usage of comparable habitats in the wider study area). The 'loss' of this area would be expected to result in a reduction in foraging (and potentially roosting) opportunities for this species (if present), possibly leading to associated displacement effects. In the absence of any specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

8.4.5 Therefore, the potential for a significant impact to occur could increase further, when land-take associated with the Avonmouth employment is considered in the context of: impacts upon this species associated with:

- the increased levels of development-related disturbance associated with the Avonmouth employment area;
- impacts upon this species associated with the BCSES;



- the consented Deep Sea Container Terminal at Avonmouth; and
- the consented wind farm developments at Avonmouth Sewage Works and Chittening.

8.4.6 In particular, the Severnside Bird Surveys have identified that interchange of birds takes place between inland sites and nearby estuarine areas at Severnside (Wessex Ecological Consultancy, 2002, 2006, 2007 & 2009). In the event that this were also to be the case in Avonmouth, it is considered feasible that the significance of any future habitat losses could increase, when considered in combination with the possible effects of consented estuarine development proposals. Specifically, the predicted loss and/or degradation of intertidal habitats arising from the construction of the Deep Sea Container Terminal at Avonmouth, in combination with possible displacement effects arising from the operation of the consented wind farm developments could place unsustainable levels of foraging (and possibly roosting) pressure upon unaffected areas of saltmarsh and intertidal mudflats in the vicinity of Severn Beach and the northern section of Chittening Warth. Under these conditions, it is anticipated that the importance of inland grazing pasture for curlew could increase substantially (given the extent of interchange of birds using the estuarine and inland sites which already exists, particularly in relation to human disturbance along the estuary). Further losses of habitat arising as a result of the Avonmouth employment area could lead to associated reductions in the overall carrying capacity of the study area, potentially resulting in the displacement of curlew from the Avonmouth area (and possibly the entire study area) altogether.

8.4.7 The remaining two areas of grazing pasture under consideration in relation to this species are located outwith the Avonmouth employment area, and thus it has been assumed that no future land-take would occur from this form of development. In the absence of any specific details regarding how any future development proposals could affect these areas of grazing pasture, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

8.4.8 In order to determine whether this impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl species within the Qualifying Assemblage (as described in Paragraph 8.4.29).

Avonmouth Employment Area: Disturbance

8.4.9 In addition to habitat loss, it is also possible that curlew could become displaced from parts of other areas of grazing pasture in close proximity to the boundary of the Avonmouth employment area through increased levels of development-related disturbance. As shown on Figure 8b, these areas comprise:

- approximately 1,114,000m² of grazing pasture at Hallen Marsh (see Target Note 1); and
- approximately 332,000m² of grazing pasture to the west of King's Weston Lane (see Target Note 3)

8.4.10 These sites are located directly adjacent to the boundary of the Avonmouth employment area and, depending upon the timing, nature and extent of any development proposals in this area, it is possible that curlews could be subject to increased levels of noise and visual disturbance, which could give rise to these birds being displaced from these areas (either on a short-term, or on a more prolonged/permanent basis). As a result, these areas of habitat could be rendered unavailable for use as feeding and roosting areas, either on a short-term basis (for example, the short-lived duration of nearby construction works), or for more prolonged periods/permanently (e.g. during the operational phase of a nearby wind farm development). In the absence of any



specific details regarding how any future development proposals could affect these water bodies, this approach is considered to represent a reasonable worst case scenario (and has been developed in consultation and agreement with the Project Partnership).

8.4.11 The potential for a significant impact to occur could increase further, when considered in the context of: impacts upon this species associated with:

- the potential for future habitat loss associated with the Avonmouth employment area;
- impacts upon this species associated with the BCSES;
- the consented Deep Sea Container Terminal at Avonmouth; and
- the consented wind farm developments at Avonmouth Sewage Works and Chitterning.

In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of disturbance upon all relevant species within the Qualifying Assemblage. Therefore, the significance of disturbance in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Paragraph 8.4.30.

BCSES: Displacement

8.4.12 As described for gadwall, there is considered to be the potential for the curlew to be displaced from a number of pasture and/or wetland sites within Avonmouth as a result of future wind farm development, which could take place based upon the findings of the BCSES (notwithstanding the potential impacts of habitat loss and disturbance associated with future development in the Avonmouth employment area. The rationale behind this impact is discussed in relation to gadwall in Paragraphs 8.2.12 to 8.2.18; however, it is considered reasonable to assume that this species could be subject to displacement effects across all inland sites where it has been found (or assumed likely) to occur (as shown on Figure 8b). Furthermore, the potential significance of this impact could increase further when its effects are considered in combination with those associated with:

- the potential for habitat loss and increased levels of disturbance associated with future development within the Avonmouth employment area;
- impacts upon this species associated with the consented Deep Sea Container Terminal at Avonmouth; and
- impacts upon this species associated with the consented wind farm developments at Avonmouth Sewage Works and Chitterning.

In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of disturbance upon all relevant species within the Qualifying Assemblage (as described in Paragraph 8.4.30).



Lapwing

8.4.13 The following table summarises the potential impacts under consideration in relation to lapwing, as a result of the Avonmouth employment area and BCSES.

Species and estimated wintering number	Site Name (& Figure reference)	Avonmouth Employment Area		BCSES
		Habitat loss	Disturbance	Displacement
		Number / Area (m ²)	Number / Area (m ²)	Number / Area (m ²)
Lapwing (Figure 10b) 310 birds (2.4% of the total Severn Estuary population and 0.45% of the qualifying Assemblage)	Hallen Marsh (1)	-	1,114,000	1,114,000
	Merebank (2)	33,500	-	33,500
	Avonmouth Sewage Works/Pools (3)	-	4 / 35,350	4 / 35,350
	Land to the south of Avonmouth Sewage Works (4)	241,000	-	333,000
	Land to the west of King's Weston Lane (5)	-	332,000	332,000
	Total	274,500	4 pools / 35,350 Pasture – 1,446,000	4 pools / 35,350 Pasture – 1,812,500

- No impact predicted

Avonmouth Employment Area: Habitat Loss

8.4.14 As shown on Figure 10b, the following areas of land/grazing pasture are located within the footprint of the Avonmouth employment area, and (based upon existing desk-based records), collectively, these are considered to support flocks of up to 310 lapwings during the winter:

- Approximately 33,500m² of land at Merebank (Target Note 2); and
- Approximately 241,000m² of grazing pasture within land to the south of Avonmouth Sewage Works (Target Note 4).

8.4.15 The rationale underpinning the assessment of potential future habitat losses in relation to curlew (as described in Paragraphs 8.4.3 to 8.4.8) at Avonmouth would also be applicable to lapwing, given: (i) the degree of comparability in areas where these species have previously been recorded/assumed to be present (see Figures 8b and 10b); (ii) the likely similarities in the usage of grazing pasture by lapwing and curlew during the winter (i.e. as foraging (and possibly roosting) habitat); and (iii) the likely effects of habitat loss upon these species (i.e. displacement of birds). In view of these reasons, as well as the perceived likelihood that a degree of interchange takes place between lapwings at inland sites and estuarine sites (J. Martin, (Natural England) *pers comm.*), the assessment of potential cumulative impacts described in relation to curlew (see Paragraphs 8.4.5 and 8.4.6) would also be applicable to lapwing.

8.4.16 In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl species within the Qualifying Assemblage. Therefore, the significance of habitat loss in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Paragraph 8.4.29.

Avonmouth Employment Area: Disturbance

8.4.17 In addition to habitat loss, it is also considered possible that flocks of up to 310 lapwings could be subject to increased levels of noise and visual disturbance at the following inland (wetland) sites, from development associated with the Avonmouth employment area:



- Approximately 1,114,000m² of grazing pasture at Hallen Marsh (see Target Note 1 on Figure 10b);
- Four water bodies (totalling approximately 35,350m² of wetland habitat) at Avonmouth Pools/Sewage Works (see Target Note 3 on Figure 10b);
- Approximately 332,000m² of grazing pasture at land to the west of King's Weston Lane (see Target Note 5 on Figure 10b);

8.4.18 As shown on Figure 10b, these sites are located immediately adjacent to parcels of land identified within the Avonmouth employment area. The rationale underpinning the assessment of potential future increases in development-related disturbance in relation to curlew at Avonmouth (as described in Paragraphs 8.4.3 to 8.4.8) would also be applicable to lapwing, given: (i) the degree of comparability in areas where these species have previously been recorded/assumed to be present (see Figures 8b and 10b); (ii) the likely similarities in the usage of grazing pasture by lapwing and curlew during the winter (i.e. as foraging (and possibly roosting) habitat); and (iii) the likely effects of habitat loss upon these species (i.e. displacement of birds). In view of these reasons, as well as the perceived likelihood that a degree of interchange takes place between lapwings at inland sites and estuarine sites (J. Martin, (Natural England) *pers comm.*), the assessment of potential cumulative impacts described in relation to curlew (see Paragraph 8.4.5 and 8.4.6) would also be applicable to lapwing.

8.4.19 In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl species within the Qualifying Assemblage. Therefore, the significance of habitat loss in relation to all relevant waterfowl species within the Qualifying Assemblage is discussed in Paragraph 8.4.30.

BCSES: Displacement

8.4.20 As described for gadwall, there is considered to be the potential for the lapwings to be displaced from a number of pasture and/or wetland sites within Avonmouth as a result of future wind farm development, which could take place based upon the findings of the BCSES (notwithstanding the potential impacts of habitat loss and disturbance associated with future development in the Avonmouth employment area. The rationale behind this impact is discussed in relation to gadwall in Paragraphs 8.2.12 to 8.2.18; however, it is considered reasonable to assume that lapwings could be subject to displacement effects across all inland sites where it has been found (or assumed likely) to occur (as shown on Figure 8b). Furthermore, the potential significance of this impact could increase further when its effects are considered in combination with those associated with:

- the potential for habitat loss and increased levels of disturbance associated with future development within the Avonmouth employment area;
- impacts upon this species associated with the consented Deep Sea Container Terminal at Avonmouth; and
- impacts upon this species associated with the consented wind farm developments at Avonmouth Sewage Works and Chittingen.

In order to determine whether this potential impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of disturbance upon all relevant species within the Qualifying Assemblage (as described in Paragraph 8.2.30).



Common snipe

- 8.4.21 The following table summarises the potential impacts under consideration in relation to common snipe, as a result of the Avonmouth employment area and BCSES.

Species and estimated wintering number	Site Name (& Figure reference)	Avonmouth Employment Area		BCSES
		Habitat loss	Disturbance	Displacement
		Number / Area (m ²)	Number / Area (m ²)	Number / Area (m ²)
Common snipe 53 birds (12.2% of the total Severn Estuary population and 0.08% of the Qualifying Assemblage)	Assumed to be present in discrete locations within areas of grazing pasture; however, not possible to quantify land areas.	*	*	*
	Total	*	*	*

* it is not possible to quantify an area of land which could support these birds due to the underlying uncertainties in this species' density and distribution at Severnside.

- 8.4.22 The abundance and distribution of common snipe in Avonmouth is particularly poorly understood, due to the cryptic nature and low detectability of this species having resulted in a paucity of baseline data. It is considered possible that the land situated to the south of Avonmouth Sewage Works could support significant numbers of common snipe (given potential suitability of the grassland/reedbed habitats and this species' likely density, distribution and usage of comparable habitats in the wider study area). Furthermore, it is also considered feasible that discrete areas of suitable habitat (e.g. stands of reeds, unmanaged field corners, neglected rhynes, waterlogged ground, etc) could support birds. As a precautionary approach, it has been assumed that up to 53 birds (the peak winter count identified during the Stage 1 desk study exercise) could use habitats within the Avonmouth area; however, it has not been possible to quantify the area of land which could support these birds.

Avonmouth Employment Area: Habitat Loss

- 8.4.23 For the purposes of the Avonmouth impact assessment, it has been assumed that future land-take associated with new development within the Avonmouth employment area could have a potentially significant effect upon the number of common snipe which Avonmouth can support. The 'loss' of wetland habitats within the footprint of the Avonmouth employment area would be expected to result in a reduction in foraging (and potentially roosting) opportunities for this species, possibly leading to associated displacement effects. Furthermore, the potential cumulative impacts described previously in relation to curlew (see Paragraphs 8.4.5 and 8.4.6) in relation to other future potential and consented development proposals could also increase the significance of this impact further. In the absence of more quantitative information on snipe numbers and distributions relative to future development, it is difficult to make a more accurate assessment of the impacts which could arise as result of the Avonmouth employment area.
- 8.4.24 In order to determine whether this impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl within the Qualifying Assemblage (as described in Paragraph 8.4.29).

Avonmouth Employment Area: Disturbance

- 8.4.25 In addition to habitat loss, the possibility of disturbance impacts upon common snipe cannot be discounted, depending upon the distribution of this species roosting and feeding sites relative to



the footprint of the Avonmouth employment area. As a worst case scenario, it has been assumed that future development within the footprint of the Avonmouth employment area could have a potentially significant effect upon the number of common snipe which Avonmouth can support. Increased levels of noise and visual disturbance could result in a reduction in foraging (and potentially roosting) opportunities for this species, possibly leading to associated displacement effects. Furthermore, the potential cumulative impacts described previously in relation to curlew (see Paragraph 8.4.5 and 8.4.6) in relation to other future potential and consented development proposals could also increase the significance of this impact. However, in the absence of more detailed site-specific information, it is not possible to quantify and validate this impact further.

- 8.4.26 In order to determine whether this impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of habitat loss upon all relevant waterfowl within the Qualifying Assemblage (as described in Paragraph 8.4.29).

BCSES: Displacement

- 8.4.27 As described for gadwall, there is considered to be the potential for common snipe to be displaced from a number of pasture and/or wetland sites within Avonmouth as a result of future wind farm development, which could take place based upon the findings of the BCSES (notwithstanding the potential impacts of habitat loss and disturbance associated with future development in the Avonmouth employment area. As a worst case scenario, it has been assumed that future wind farm development within the footprint of the Avonmouth employment area could have a potentially significant effect upon the number of common snipe which Avonmouth can support. However, in the absence of more detailed site-specific information, it is not possible to quantify and validate this impact further.
- 8.4.28 In order to determine whether this impact could have a potentially significant effect upon the favourable condition status of the Severn Estuary SPA and Ramsar Qualifying Assemblage (either alone, or in combination with other impacts), it is necessary to consider the effects of displacement upon all relevant waterfowl within the Qualifying Assemblage (as described in Paragraph 8.4.31).



Significance of impacts upon the Qualifying Assemblage

Avonmouth employment area: Habitat loss

8.4.29 The likely significance of the potential impacts which have been assessed in relation to the Qualifying Assemblage are described in the following table.

Species	Estimated wintering number	Impact description	Potential Impact Significance (Y/N)		Justification	Mitigation required (Y/N) ²
			Stand-alone	Cumulative		
Gadwall (Figure 4b)	40 birds (0.06% of the Qualifying Assemblage)	Potential loss of 11 pools with a combined surface area of 41,000m ²	N*	Y	The Qualifying Assemblage species are present in relatively low numbers compared to the total for the entire Qualifying Assemblage (68,026) and, therefore, predicted impacts for each of the individual Qualifying Assemblage species under consideration would not be considered as potentially significant, in their own right. However, a total number of 850 birds (i.e. 1.2% of the entire SPA Qualifying Assemblage) are predicted to be potentially affected by habitat loss and disturbance impacts. This is considered to represent a significant proportion of the entire SPA Qualifying Assemblage and, therefore, it is considered feasible that potentially significant impacts upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas.	Y
Teal (Figure 5a)	100 birds (0.15% of the Qualifying Assemblage)	Potential loss of 13 pools with a combined surface area of 42,600m ²	N	Y		Y
Pochard (Figure 6)	60 birds (0.14% of the Qualifying Assemblage)	Potential loss of 11 pools with a combined surface area of 41,000m ²	N	Y		Y
Tufted duck (Figure 7a)	68 birds (0.14% of the Qualifying Assemblage)	Potential loss of 11 pools with a combined surface area of 41,000m ²	N	Y		Y
Mallard (Figure 9a)	110 birds (0.16% of the Qualifying Assemblage)	Potential loss of 12 pools with a combined surface area of 41,600m ²	N	Y		Y
Shoveler (Figure 11)	59 birds (0.09% of the Qualifying Assemblage)	Potential loss of 8 pools with a combined surface area of 22,800m ²	N	Y		Y
Curlew (Figure 8a)	50 birds (0.07% of the Qualifying Assemblage)	Potential loss of grazing pasture in one location, with a surface area of 241,000m ²	N	Y		Y
Lapwing (Figure 10a)	310 birds (0.45% of the Qualifying Assemblage)	Potential loss of land/grazing pasture in two locations, with a combined surface area of 274,500m ²	N	Y		Y
Common snipe	53 birds (0.08% of the Qualifying Assemblage)	Impact not possible to quantify due to weaknesses in the underlying bird survey data	N	Y ¹	Five year peak mean WeBS data for the period 2003/4-2007/8 suggest that the Severn Estuary's wintering waterfowl population is 69,803 birds. Based upon these data, the Severn Estuary could be regarded as meeting its conservation objective for this species at present. Notwithstanding this, in view of the number of birds which could be affected by land-take associated with the Avonmouth employment area (alone and in combination with other consented developments), future habitat loss could be regarded as having the potential for a significant effect upon the favourable condition status of the waterfowl populations within the SPA, as well as the integrity of the Severn Estuary SPA and Ramsar site. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).	Y

* This element of the impact assessment relates specifically to the Qualifying Assemblage. Potential impacts upon gadwall as a Qualifying Species for the Severn Estuary SPA and Ramsar site have been dealt with in Section 8.2.

¹ In the absence of robust species-specific data to confirm otherwise, impacts on common snipe have been assumed to contribute to a potentially significant cumulative impact upon the favourable condition status of Qualifying Assemblage for the Severn Estuary SPA and Ramsar site.

² Mitigation required in relation to a potentially significant cumulative impact.



Significance of impacts upon the Qualifying Assemblage

Avonmouth employment area: Disturbance

8.4.30

The likely significance of the potential impacts which have been assessed in relation to the Qualifying Assemblage are described in the following table.

Species	Estimated wintering number	Impact description	Potential Impact Significance (Y/N)		Justification	Mitigation required (Y/N) ²
			Stand-alone	Cumulative		
Gadwall (Figure 4b)	40 birds (0.06% of the Qualifying Assemblage)	Potential disturbance to four pools (Avonmouth Pools), with a surface area of 35,350m ²	N	Y	The Qualifying Assemblage species are present in relatively low numbers compared to the total for the entire Qualifying Assemblage (68,026) and, therefore, predicted impacts for each of the individual Qualifying Assemblage species under consideration would not be considered as potentially significant, in their own right. However, a total number of 850 birds (i.e.1.2% of the entire SPA Qualifying Assemblage) are predicted to be potentially affected by habitat loss and disturbance impacts. This is considered to represent a significant proportion of the entire SPA Qualifying Assemblage and, therefore, it is considered feasible that potentially significant impacts upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas.	Y
Teal (Figure 5a)	100 birds (0.15% of the Qualifying Assemblage)	Potential disturbance to four pools (Avonmouth Pools), with a surface area of 35,350m ²	N	Y		Y
Pochard (Figure 6)	60 birds (0.14% of the Qualifying Assemblage)	Potential disturbance to four pools (Avonmouth Pools), with a surface area of 35,350m ²	N	Y		Y
Tufted duck (Figure 7a)	68 birds (0.14% of the Qualifying Assemblage)	Potential disturbance to four pools (Avonmouth Pools), with a surface area of 35,350m ²	N	Y		Y
Mallard (Figure 9a)	110 birds (0.16% of the Qualifying Assemblage)	Potential disturbance to four pools (Avonmouth Pools), with a surface area of 35,350m ²	N	Y	The Severn Estuary SPA's conservation objective for the Qualifying Assemblage is to maintain the waterfowl population and it supporting habitats in favourable condition. As set out in the Regulation 33 Advice, the relevant conditions to maintaining favourable condition status in the context of this project include: • waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance. It is considered feasible that the effects of increased levels of disturbance associated with future development within the Avonmouth employment area could involve the (permanent) displacement of (at least a) proportion of these birds from Avonmouth and (in the case of certain species) possibly the entire study area. Under these circumstances, it is considered possible that the Severn Estuary could be regarded as failing to meet its conservation objective for this species in the event that further development takes place within the Avonmouth employment area. Given the numbers of birds which have been identified, this potential impact could affect a significant proportion of the entire SPA assemblage and, therefore, it is considered feasible that a potentially significant impact upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Avonmouth and Severnside study areas. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).	Y
Shoveler (Figure 11)	59 birds (0.09% of the Qualifying Assemblage)	Potential disturbance to four pools (Avonmouth Pools), with a surface area of 35,350m ²	N	Y		Y
Curlew (Figure 8a)	50 birds (0.07% of the Qualifying Assemblage)	Potential disturbance to grazing pasture in three locations, with a combined surface area of 1,538,000m ²	N	Y		Y
Lapwing (Figure 10a)	310 birds (0.45% of the Qualifying Assemblage)	Potential disturbance to land/grazing pasture in two locations, with a combined surface area of 1,146,000m ² as well as four waterbodies (Avonmouth Pools) with a surface area of 35,350m ²	N	Y		Y
Common snipe	53 birds (0.08% of the Qualifying Assemblage)	Impact not possible to quantify due to weaknesses in the underlying bird survey data	N	Y ¹		Y

* This element of the impact assessment relates specifically to the Qualifying Assemblage. Potential impacts upon gadwall as a Qualifying Species for the Severn Estuary SPA and Ramsar site have been dealt with in Section 8.2.

¹ In the absence of robust species-specific data to confirm otherwise, impacts on common snipe have been assumed to contribute to a potentially significant cumulative impact upon the favourable condition status of Qualifying Assemblage for the Severn Estuary SPA and Ramsar site.

² Mitigation required in relation to a potentially significant cumulative impact.

Significance of impacts upon the Qualifying Assemblage

BCSES: Displacement

8.4.31 The likely significance of the potential impacts which have been assessed in relation to the Qualifying Assemblage are described in the following table.

Species (Figure No.)	Estimated wintering number	Impact description	Potential Impact Significance (Y/N)		Justification	Mitigation required (Y/N) ²	
			Stand-alone	Cumulative			
Gadwall (Figure 4b)	40 birds (0.06% of the Qualifying Assemblage)	Potential displacement of birds from 16 pools with a combined surface area of 76,950m ²	N	Y	The Qualifying Assemblage species are present in relatively low numbers compared to the total for the entire Qualifying Assemblage (68,026) and, therefore, predicted impacts for each of the individual Qualifying Assemblage species under consideration would not be considered as potentially significant, in their own right. However, a total number of 850 birds (i.e.1.2% of the entire SPA Qualifying Assemblage) are predicted to be potentially affected by habitat loss and disturbance impacts. This is considered to represent a significant proportion of the entire SPA Qualifying Assemblage and, therefore, it is considered feasible that potentially significant impacts upon the favourable condition status of the Qualifying Assemblage could occur, leading to potentially significant effects upon the integrity of the Severn Estuary SPA and Ramsar site. Furthermore, the significance of these potential impacts (and their associated potential effects upon the integrity of the Severn Estuary SPA and Ramsar site) would be considered likely to increase substantially when considered in the context of other developments (and their impacts) within Severnside and Avonmouth study areas.	Y	
Teal (Figure 5a)	100 birds (0.15% of the Qualifying Assemblage)	Potential displacement of birds from 18 pools with a combined surface area of 79,350m ²	N	Y		Y	
Pochard (Figure 6)	60 birds (0.14% of the Qualifying Assemblage)	Potential displacement of birds from 15 pools with a combined surface area of 76,350m ²	N	Y		Y	
Tufted duck (Figure 7a)	68 birds (0.14% of the Qualifying Assemblage)	Potential displacement of birds from 15 pools with a combined surface area of 76,350m ²	N	Y		Y	
Mallard (Figure 9a)	110 birds (0.16% of the Qualifying Assemblage)	Potential displacement of birds from 16 pools with a combined surface area of 76,950m ²	N	Y		Y	
Shoveler (Figure 11)	59 birds (0.09% of the Qualifying Assemblage)	Potential displacement of birds from 12 pools with a combined surface area of 58,150m ²	N	Y		Y	
Curlew (Figure 8a)	50 birds (0.07% of the Qualifying Assemblage)	Potential displacement of birds from three areas of grazing pasture, with a combined surface area of 1,779,000m ²	N	Y		the 5 year peak mean population size for the waterfowl assemblage is no less than 68,026 individuals (i.e. the 5 year peak mean between 1988/9 - 1992/3); and	Y
Lapwing (Figure 10a)	310 birds (0.45% of the Qualifying Assemblage)	Potential displacement of birds from for areas of grazing pasture (with a combined surface area of 1,812,400m ²) and four pools (Avonmouth Pools) with a combined surface area of 35,350m ²	N	Y		waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.	Y
Common snipe	53 birds (0.08% of the Qualifying Assemblage)	Impact not possible to quantify due to weaknesses in the underlying bird survey data	N	Y ¹		Five year peak mean WeBS data for the period 2003/4-2007/8 suggest that the Severn Estuary's wintering waterfowl population is 69,803 birds. Based upon these data, the Severn Estuary could be regarded as meeting its conservation objective for this species at present. Notwithstanding this, in view of the number of birds which could be affected by land-lake associated with the Avonmouth employment area (alone and in combination with other consented developments), future habitat loss could be regarded as having the potential for a significant effect upon the favourable condition status of the waterfowl populations within the SPA, as well as the integrity of the Severn Estuary SPA and Ramsar site. Further mitigation measures would, therefore, be required (see Section 9.7 for further details).	Y



9.0 Mitigation

9.1 Assumptions underpinning the mitigation strategy

- 9.1.1 Based upon the outcomes of the impact assessments, a mitigation strategy has been adopted for gadwall and the Qualifying Assemblage, and is described in detail in Section 9.8. In defining the nature and extent of mitigation that would be necessary to address the predicted impacts, a number of key assumptions/decisions have been made, which have provided a framework for the strategy. These are described below and are also referred to in Section 9.7 (as appropriate):

Assumption 1: Measures to avoid impacts (thereby safeguarding habitats and the birds which they support) cannot be guaranteed.

- 9.1.2 In the absence of any specific details regarding how any future development proposals could affect wetland habitats/grazing pasture (and the populations of waterfowl which they support), a reasonable worst-case scenario has been adopted for the Review of the 1957/58 Severnside Consent and the Avonmouth Impact Assessments. This approach presumes that each species of waterfowl could be subject to the effects of permanent habitat loss and/or permanent disturbance and/or permanent displacement, as a result of future development activities. This principle has also been transposed into the mitigation strategy, such that mitigation has been developed to address the potential impacts on a like-for-like basis.

- 9.1.3 From a nature conservation perspective, Natural England has advocated the principle that safeguarding existing wetland habitat/grazing pasture is a preferable mitigation option to new habitat creation/enhancement, wherever possible. Whilst this principle remains valid, it is acknowledged by the Project Partnership that the extent to which existing habitats can be safeguarded from future development associated with the 1957/58 Severnside Planning Consent and (to a lesser extent) the footprint of the Avonmouth Employment Area cannot be guaranteed. The mitigation strategy is, therefore, underpinned by the presumption that habitat creation/enhancement proposals would need to be developed, to avoid potentially significant impacts upon the integrity of the Severn Estuary SPA and Ramsar site, as a result of possible future development, which could feasibly take place within these development areas.

Assumption 2: A holistic approach to mitigation.

- 9.1.4 In carrying out the impact assessments described in Sections 7 and 8, the potential effects of land-take, disturbance and displacement have been determined individually for Severnside and Avonmouth (albeit that consideration has been given to the potential cumulative effects of the predicted impacts). However, in developing the mitigation strategy, the Project Partnership has agreed that a more holistic approach to mitigation should be adopted. As a result, consideration has been given to identifying areas of potential mitigation land for future habitat creation/enhancement works across (and in some cases outwith) the overall study area (as shown on Figure 1), regardless of whether the development could be located at Severnside or Avonmouth.

Assumption 3: The Ecological Refuge Area represents a priority mitigation site.

- 9.1.5 The creation of an Ecological Refuge Area at Severnside (as shown by Area F on Figure 12) formed part of a S106 Agreement associated with the development of (P94/400/8) the Western Approaches Park (WAP1). At the request of the Project Partnership (and in keeping with the underlying justifications for its creation), the Ecological Refuge Area has been considered as a



priority site for adoption into the mitigation strategy. Further details pertaining to the Ecological Refuge Area are provided in Section 9.3.

Assumption 4: Addressing the effects of habitat loss represents a key driving principle within the mitigation strategy.

9.1.6 There is a presumption that the mitigation strategy will be targeted towards off-setting the effects of predicted habitat loss (as opposed to disturbance and displacement) as a priority, for the following reasons:

- Habitat loss is predicted to affect the majority of wetland sites/grazing pasture within the study area.
- The effects of habitat loss on waterfowl populations tend to be permanent and irreversible, resulting in a long-term reduction of net carrying capacity within the study area.
- The effects of habitat loss on waterfowl populations can be predicted with relatively high confidence (i.e. the 'loss' of wetland habitat/grazing pasture under clearly-defined development footprints, leading to a quantifiable reduction in habitat availability, represents an outcome that can be predicted with relative certainty).
- Conversely, the effects of development-related disturbance and displacement on waterfowl populations are more difficult to predict confidently, since they can be influenced by unknown factors such as the nature of the disturbance source, the characteristics of the wetland site/grazing pasture, the effects of habituation, the existing levels of background disturbance, etc.

In a small number of instances, particular wetland sites/areas of grazing pasture may be subject to disturbance and/or displacement impacts only (e.g. Orchard Pools). In these cases, the mitigation strategy gives specific consideration as to whether the habitat creation/enhancement measures which are proposed in relation to habitat loss would also be considered sufficient to address the effects of the disturbance impact, or whether additional mitigation proposals would need to be developed.

Assumption 5: The mitigation strategy will aim to remain proportionate to the scale of impacts predicted, based upon: (i) the areas of habitat which could be affected; (ii) the numbers of birds which are predicted to be present; and (iii) potentially differing habitat requirements for the 'affected' waterfowl species in question.

9.1.7 The mitigation strategy seeks to identify habitat creation/enhancement options based upon: (i) the areas of habitat which could be affected by impacts predicted in Sections 7 and 8; (ii) the numbers of birds which are predicted to be affected by impacts described in Sections 7 and 8 and (iii) the degree to which multiple waterfowl species using the same wetland sites/grazing pasture can be accommodated into the same mitigation areas (based upon an assessment of their habitat preferences). In this way, it is hoped that the nature and extent of any mitigation proposals can remain proportionate to the scale of the impacts predicted. For example, the study identifies a range of wildfowl species to be using the same wetland sites across the study area. In determining the new wetland habitat that would need to be created to address predicted levels of habitat loss, it is recognised that the majority of the 'affected' wildfowl species could be accommodated within the same areas of newly-created wetland habitat, provided that:

- sufficiently large areas of land are available to mitigate for the predicted levels of habitat loss on a like-for-like basis; and
- any species-specific habitat requirements are accounted for by the mitigation proposals (e.g. the differing water depths required by ducks, depending upon whether they feed by dabbling (teal), up-ending (mallard) or diving (tufted duck).



9.2 The approach

- 9.2.1 The findings of the impact assessments report indicate that continued development at Avonmouth and Severnside (including the concomitant loss of wetland habitat and disturbance/displacement of wetland birds through development) could have potentially significant impacts upon the favourable condition status of populations of wildfowl and waders listed within the Qualifying Species/Assemblage for the Severn Estuary SPA and Ramsar site. In terms of potential mitigation options, the progressive approach to land development at Severnside and Avonmouth arising from the large amount of development which is already consented/proposed, must have regard to the existing (WAP1) S106 Agreement (see below) to ensure that a piecemeal approach to developing site-specific mitigation measures is avoided.
- 9.2.2 The 1957 and 1958 Severnside planning consents remain extant and capable of further implementation. Following a lengthy Public Inquiry, the Secretary of State confirmed the status of the 1957 planning consent as extant and capable of further implementation; subsequent development has continued to take place within the consented area. The terms of the 1957 consent are such that certain development can take place across the majority of the consented area without the need for further planning permissions or reserved matters approval. In relation to the limited areas within the 1957 consented area that require reserved matter approval for layout design and external appearance prior to development within that area, consideration will be given, on receipt of a reserved matters application and the subsequent Appropriate Assessment, to the desirability of providing habitat areas relevant to the reserved matter submitted and proportionate to the area for which the reserved matter is sought.
- 9.2.3 As discussed in Section 3.2, the 1957 & 1958 planning consents have, however, been subject to modification through the signing of a S106 Agreement in conjunction with development of (P94/400/8) the Western Approaches Park (WAP1) on 7th June 1995. This S106 Agreement is binding on the owners of the land covered by the 1957/58 Severnside Planning Consent and has an agreed and implemented an Ecological Masterplan (dated 1997), which includes: (i) an Ecological Refuge Area currently comprising two 'core' areas of land for ecological mitigation, totalling 28 hectares, which will be augmented to 38 hectares (see Section 9.3, below for further details); and (ii) a series of green corridors running through the 1957/ 58 Planning Consent Area. In addition the S106 Agreement restricts development within the Severn Estuary, the foreshore and within land to the north and west of the A4132.

9.3 The Ecological Refuge Area

- 9.3.1 The (WAP1) S106 Agreement specifies that *'an area of approximately 38 hectares....shall be identified under the terms of the Overall Masterplan and the Ecological Estate Management Plan as a nature sanctuary with the objective of providing a fixed area of land capable of sustaining the general biodiversity of the Overall Masterplan area free from disturbance.'* The location of the Ecological Refuge Area is denoted by Area F, as shown on Figure 12. Based upon the information contained within the (WAP1) S106 Agreement, two 'core' areas of land totalling 28 hectares have been identified within the Ecological Refuge Area, to the north-west and south-east of the M49 motorway corridor respectively. Furthermore, there is also a commitment within the (WAP1) S106 Agreement to incorporate a further 10 hectares of land as part of the existing 'core' areas, which would result in a total of 38 hectares of land potentially being available for habitat creation works in the long-term.
- 9.3.2 The Ecological Refuge Area comprises a combination of farmland and reclaimed tip. The area of land lying to the east of the M49 motorway predominantly comprises pasture although there are remnants of abandoned orchard. To the west of the M49 motorway lies an area of former



tip, which has been capped and restored, as well as additional areas of pasture. Field boundaries typically comprise hedgerows, with hedgerow trees and in some cases field drains. Further details pertaining to the nature of the site and its habitats are (to some extent) described in Appendix 3 (since the western part of the Ecological Refuge Area (Areas J and K on Figure 1 in Appendix 3) was included within the March 2010 habitat assessment (as described in Appendix 3)).

9.3.3 The Ecological and Estate Management Plan provides a description of measures which would be implemented in order to protect, enhance and manage the Ecological Refuge Area. Depending upon the extent which the Ecological Refuge Area delivers mitigation in relation to impacts at Severnside and Avonmouth, it may be necessary to review the management plan for this area, to ensure that its objectives are consistent with the requirements of any future habitat creation and/or enhancement works. However, it is noted that the Ecological and Estate Management Plan already incorporates measures to create new wetlands and improve upon the diversity of the existing grassland habitats within this area, which could form the basis of a more targeted series of management prescriptions for waterfowl in the future.

9.3.4 Once fully implemented, the Ecological Refuge Area has the potential to provide part of the long-term mitigation to address at least a proportion of the potential adverse impacts of future development within the 1957/58 Planning Consent Area and Avonmouth impact assessment. Whilst creating new wetland habitat on the 38 hectares of land identified within the S106 Agreement would be expected to mitigate, in part, for the effects of habitat loss/disturbance/displacement, the locations of these areas with requisite lines of sight and the natures of the habitats provided (including suitably-sized wetland areas) will be crucial to the success of this mitigation. Additionally, whilst the S106 Agreement safeguards the Orchard Pools themselves from future habitat losses, disturbance and/or displacement of gadwall and the Qualifying Assemblage of waterfowl arising from development of adjoining land within the 1957/58 consented area could still arise unless carefully controlled during development.

9.4 Strategic consideration of future wind farm development associated with wetland sites

9.4.1 Strategic consideration should be given to the location and extent of future wind development, particularly at those sites which have been identified as potentially suitable for wind farm development within the BCSES, as well as any other sites which could be proposed. It is recognised that wind farm developments have the potential to give rise to detrimental impacts upon bird populations, most notably through: (a) collision with turbines; (b) habitat loss; and (c) displacement from habitats. In view of this, the range of sites proposed for possible future wind farm development within the BCSES has been reviewed, to determine its potential impact upon the outcomes of this study. In particular, the avoidance of siting future wind farm development within, or in close proximity to, greenfield land which is not currently consented or allocated for any other development (e.g. Hallen Marsh) would afford two important outcomes in relation to the Severn Estuary SPA and Ramsar site:

- (vi) wetland sites (and their bird communities) which are only predicted to be affected by potential displacement impacts associated with BCSES wind farm developments at Avonmouth (e.g. curlews at Hallen Marsh (see Figure 8b)), would no longer be at risk from these impacts.



- (vii) the extent of greenfield land which could be available to deliver robust mitigation to off-set impacts associated with the 1957/58 Severnside Consent and the Avonmouth employment area would be maximised and would be free from potential wind farm-related constraints.

9.4.2 Policy BCS4 (Avonmouth and Bristol Port) identifies Avonmouth as ‘a *priority area for industrial and warehousing development and renewal. Its economic strengths will be supported whilst protecting its environmental assets and acknowledging its development constraints.*’ In particular, the policy does not promote new allocations for employment on greenfield land and stipulates that renewable energy proposals will be expected to demonstrate how they protect the area’s environmental assets and, specifically, comply with the Habitats Regulations to avoid significant adverse effect on the Severn Estuary.

9.4.3 In view of this planning policy background and given the constraints which are likely to limit the location and extent of mitigation sites (see Section 11.1), it is proposed that strategic consideration be given to limiting the locations of potential future wind farm developments (as identified within the BCSES) away from those areas associated with wetland sites, to reduce the significance of potential impacts upon waterfowl and safeguard the effectiveness of the mitigation strategy in relation to this study.

9.5 Habitat safeguard, creation and enhancement outwith consented / allocated development land

9.5.1 In combination with the land identified within the Ecological Masterplan (Area F on Figure 12), the use of land situated outwith of the 1957/58 Severnside Consent Area and the Avonmouth employment area potentially represents the most feasible means of delivering appropriate levels of mitigation in relation to the impacts identified in Sections 7 and 8. For the purposes of this study, it has been assumed that this land would not be subject to land-take, or direct habitat loss associated with either of these development routes. Nevertheless, it is inevitable that further site-specific work would still need to be undertaken to investigate and (where necessary) overcome a range of other constraints, which could undermine the ability to use any given land parcel for dedicated mitigation. These constraints are likely to include (but may not be limited to):

- Land ownership;
- Existing/future land uses;
- Soil suitability and hydrological conditions for wetland creation;
- Potential disturbance effects from surrounding land use;
- Existing sight-lines;
- Existing levels of bird usage and
- Existing policy designations.

9.5.2 The selection of a number of such sites would also enable a network of wetland areas to be established which (subject to further management considerations) could be maintained as mitigation areas in perpetuity. In this way, a holistic approach to mitigation could be adopted as a means of securing sufficient quantities of land, at appropriate locations, to off-set the scale of impacts which could arise through the proposed development at Severnside and Avonmouth.



Preferred mitigation option(s)

9.5.3 Based upon the range of mitigation options identified above (and the constraints and opportunities associated with each of these), consideration will be given to addressing the impacts identified in Sections 7 and 8, by the following means:

- habitat safeguard, creation and enhancement outwith consented/allocated development land; and
- strategic consideration of future wind farm development associated with wetland sites.

9.6 Proposed mitigation sites

9.6.1 In view of the mitigation options under consideration in this study, a series of potential mitigation sites (Areas A – F on Figure 12) has been proposed. The selection of these sites has been based upon the following information:

- A habitat assessment survey which was carried out in March 2010 across the study area (see Appendix III for further details). Whilst the coverage of the habitat assessment survey within the study area was not comprehensive, its aims included the identification possible wetland sites for safeguard, habitat creation and habitat enhancement, as a means of providing a network of strategic mitigation to off-set the impacts identified in Sections 7 and 8. During the habitat assessment survey, a range of site-specific parameters were recorded, in order to allow a high-level assessment to be made of potential constraints and opportunities which could affect the feasibility/deliverability of mitigation within any given area.
- Recommendations for potential habitat creation/enhancement areas within the Severnside Bird Surveys (Wessex Ecological Consultancy, 2002).
- Details of potential habitat creation enhancement areas which have been identified at two former landfill sites, subject to further detailed feasibility studies.

9.6.2 Based upon these information sources, the proposed mitigation areas in relation to the impacts identified in Sections 7 and 8 (subject to further consideration of site-specific constraints) are shown on Figure 12. In addition, those factors which could represent constraints/opportunities for mitigation in these areas are summarised in the table overleaf.

9.6.3 The table indicates that, based on dialogue with the landowners SITA, Areas D and E are eminently deliverable. Northwick Farm (E) is a restored landfill: and Berwick Farm (D) a land-fill in the process of restoration. Area C (Hallen Farm) consists of Bristol City Council-owned land, significant proportion of which is inviolate from development as it constitutes part of the exclusion zone of a high pressure gas pipeline. As much of C comprises Bristol City Council-owned farmland, agri-environmental schemes would provide a funding stream and a mechanism of marrying continued agricultural use with delivery of C as mitigation. The remaining two Areas, A and B, are privately owned agricultural land, with A previously being used by the Highways Agency. Because of this, delivery of these parts of the mitigation strategy present the greatest challenge of the five identified areas'.



Site (see Figure 13)	Area (m ²)	Existing land use	Summary of habitats	Existing bird usage and connectivity with other wetlands	Potential bird disturbance sources	Existing policies/designations	Commentary on constraints/opportunities ¹
A	137,000	Former highways construction compound area now restored to grazing pasture (Wessex Ecological Consultancy, 2002).	Area of low-lying improved grassland bisected by a network of mature hedgerows. Hedgerows are up to 5m high, and sight-lines are generally 50m-100m. Not included within the March 2010 habitat assessment survey.	This site has been found to support flocks of up to 26 lapwings on occasions, but otherwise no desk-based records of significant waterfowl counts have been identified. Owing to its juxtaposition to the Severn Estuary, it is often overflown by waders and wildfowl (Wessex Ecological Consultancy, 2002)	M4 motorway adjacent to the site's southern boundary. Public access along the site's western boundary (outwith Area A).	None identified	Opportunities This site was identified as a potentially suitable for habitat creation during the Severnside Bird Surveys (Wessex Ecological Consultancy, 2002). Despite the potential suitability of the habitats, the site has not been found to support large concentrations of birds on a regular basis, but appears to be situated along a well-used fly-way to from the adjacent estuary. A limited amount of earthworks would be required to create waterbodies/scrapes in this area. Constraints There is public access along the site's western boundary. Whilst this could provide education opportunities, it could give rise to potential disturbance effects. Therefore, consideration may need to be given to screening. Existing sightlines may need to be extended through selective hedgerow removal.
B* (Area G in Appendix III)	245,000	Grazing pasture	Area of low-lying improved grassland bisected by a network of rhynes and (in some cases) fragmented and mature hedgerows. Hedgerows are 5m-10m high and sight-lines are >200m in most cases. Small pools/water-logged ground likely to be present	This site represents an extension to larger area of land to the east of the M49 and at Whitehouse Farm which have previously been found to support significant numbers of lapwings and curlews. Information supplied by Natural England indicates that there is (likely to be) interchange of birds between this site and other areas of grazing pasture to the north of Pliwing and within the Severn Estuary itself.	The eastern boundary of this site would be situated adjacent to the boundary of the 1957/58 Severnside Consent Area. Furthermore, a large warehouse development and access road have already been constructed adjacent to this site.	Site represents a receptor site for great crested newts relocated from adjacent development land.	Opportunities Parts of this site already have already been subject to usage by significant numbers of birds and there is considered to be the potential for further habitat enhancement works (e.g. creation of wetland features) through a limited amount of earthworks to enhance this area and increase its carrying capacity. Constraints The site is located adjacent to the boundary of the 1957/58 Severnside Consent Area, with a large warehouse development already constructed. This could introduce a degree of disturbance to the site which could reduce its attractiveness to birds. The site also represents a receptor site for great crested newts relocated from adjacent development land; however, the broad habitat requirements for wintering birds and great crested newts are not necessarily mutually exclusive. Existing sightlines may need to be extended through selective hedgerow removal.
C* (Area E in Appendix III)	1,113,780	Grazing pasture and arable land	Area of mixed-use agricultural land, surrounded by a network of deep rhynes (>2m in places) and mature hedgerows/tree-lines (mainly 2-5m in height, but >5m in places. Sight-lines up to 200m, but generally <120m. Small number of isolated pools (<10m diameter) scattered throughout the site	Flocks of up to 35 curlews previously recorded; however, no other significant desk-based records of birds have been identified. The site is located centrally within the study area and in close proximity to Disused Reservoir Pools, and Pools at Lawrence Weston Road (albeit that these sites could subsequently be 'lost' to development-related land-take). The site's western boundary is located within 1km of the Severn Estuary.	The site's western boundary is situated adjacent to existing development areas; however, the remainder of the site is relatively free from disturbance sources. The site is located within 600m of multiple BCSES potentially feasible wind farm sites.	Located within 600m of multiple BCSES potentially feasible wind farm sites.	Opportunities The site represents a large-scale area of farmland habitat located centrally within the study area and close proximity to the Severn Estuary. Parts of this site already have already been subject to usage by significant numbers of birds and there is considered to be the potential for further habitat enhancement works (e.g. creation of wetland features) through earthworks/vegetation removal to enhance this area and increase its carrying capacity. Constraints Located within 600m of multiple BCSES potentially feasible wind farm sites. Existing sightlines may need to be extended through selective hedgerow removal.
D	307,300	Land-fill site – under restoration	Unknown – this area was not included within the March 2010 habitat assessment survey.	No desk-based records of birds have been recorded. Located in relatively close proximity to Hallen Marsh (Area C) and other wetland sites (albeit that these sites could subsequently be 'lost' to development-related land-take).	Unknown – this area was not included within the March 2010 habitat assessment survey.	Unknown	This area was identified as a potentially suitable mitigation site by the County Ecologist for South Gloucestershire, since it forms part of an active land-fill site which is to undergo restoration works to agricultural land No further site-specific information pertaining to the constraints/opportunities associated with this site is available, at the time of writing. (the site now has permission for restoration to agricultural land, incorporating features which should hold standing water during the autumn/winter months. However, 'capping' the landfill in 'cells' has meant restoration is in stages and that, once complete, the site will consist of a series of mounds, with a series of scrapes to hold water on each crown. Given that this is not typical of the wetland habitat typically used, flat with good lines of sight, there is a degree of uncertainty as to how much it will be used).
E	91,500	Restored Northwick land-fill site, now comprises grazing pasture	Area of low-lying improved grassland surrounded by a network of mature hedgerows.	No desk-based records of birds have been recorded; however, the site lies adjacent to Northwick Warth and, therefore, it is likely that significant numbers of birds may be present on occasions.	Public access along the site's western boundary (outwith Area E).	Unknown	This area was identified as a potentially suitable mitigation site by the County Ecologist for South Gloucestershire, since it forms part of a restored land-fill site. No further site-specific information pertaining to the constraints/opportunities associated with this site is available, at the time of writing.

¹ denotes those sites which were surveyed as part of the March 2010 habitat assessment survey
¹ High-level constraints/opportunities have been identified on the basis of readily available information (e.g. the findings of the walkover surveys, aerial photography, etc) and do not cover the full range of factors that may be relevant to these sites (e.g. land ownership, flood risk, conflicting protected species constraints, etc).



9.7 Mitigation strategy and residual impacts

Review of the 1957/58 Severnside Consent

Gadwall

Habitat loss

- 9.7.1 The degree to which all (or at least some) of the water bodies within the footprint of the 1957/58 Severnside Planning Consent, which have been identified as supporting (or likely to support) foraging and/or roosting birds during the winter, can be retained cannot be guaranteed. Therefore, measures to mitigate for the potential future loss of these water features are proposed, as a means of ensuring that gadwall would not be subject to a potentially significant residual impact in the long-term. To achieve this, it is proposed that additional water bodies be created as replacement habitat for those which could be 'lost' through development-related land-take under the footprint of the 1957/58 Severnside Planning Consent Area. The Review of Consent assumes that up to seven waterbodies (distributed across three wetland sites) could be 'lost', with a corresponding combined surface area of approximately 21,990m² (see Paragraphs 7.2.3 – 7.2.12 for further details).
- 9.7.2 In order to address the worse-case impact scenario, it would be necessary to create two to three new water bodies (each comprising between 7,330m² and 10,995m²) be created as like-for-like replacement habitat. At this stage, it is not possible to confirm definitively the locations of these replacement water bodies (due to certain constraining factors which could exist (see Section 11.1 for further details). However, (as described previously) the Ecological Refuge Area and a further five sites have been identified as potential locations for implementing mitigation measures. These mitigation sites are shown on Figure 12 and comprise:
- The fields to the north of the M4 Bridge (Area A) – approximately 137,000m²;
 - The fields at Whitehouse Farm (Area B) – approximately 245,000m²;
 - Hallen Marsh (Area C) – approximately 1,113,780m²;
 - Berwick Farm Landfill Site (Area D) – approximately 307,300m²;
 - The former Northwick Landfill Site (Area E) – approximately 91,500m²; and
 - The Ecological Refuge Area (Area F) – 'core' areas to comprise approximately 380,000m².
- 9.7.3 At the time of writing, it is proposed that the feasibility of creating at least a proportion of these new water bodies be investigated in Areas D and E (i.e. the former landfill sites). It is understood that agreements are in place for these landfill sites to be restored to a combination of agricultural and nature conservation land uses and, therefore, there appear to be obvious synergies with the requirements of this study. In view of this, the Project Partnership has indicated that these areas should be considered as possible habitat creation areas in the first instance (subject to the findings of further feasibility study).
- 9.7.4 Areas D and E have a combined surface area of 398,800m² and, therefore, the creation of 21,990m² of new wetland habitat at these locations would only equate to approximately 6% of this land area. However, as former landfill sites, there remains an element of uncertainty surrounding the feasibility of creating new wetland habitats at these locations. In particular, there is likely to be a requirement that the integrity of the landfill capping remains unaffected by any subsequent site operations. Consultation with South Gloucestershire Council's (SGC) Ecologist has indicated that it may only be possible to create a series of wetland 'scrapes' and shallow depressions (rather than excavating deeper pools) at these sites. Furthermore,



depending upon the sites' vertical elevations compared with their surroundings, it may be necessary for these wetland features to be fed by precipitation and site-based surface water run-off (rather than being fed by the ditch and rhyne network within the study area). Gadwall is a species which feeds predominantly by 'dabbling', although some 'up-ending' also takes place and, therefore, the water depth across a proportion of the new ponds should not exceed 0.3m, in order to provide suitable feeding opportunities for this species (Newbold & Mountford, 1997). Therefore, despite these potential constraining factors, it is possible that habitat creation measures could still be achieved within Areas D and E for this species during the winter months; however, this would need to be confirmed through further investigation.

- 9.7.5 Assuming the successful implementation of the proposed mitigation measures, potentially significant residual impacts upon gadwall, as a result of development-related land-take would not be expected to occur. In view of this, it is considered that habitat loss associated with the 1957/58 Severnside Planning Consent (either alone, or in combination with other plans or projects) would not be expected to result in potentially significant residual impacts upon the favourable condition status of the gadwall population within the SPA. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.

Disturbance

- 9.7.6 Orchard Pools have been identified as being sufficiently close to the boundary of the 1957/58 Severnside Planning Consent, such that significant levels of disturbance upon gadwall using this wetland site could occur, depending upon the nature of any future development proposals. Information supplied by SGC's Ecologist indicates that Astra Zeneca has submitted a planning application to construct a series of industrial units adjacent to their existing pharmaceutical plant, extending into the fields to the south of Orchard Pools. As there is the potential for these proposals to affect adversely any gadwall using this wetland site (due to the proximity of proposed development and the nature of the proposals), measures to avoid/reduce this potential impact have been included within the planning application. These measures comprise the inclusion of a wetland 'buffer' zone between the proposed development footprint and Orchard Pools, to provide a degree of spatial separation and screening between the boundary of the Orchard Pools site and the proposed development footprint. In addition, measures to attenuate noise and vibration during the construction and operation of the proposed development are also included. It has been agreed with the Project Partnership that any future development proposals in the vicinity of Orchard Pools should also include a comparable suite of effective mitigation measures, to ensure that waterfowl at this wetland site are not adversely affected by future development-related disturbance.
- 9.7.7 Based upon the inclusion of effective mitigation measures in relation to Astra Zeneca's proposed warehouse development, and assuming a commitment that a comparable suite of effective mitigation measures would remain in place in relation to any other future development proposals which could affect this site, potentially significant residual impacts upon gadwall would not be expected to occur.
- 9.7.8 Whilst disturbance-related impacts are also considered feasible in relation to one of the pools to the east of Grove Farm, the creation of approximately 21,990m² of new wetland habitat (potentially at Areas D & E) would also be expected to mitigate for any displacement effects associated with increased levels of development-related disturbance at this wetland site.
- 9.7.9 In view of these potential mitigation outcomes, it is considered that increased levels of development-related disturbance associated with the 1957/58 Severnside Planning Consent (either alone, or in combination with other plans or projects) would not be expected to result in



potentially significant residual impacts upon the favourable condition status of the gadwall population within the SPA. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.

The Qualifying Assemblage - Wildfowl

Habitat loss

9.7.10 Potentially significant levels of habitat loss have been predicted in relation to the relevant species of wildfowl within the Qualifying Assemblage. The extent of this habitat loss is the same as that described for gadwall, due to these birds being present at the same sites within Severnside. Therefore, it is proposed that the proposed approach to delivering appropriate mitigation measures for gadwall (i.e. 21,000m² of new wetland habitat, described previously) would also be sufficient to address the levels of habitat loss, which have been predicted in relation to the majority of the wildfowl species under consideration as part of the Qualifying Assemblage. However, it is important to recognise that there are variations in the water level requirements for the different species of over-wintering wildfowl. Species such as tufted duck feed predominantly by diving, the remainder of species 'dabble' and 'up-end' and, therefore, their depth preferences are dependent upon their size. The water body creation proposals would need to incorporate sufficient variation in water depth to accommodate the range of wildfowl which could be affected by habitat loss. In particular, any new water bodies would need to provide foraging opportunities for shallow feeding or 'dabbling' species, such as: mallard (which require depths not exceeding 0.35m); teal (which require depths not exceeding 0.20m); and shoveler (which require depths not exceeding 0.30m) (Newbold & Mountford, 1997). However, tufted duck would require deeper wetlands, typically between 0.35m and 5.0m in depth (Newbold & Mountford, 1997). Given the likely constraints to deep excavation within the former landfill sites (described above), the feasibility of using part of the Ecological Refuge Area for the creation of at least one deep pool for this species should also be investigated. This water feature would also need to be carefully sited to avoid the reclaimed tip area within this site. Furthermore, the health and safety implications of attracting waterfowl to an area immediately adjacent to the M49 motorway would also be paramount issue that would require further consideration.

9.7.11 These potential mitigation measures would need to be taken into consideration with those which are proposed in relation to waders (see Paragraphs 9.7.13 to 9.7.18, below), in order to ascertain whether they would be effective in off-setting a potentially significant impact in relation to the SPA Qualifying Assemblage (see Paragraph 9.7.18 for further details).

Disturbance

9.7.12 The proposed approach to the (on-going) delivery of appropriate mitigation measures for gadwall at Orchard Pools (described previously) would also be expected to address any potentially significant (cumulative) disturbance impacts which have been predicted in relation to the relevant species of wildfowl within the SPA Qualifying Assemblage (see Paragraph 9.7.22).

The Qualifying Assemblage - Waders

Habitat loss

9.7.13 As described above for gadwall, consideration should be given to avoiding the predicted impact upon waders, as a means of mitigation (where possible). This would involve safeguarding (at least part of) the areas of grazing pasture which have previously been found to support flocks of curlew, lapwing and common snipe (i.e. the fields to the east of the M49, the Astra Zeneca fields



and an area of Dyer's Common (see Figures 8a, 10a & 12a respectively)). It has been assumed that the retention of these areas within the footprint of the 1957/58 Severnside Planning Consent could not be guaranteed.

- 9.7.14 Under these circumstances, additional measures would be required to mitigate for the potential loss of this grazing pasture, as a means of ensuring that the Qualifying Assemblage (and specifically, the contribution that these waders make to this assemblage) would not be subject to a potentially significant residual impact in the long-term. A substantial proportion of the potential impact upon the Qualifying Assemblage relates to lapwings (which are the most abundant species, predicted as being present within the areas to be 'lost' in numbers which equate to approximately 1% of the total SPA Qualifying Assemblage). In view of this, it is proposed that mitigation measures be targeted towards this species. However, given the overlap and/or similarity in this species' habitat requirements to those of curlew and (to a lesser extent) common snipe, it is considered feasible that the delivery of mitigation measures which are biased towards lapwings would also off-set (to some extent) the potential habitat losses which have been predicted in relation to these species.
- 9.7.15 The review of the 1957/58 Severnside Consent has identified that up to approximately 456,900m² of grazing pasture (which has been found/is assumed to support wintering lapwings) could be 'lost' under the future development footprint, based upon a worst-case scenario (see Paragraphs 7.4.13 – 7.4.18 for further details). As described for gadwall, it is proposed that the feasibility of undertaking habitat creation works within Areas D and E (i.e. the former landfill sites) should be investigated, as a means of address this potential impact. Collectively, these sites comprise 398,800m² of land. Taking into account the possibility that 21,990m² of new wetland habitat could be created in these areas, to address potential impacts in relation to gadwall and the relevant waterfowl species within the Qualifying Assemblage, approximately 376,800m² of land could be available for further habitat creation in relation to lapwings. Whilst this combined area would still fall short of the total area of grazing pasture which has been predicted to be at risk from habitat loss at Severnside, it is considered feasible that this discrepancy could be addressed by utilising approximately 80,000m² of land within the Ecological Refuge Area (although this would also need to be investigate through further feasibility study).
- 9.7.16 In recent years, a considerable amount of effort has been invested in developing nature conservation strategies to reverse the long-term decline in the UK's lapwing population. In many cases, these nature conservation strategies tend to focus upon creating and managing farmland habitats for breeding lapwings (rather than wintering birds). For the purposes of this study, it would be more appropriate to target habitat creation and management practices towards wintering lapwings (albeit that it would clearly be desirable to maximise any benefits which could be conferred to breeding birds).
- 9.7.17 Studies in relation to winter habitat usage by lapwings in the UK have shown that this species has historically exhibited a pronounced preference for permanent pasture (Gillings *et al*, 2007). This species tends to forage by sight, favouring earthworms and other soil invertebrates which tend to occur in abundance throughout this habitat type. Furthermore, long-standing pasture provides better levels of insulation from frost, making foraging possible in colder weather. Nonetheless, in areas where arable crops dominate (and there is a general absence of pasture), lapwings have been found to feed within different crop types, depending upon season, availability and weather conditions. In particular, crops such as sugar beet have been found to be favoured by lapwings, due to the presence of crop pest species which provide foraging opportunities (Gillings *et al*, 2007). In addition, the spreading of manure across intensively



managed arable land has also been shown to increase the productivity of these areas for feeding birds (Gillings *et al*, 2007).

- 9.7.18 This species' roosting requirements tend to comprise ploughed or worked soil, or tussocky grassland (or similar), where the broken nature of the ground provides shelter and concealment from predators (Shrubb, 2007). Lapwings are also attracted to flooded pastures as roosts, roosting at the margins of the water which presumably also provides protection from predators (Shrubb, 2007).
- 9.7.19 It is proposed that additional measures be carried out to enhance these fields and improve their carrying capacity for the wader species. Given the variety of agricultural habitats which are used by lapwings, further consideration should be given to developing a range of potentially suitable habitats for feeding and roosting birds. This could include the creation of a series of wet scrapes/grips which would retain areas of shallow water for prolonged periods during the winter months, as well as areas of bare ground and modifications to the grassland structure to create a more diverse sward height.
- 9.7.20 A total of 454,050m² of grazing pasture which is considered to support 104 curlews has been predicted to be subject to habitat loss during the Review of the 1957/58 Severnside Consent (see Paragraphs 7.4.3 – 7.4.8). In addition, grazing pasture/wetland habitat supporting 53 common snipe is predicted to be 'lost' through future development at Severnside (see Paragraphs 7.4.24 – 7.4.27). Given the degree of overlap between the habitat requirements for lapwing, curlew and common snipe, it is considered feasible that the measures described previously in relation to lapwing, would also be expected to confer benefits to the other wader species, which could offset the potential impacts which have been identified in relation to these species.
- 9.7.21 In view of these potential mitigation outcomes (and notwithstanding the findings of any subsequent feasibility studies), it is considered that future habitat loss associated with the 1957/58 Severnside Planning Consent (either alone, or in combination with other plans or projects) would not be expected to result in a potentially significant residual impact upon the favourable condition status of the SPA's Qualifying Assemblage. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.

Disturbance

- 9.7.22 In addition to habitat loss, the potential for increased levels of development-related disturbance has been predicted in relation to waders using approximately 267,400m² of land at Severnside. Depending upon the nature and extent of habitat creation work that is carried out in relation to habitat loss, it is possible that sufficient areas of newly-created habitat (in Areas D, E and F) may be available to accommodate any waders which are displaced from areas of land surrounding the 1957/58 Severnside Consent Area, as well as to address the potential effects of habitat loss.
- 9.7.23 To a large extent, this judgement will be dependent upon the outcomes of further feasibility studies, which would help determine the likely carrying capacities of any newly-created habitats for waders. In the event that additional areas of land were deemed to be necessary to address potential disturbance impacts, it is considered feasible that the fields at Whitehouse Farm (Area B on Figure 12) might provide a sufficient area of land (245,000m²) for this purpose. These fields comprise an area of sheep-grazed pasture and lie directly adjacent to an area of land to be 'lost' under the footprint of the 1957/58 Severnside Planning Consent. This area has previously been found to support flocks of up to 625 lapwings, as well as 31 curlews. Given



juxtaposition of these fields to this area, it is considered feasible that (with additional habitat enhancement to increase their carrying capacity) flocks of waders could be displaced into Area B.

- 9.7.24 All of the potential mitigation sites identified above would likely be subject to a degree of background disturbance associated with the surrounding land uses (and potentially future development which could take place in adjacent parts of the 1957/58 Severnside Consent Area). It would therefore be important to ensure that consideration were given to this during the detailed design of the habitat creation areas, to ensure that this does not detract from the likelihood of birds using these sites in the future. Furthermore, the health and safety implications of attracting waterfowl to areas immediately adjacent to the M49 motorway would also be paramount issue that would require further consideration.
- 9.7.25 Notwithstanding the findings of any subsequent feasibility studies relating to Areas A-F, provided these mitigation sites and measures are delivered it is considered that future habitat loss associated with the 1957/58 planning permission at Severnside would not be expected to result in a potentially significant residual impact upon the favourable status of the Severn Estuary SPA's qualifying assemblage (either alone or in combination) and that, accordingly, no potentially significant effects upon the integrity of the SPA/Ramsar would be expected to occur'.

The Avonmouth Impact Assessments

Gadwall

Avonmouth Employment Area: Habitat loss

- 9.7.26 The degree to which all (or at least some) of the water bodies within the footprint of the Avonmouth employment area, which have been identified as supporting (or likely to support) foraging and/or roosting birds during the winter can be retained in the future cannot be guaranteed. Therefore, measures to mitigate for the potential future loss of these water features are proposed, as a means of ensuring that gadwall would not be subject to a potentially significant residual impact in the long-term. To achieve this, it is proposed that additional water bodies be created as replacement habitat for those which could be 'lost' through development-related land-take. The Avonmouth impact assessment predicts the potential for up to 11 waterbodies (distributed across three wetland sites) to be affected by direct habitat loss, with a corresponding combined surface area of approximately 41,000m². Therefore, it is proposed that two to three new water bodies (each comprising between approximately 13,800m² and 20,250m²) be created as replacement habitat.
- 9.7.27 In the first instance, it is proposed that further consideration be given to the creation of additional wetland habitats at the former landfill sites and the Ecological Refuge Area (i.e., Areas D, E and F on Figure 12). The Review of Consent has identified that these areas could represent potentially suitable sites for new wetland habitat provision in relation to impacts associated with the 1957/58 Severnside Planning Consent (notwithstanding the findings of further investigation into the feasibility of habitat creation in these locations). Collectively, these areas comprise an area of approximately 398,800m² and, therefore, it is deemed potentially feasible that they could accommodate approximately 41,000m² of new wetland habitat, as well as 21,990m² of new wetland habitat which is required in relation to habitat loss under the footprint of the 1957/58 Severnside Consent Area. Collectively, these areas of new wetland habitat would occupy approximately 16% of the entire land area that could be available across Areas D and E. The nature of any new wetland features in Areas D and E (and possible



constraining factors) are described previously in relation to Severnside (see Paragraphs 9.7.1 to 9.7.9).

9.7.28 In the event that definitive proposals were developed to accommodate all new areas of wetland habitat within Areas D and E, it would be necessary to re-evaluate whether this could have a knock-on effect upon the extent of wader mitigation which could be provided within these areas (as described in Paragraphs 9.7.13 to 9.7.18) and, therefore, whether further provision in relation to impacts upon waders might be required.

9.7.29 Assuming the successful implementation of the proposed mitigation measures, potentially significant residual impacts upon gadwall, as a result of development-related land-take would not be expected to occur. In view of this, it is considered that habitat loss associated with the Avonmouth employment area (either alone, or in combination with other plans or projects) would not be expected to result in potentially significant residual impacts upon the favourable condition status of the gadwall population within the SPA. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.

Avonmouth Employment Area: Disturbance

9.7.30 In addition to habitat loss, the potential for increased levels of development-related disturbance has been predicted in relation to gadwall using approximately 35,350m² of wetland habitat at Avonmouth Pools. Depending upon the nature and extent of habitat creation work which could be carried out in relation to the possible effects of habitat loss upon this species (see Paragraphs 9.7.23 to 9.7.26 above), it is possible that sufficient areas of newly-created habitat (in Areas D and E) may be available to accommodate any birds which are displaced from Avonmouth Pools, as well as to address the potential effects of habitat loss. To a large extent, this judgement will be dependent upon the outcomes of further feasibility studies, which would help determine the likely carrying capacities of any newly-created wetland habitats for gadwall (and other waterfowl).

9.7.31 Based upon a worst-case scenario, it is considered possible that an area of 35,350m² of new wetland habitat could be required as mitigation to address the displacement of gadwall from Avonmouth Pools. This would be in addition to the 41,000m² of new wetland habitat which has been proposed as mitigation in relation to the possible effects of habitat loss upon this species. To achieve this, it may be possible to increase the provision of wetland habitat within Areas D and E, or possibly creating additional wetland habitat in other locations, such as the Ecological Refuge Area (Area F); however, it is not possible to put forward definitive proposals at this stage due to the underlying uncertainties regarding the feasibility of delivering mitigation measures at these sites.

9.7.32 In the event that adequate mitigation outcomes were deliverable in relation to this species, it is considered that increased levels of development-related disturbance associated with the Avonmouth employment area (either alone, or in combination with other plans or projects) would not be expected to result in potentially significant residual impacts upon the favourable condition status of the gadwall population within the SPA. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.

BCSES: Displacement

9.7.33 The Avonmouth impact assessments predict that all of the inland waterbodies within Avonmouth which have been found (or are considered likely) to support gadwall, could be subject to a displacement of birds as a result of possible future wind farm development arising from the



potential wind farm sites identified in the BCSES. It is not possible to quantify this impact any further than this; however, it is anticipated that the potential mitigation measures which have been proposed for this species in relation to habitat loss associated with the Avonmouth employment area would also be sufficient to address the potential effects of displacement due to future wind farm development. This approach has been developed in accordance with Assumption 4 in Section 9.1

- 9.7.34 Assuming the successful implementation of these proposed mitigation measures, potentially significant residual impacts upon gadwall, as a result of displacement from future wind farm developments would not be expected to occur (either alone, or in combination with other plans or projects) and thus, potentially significant residual impacts upon the favourable conservation status of the gadwall population within the SPA.

The Qualifying Assemblage: Wildfowl

- 9.7.35 The proposed approach to delivering mitigation measures for gadwall (described in Paragraphs 9.7.1 to 9.7.22) would also address the potentially significant impacts which have been predicted in relation to the relevant waterfowl species under consideration as part of the Qualifying Assemblage. Whilst the impact assessment predicts that teal may be subject to disturbance at an additional two pools (2400m²) at Seabank Power Station (compared to other wildfowl species at Avonmouth) through future development work, it seems feasible that this potential impact could be addressed by the mitigation measures for gadwall. This assumes that newly-created wetland habitats are of a sufficient habitat quality to accommodate any teal which could be displaced from the pools at Seabank Power Station through development-related disturbance. To a large extent, this judgement will be dependent upon the outcomes of further feasibility studies, which would help determine the likely carrying capacities of any newly-created wetland habitats for teal (and other waterfowl).
- 9.7.36 However, there are variations in the water level requirements for the different species of over-wintering wildfowl. Species such as tufted duck and pochard feed predominantly by diving, whilst the remaining wildfowl species 'dabble' and/or 'up-end' and, therefore, their water depth preferences for feeding are dependent upon their sizes. The water body creation proposals would need to incorporate sufficient variation in water depth to accommodate the range of wildfowl which could be affected by habitat loss. In particular, any new water bodies would need to provide foraging opportunities for shallow feeding or 'dabbling' species, such as: mallard (which require depths not exceeding 0.35m); teal (which require depths not exceeding 0.20m); and shoveler (which require depths not exceeding 0.30m). However, species such as pochard and tufted duck would require deeper wetlands (typically depths of up to 2.5m for pochard and 5.0m for tufted duck) (Newbold & Mountford, 1997). Given the likely constraints to deep excavation within the former landfill sites (described above), the feasibility of using part of the Ecological Refuge Area for the creation of at least one deep pool for this species should also be investigated. This water feature would also need to be carefully sited to avoid the reclaimed tip area within this site. Furthermore, the health and safety implications of attracting waterfowl to an area immediately adjacent to the M49 motorway would also be paramount issue that would require further consideration.
- 9.7.37 These potential mitigation measures would need to be taken into consideration with those which are proposed in relation to waders (see below), in order to ascertain whether they would be effective in off-setting a potentially significant impact in relation to the SPA Qualifying Assemblage (see Paragraph 9.7.40 for further details).



The Qualifying Assemblage: Waders

Avonmouth Employment Area: Habitat loss

- 9.7.38 The Avonmouth impact assessment has identified that up to approximately 275,500m² of grazing pasture which has either been found (or is considered likely) to support lapwings and curlew could be 'lost' under the future development footprint at Avonmouth (see Paragraphs 8.4.14 – 8.4.16). It is understood that the degree to which all (or at least some) of this existing habitat within the footprint of the Avonmouth employment area can be retained cannot be guaranteed. Therefore, measures to mitigate for the potential future loss of grazing pasture are proposed as a means of ensuring that the Qualifying Assemblage would not be subject to a potentially significant residual impact in the long-term.
- 9.7.39 In keeping with Assumption 5 in Section 9.1, it is proposed that a comparable area of habitat be created and/or retained and enhanced for these birds. Hallen Marsh (Area C on Figure 12) comprises an area of approximately 1,114,000m² of arable land and grazing pasture, and it is considered that a proportion of this site could feasibly be used to mitigate for the effects potential habitat losses upon waders elsewhere in Avonmouth through. In particular, it is understood that a large proportion of Hallen Marsh remains undevelopable, due to the presence of a high pressure gas main and an associated health and safety buffer zone, which needs to be maintained in perpetuity. Therefore, it seems likely that this area of land would remain under agricultural management in the long-term, and could potentially be used to deliver ecological mitigation.
- 9.7.40 It is important to recognise that Hallen Marsh already supports potentially suitable habitats for use by roosting and/or feeding over-wintering wildfowl and waders (particularly, lapwing and curlew). Furthermore, the findings of the Stage 1 desk study have confirmed that this area already supports wintering waterfowl, to some extent (Cresswell Associates, 2010). Therefore, any further habitat enhancement measures which take place at this site, would need to enhance its suitability and carrying capacity for these birds, to ensure that any birds which are displaced elsewhere in Avonmouth can be accommodated at this site. An indication of the likely winter habitat requirements for lapwing is described in relation to lapwing at Severnside in Paragraph 9.7.16; however, the development of any future mitigation measures would need to be informed by a range of other factors (e.g. the findings of feasibility studies, and an indication of planned farming practices).
- 9.7.41 It is important to stress, however, that future development of wind farm sites at Avonmouth (as proposed by the BCSES) could significantly affect the effectiveness of Hallen Marsh as a mitigation site. Therefore, in the event that mitigation measures are delivered in parts of Hallen Marsh, it is strongly recommended that future wind farm development be precluded within a distance of at least 600m from the boundaries of the proposed mitigation land, as a precautionary measure. This recommendation accords with the principles underlying Assumption 3 of the mitigation strategy (see Section 9.1).
- 9.7.42 In view of these potential mitigation outcomes (and notwithstanding the findings of any subsequent feasibility studies), it is considered that future habitat loss associated with the Avonmouth employment area (either alone, or in combination with other plans or projects) would not be expected to result in a potentially significant residual impact upon the favourable condition status of the SPA's Qualifying Assemblage. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.



Avonmouth Employment Area: Disturbance

- 9.7.43 Depending upon the nature and extent of any habitat creation/enhancement work which could be carried out in relation to the possible effects of habitat loss upon lapwing and curlew (as described above), it is possible that sufficient areas of habitat (at Hallen) may be available to accommodate any birds which are displaced from Land to the West of Kings Weston Lane. Furthermore, the creation/enhancement of approximately 275,500m² of grazing pasture at Hallen Marsh would also be expected to address potential disturbance impacts of this site (provided that the retained area was located a sufficient distance away from any areas which could undergo future development within the Avonmouth employment area). To a large extent, this judgement will be dependent upon the outcomes of further feasibility studies, which would help determine the likely carrying capacities of any newly-created/enhanced for waders (and other waterfowl).
- 9.7.44 As described above in relation to habitat loss, it is important to stress that future development of wind farm sites at Avonmouth (as proposed by the BCSES) could significantly affect the effectiveness of Hallen Marsh as a mitigation site. Therefore, in the event that mitigation measures are delivered in parts of Hallen Marsh, it is strongly recommended that future wind farm development be precluded within a distance of at least 600m from the boundaries of the proposed mitigation land, as a precautionary measure. This recommendation accords with the principles underlying Assumption 3 of the mitigation strategy (see Section 9.1).
- 9.7.45 In view of these potential mitigation outcomes (and notwithstanding the findings of any subsequent feasibility studies), it is considered that potential levels of disturbance associated with the Avonmouth employment area (either alone, or in combination with other plans or projects) would not be expected to result in a potentially significant residual impact upon the favourable condition status of the SPA's Qualifying Assemblage. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.

BCSES: Displacement

- 9.7.46 The proposed mitigation measures which have been proposed in relation to future habitat loss and disturbance associated within the Avonmouth employment area would also be expected to off-set potential displacement impacts upon these birds, which could arise in relation to future wind farm development taking place under the BCSES.
- 9.7.47 In view of these potential mitigation outcomes (and notwithstanding the findings of any subsequent feasibility studies), it is considered that the displacement of birds occurring as a result of future wind farm development arising from the BCSES (either alone, or in combination with other plans or projects) would not be expected to result in a potentially significant residual impact upon the favourable condition status of the SPA's Qualifying Assemblage. Therefore, no potentially significant effects upon the integrity of the SPA and Ramsar site would be expected to occur.



10.0 Potential for Habitat Creation

- 10.1.1 As described in Appendix III, the physical characteristics of the study area (in particular the soil and drainage characteristics) provide potentially suitable conditions for the establishment and support of wet grassland natural habitats. A number of potential measures to create additional wet grassland habitats are presented below, with any additional information requirements highlighted. An example of wet grassland/wet habitat created on similar land immediately south of Clevedon is presented in Section 10.4 to highlight what can be achieved.

10.2 Habitat creation options

- 10.2.1 As described above, the physical characteristics of the study area lend it to supporting wet habitats. It is likely that the existing drainage network (in particular the depth of the ditches) and the existing agricultural practices (arable or intensive grazing) are the main factors resulting in the majority of the site's ('greenfield') land not currently supporting extensive wetland habitats.
- 10.2.2 The following measures could be adopted to create wetter ground conditions. Depending upon the mitigation requirements for individual species (as discussed in Section 9.7), it is likely that for any given location, a number of these would be required in combination.
- (i) Install water control structures in ditches. These could consist of drop log weirs with a defined invert level, such that water levels, and thus groundwater levels, could be manipulated during the year to provide, for example, the optimum conditions for wading birds during the winter, but also allow the water table to be lowered during the summer to allow grazing or grass cutting operations.
 - (ii) Create scrapes, grips or ponds within fields in order to maximise the storage of winter rainfall inputs and thus maintain wetter soil conditions for a longer period in the spring. Soil from the creation of these features could be used to create a low (<0.5m) bund around the margins of the field(s) to limit the amount of over-the-edge drainage into the ditches bordering the field. It is likely that some (minor) gradient will exist within fields, and this could be used to focus surface drainage towards a specific outfall point into an existing ditch, which could be used to control levels (e.g. retain water during the winter but allow drainage during the summer). Note that it is not proposed that the bund itself would retain water; maximum water levels would be set to existing ground levels, with ground works used to create specific wet features.
 - (iii) Lower the bank height (along for example a short 5m section) by an appropriate amount to allow water from a ditch to spill out over a field. This could be tied in with some ground manipulation as detailed in (ii) above, to provide an additional source of water input to the land. This would then encourage the inundation of areas during every flood event.
- 10.2.3 In addition to works required to manage water across these areas, there may be a need for, or a benefit in, further works to enhance the diversity of the habitats present. If the soils are determined to be nutrient-rich, some topsoil stripping or soil profile inversion would aid in the creation of species-rich grassland communities. Stripped topsoil could be used in select areas for tree planting or to create micro-topographical variations. Where earthworks are undertaken, seeding with appropriate locally native species could be used to speed up the development of more diverse vegetation communities.



10.3 Further information requirements

10.3.1 With all of these options, a certain amount of additional information would be required to inform the detailed design of any mitigation measures. This may include, but not be limited to, the following:

- Groundwater and ditch monitoring data to determine the extent of drawdown caused by the existing ditches, the level of water required in ditches to achieve a given groundwater regime etc. If not available from existing monitoring equipment it is likely that dip-wells, piezometers and stage boards would need to be installed in appropriate locations.
- Rainfall and evapo-transpiration data to inform the assessment of surface and groundwater monitoring data.
- Topographic data, to understand if there is an existing fall across a given area which can be used to focus surface flow and identify the most suitable location for surface water features. This could be acquired through specific topographic surveys of through, for example, the use of Lidar data.
- Site-specific soil data: whilst the soils are likely to be fairly uniform across the site, the soil characteristics for any given habitat creation area should be ground-truthed.
- Flood Risk Assessment: any proposal to create wetter ground conditions or, in particular, retain water behind a structure, should be assessed for the implications for flood risk. It is envisaged that many proposals may have beneficial impacts on flood risk, particularly if water is being retained within field units and not being allowed to flow quickly through the ditch network.

10.4 Example of wetland habitat creation at Dowlais Farm, Clevedon

10.4.1 The site is flat, low lying, adjacent to the Severn Estuary SPA and Ramsar site and consists of soils of the Newchurch Series. The land is owned by North Somerset Council and has undergone a number of changes to re-create approximately 45ha of wetland habitat for use by breeding waders, whilst at the same time retaining the ability of the tenant to farm the land in a more extensive manner.

10.4.2 The key aspects of this design were:

- The creation of a number of ponds designed to store winter rainfall within each unit.
- The re-creation of a network of grips across the site.
- The creations of scrapes (to a maximum depth of 0.5m below existing ground level), downhill from the storage ponds and linked to the ponds by the grip network (whilst the site could be described as flat, there was a slight fall across many of the fields which was used to focus water towards the scrapes).
- The removal of a number of hedgerows to create larger units and increase sight-lines for wading birds.
- The use of the spoil to create a 0.5m high bund around the margins of each unit to limit over-the-edge drainage into the existing ditch network. A single outfall point was created downstream from the scrape using a section of pipe running through the bund. The tenant uses this pipe to control water levels in the scrape, blocking the pipe temporarily to raise water levels as required.
- The incorporation of one-way flap valves on pipes used to form field accesses, enabling control of the direction of flow and thus the minimisation of flood risk to parts of the site and neighbouring properties (this included both fluvial flooding and sea wall overtopping/breach



events, and was detailed in the Flood Risk Assessment for the site). No structures were used on this site to raise water levels in the ditch network as a result of the concerns over flood risk in this area. The initial water balance model for the site indicated that there were sufficient winter rainfall inputs to maintain wetter ground conditions during the spring if discharge from each unit could be controlled.

- The creation of a number of small habitat ponds specifically for great crested newts in order to mitigate for any potential temporary impacts to this species during the works period.

10.4.3 Overall, it is considered that this project has been successful, and a number of wading bird species are now being recorded using the site including curlew, redshank and lapwing

Plate 1: Part of Dowlais Farm showing the deepened grip network and flooded scrape in January 2010.





11.0 Mitigation Strategy: Potential Constraints & Funding Options

11.1 Potential constraints

11.1.1 The successful implementation of the mitigation strategy would be dependent upon a range of potential constraints being overcome. Full implementation of the (WAP1) Ecological Masterplan would provide mitigation for a proportion of the impacts arising from development within part of the 1957/58 consented land. Elsewhere, it has not been possible at this stage to identify the precise locations for proposed new habitat features such as ponds, wet scrapes, etc, or identify the areas of land that they would occupy. This is particularly relevant in relation to Hallen Marsh (Area C), where a larger area of land has been identified than may be required, to allow for the possible constraints in delivering habitat creation/enhancement measures in this area (as set out below). It also helps address the uncertainty as to whether it would be feasible to utilise Areas A, and B in addition to area E (which is currently being delivered by SITA) for use as long-term mitigation areas. Possible constraints for each of the potential mitigation areas include:

- Land ownership;
- Existing and future land use/management practices;
- Suitable soil conditions and hydrological conditions being present to enable re-wetting of land to take place;
- Potential disturbance effects from surrounding land use;
- Existing policy designations;
- The ability to deliver mitigation at Areas A, B and E which would reduce the area of land needed in Hallen Marsh (Area C) (see Figure 12 for locations); and
- The implications of the mitigation strategy for existing habitats and protected species, specifically hedgerows, badgers, dormice, water voles and great crested newts.



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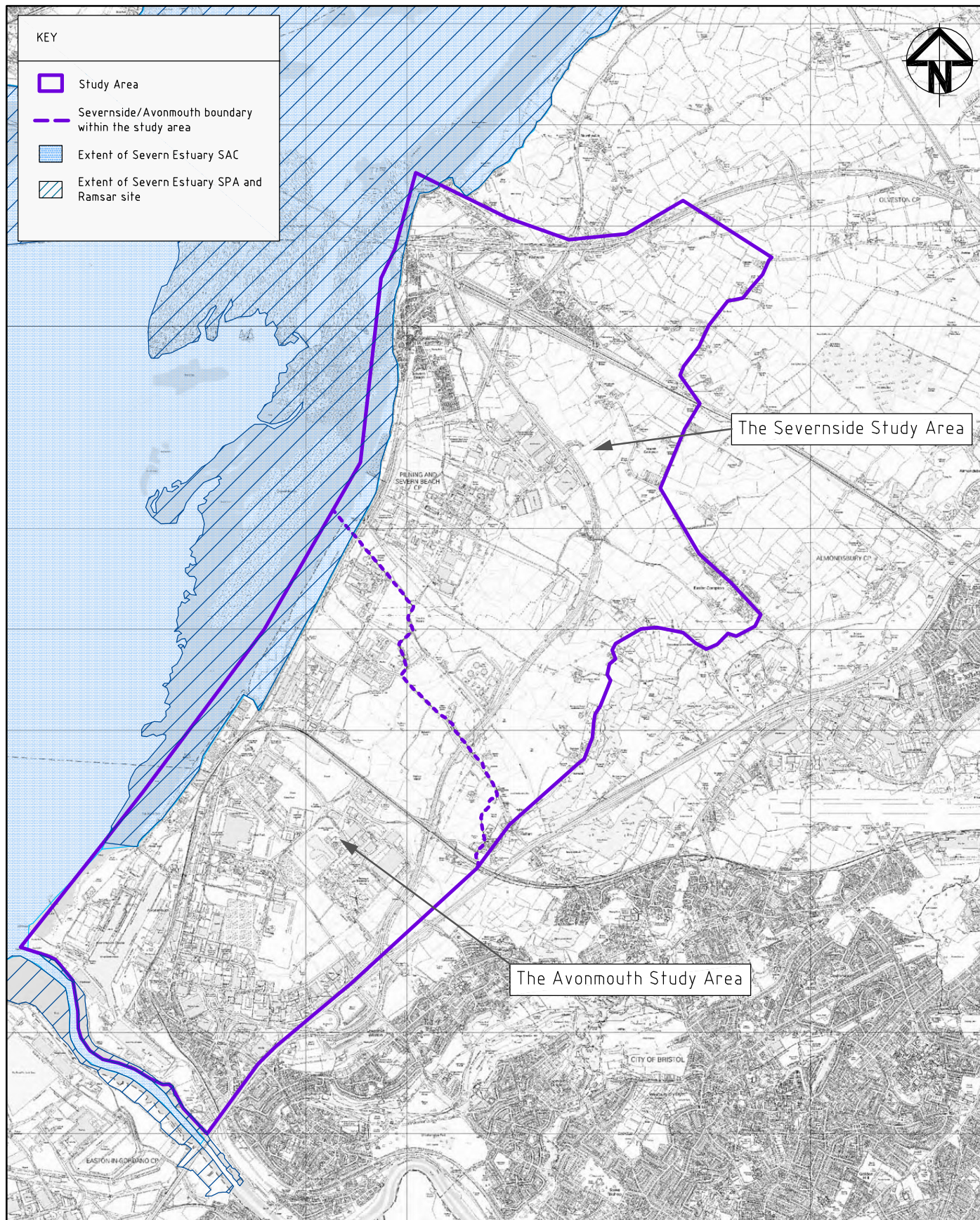
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Figures





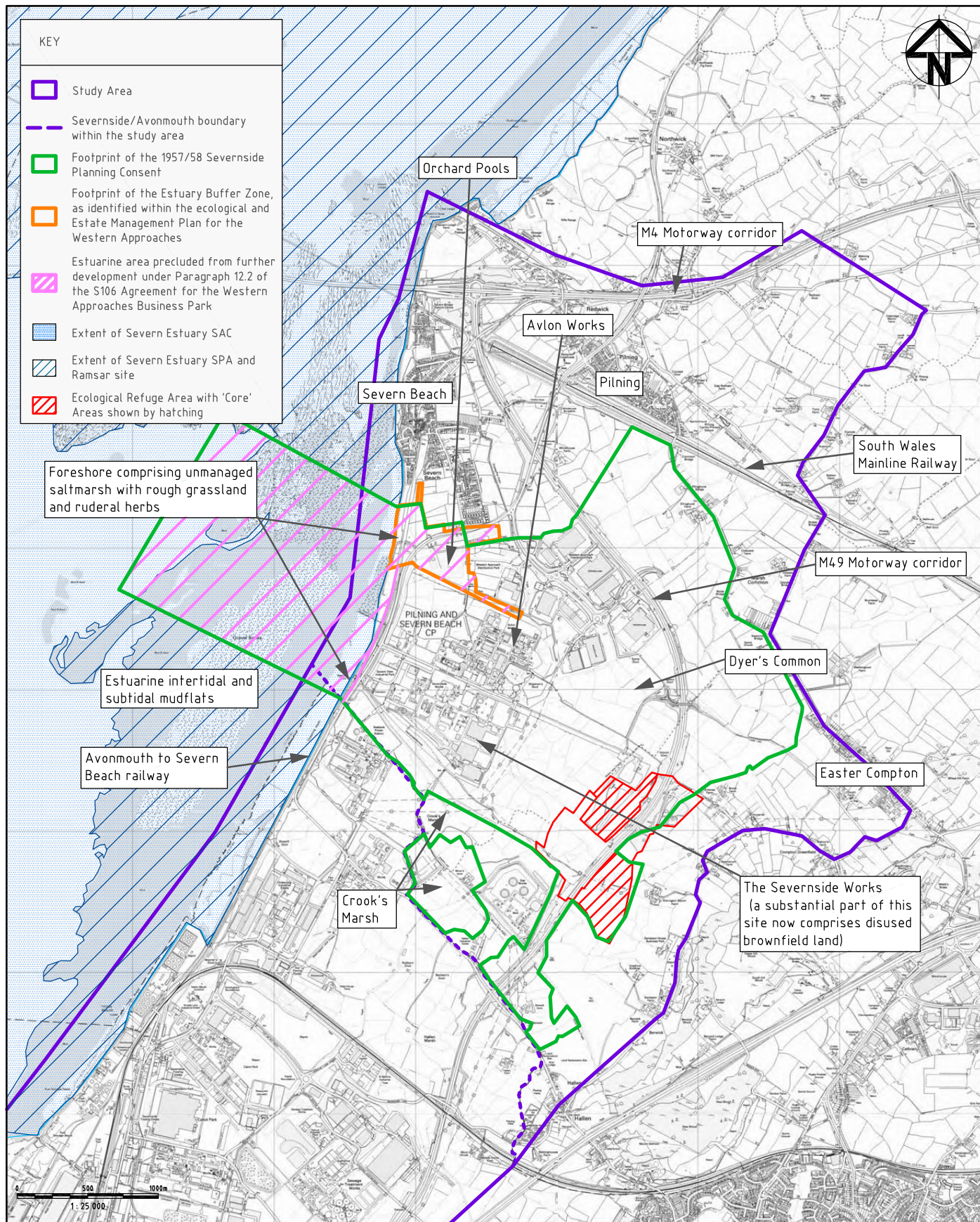
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Original Size A3		Author J.JAMESON			
Height Datum OS		Checker J.LATHAM			
Grid OS		Approver J.LATHAM			
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				Issue 02	



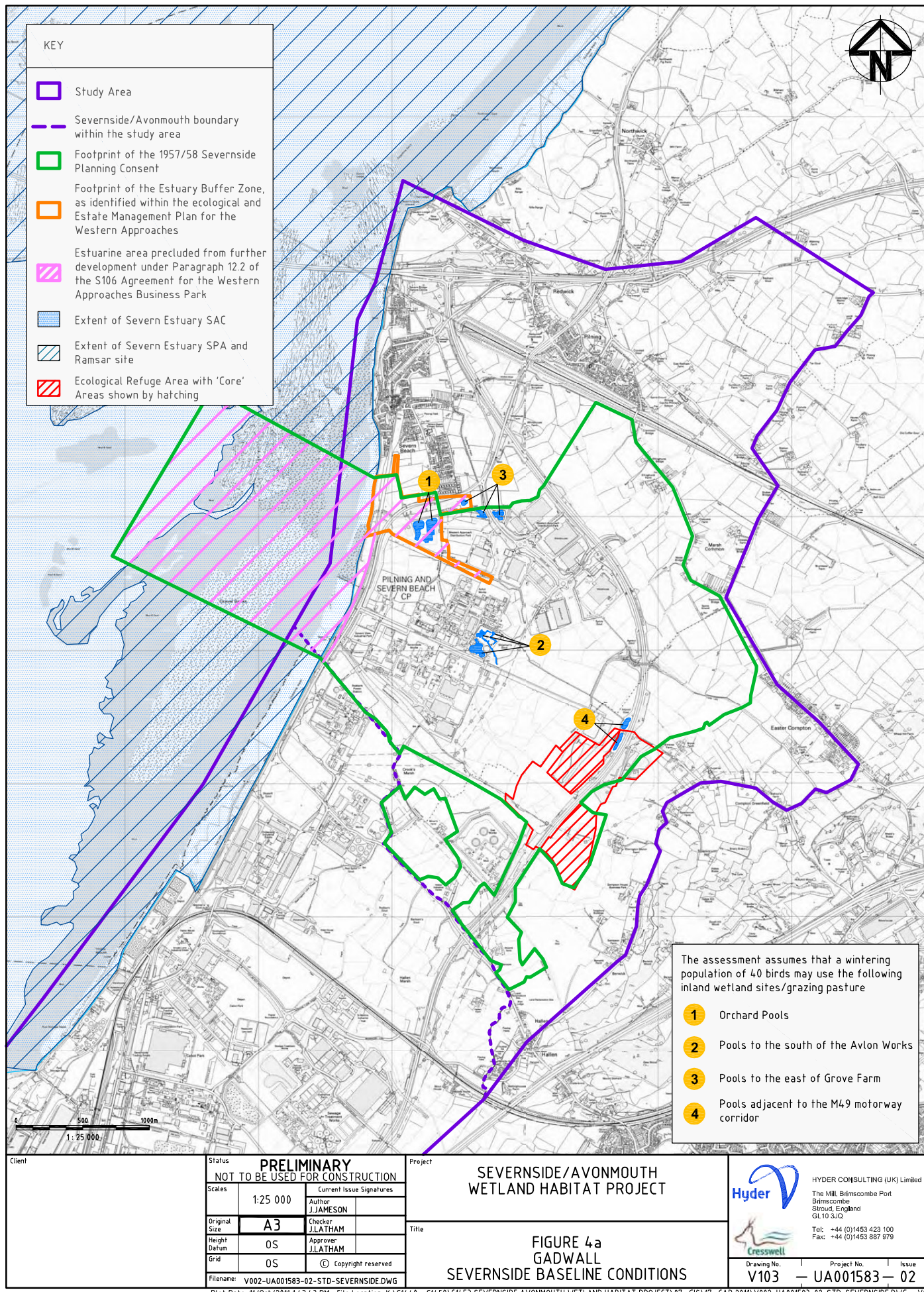
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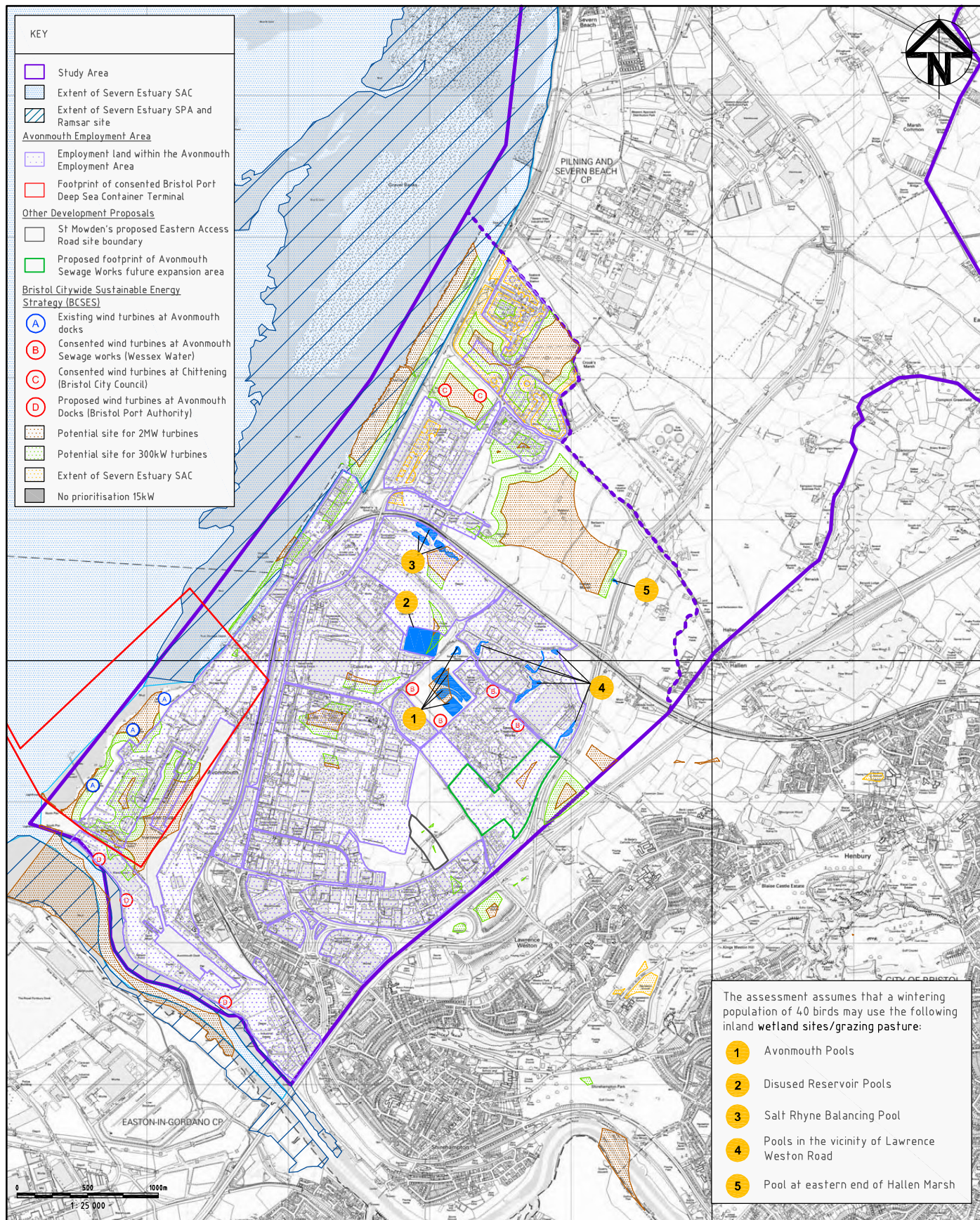


Drawing No. **V100** Project No. **— UA001583 —** Issue **02**



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Client		Status PRELIMINARY NOT TO BE USED FOR CONSTRUCTION		Project SEVERNSIDE/AVONMOUTH WETLAND HABITAT PROJECT	
Scales 1:25 000		Current Issue Signatures Author J.JAMESON		Title FIGURE 4b GADWALL AVONMOUTH BASELINE CONDITIONS	
Original Size A3		Checker J.LATHAM		Drawing No. V104	
Height Datum OS		Approver J.LATHAM		Project No. — UA001583 —	
Grid OS		© Copyright reserved		Issue 02	
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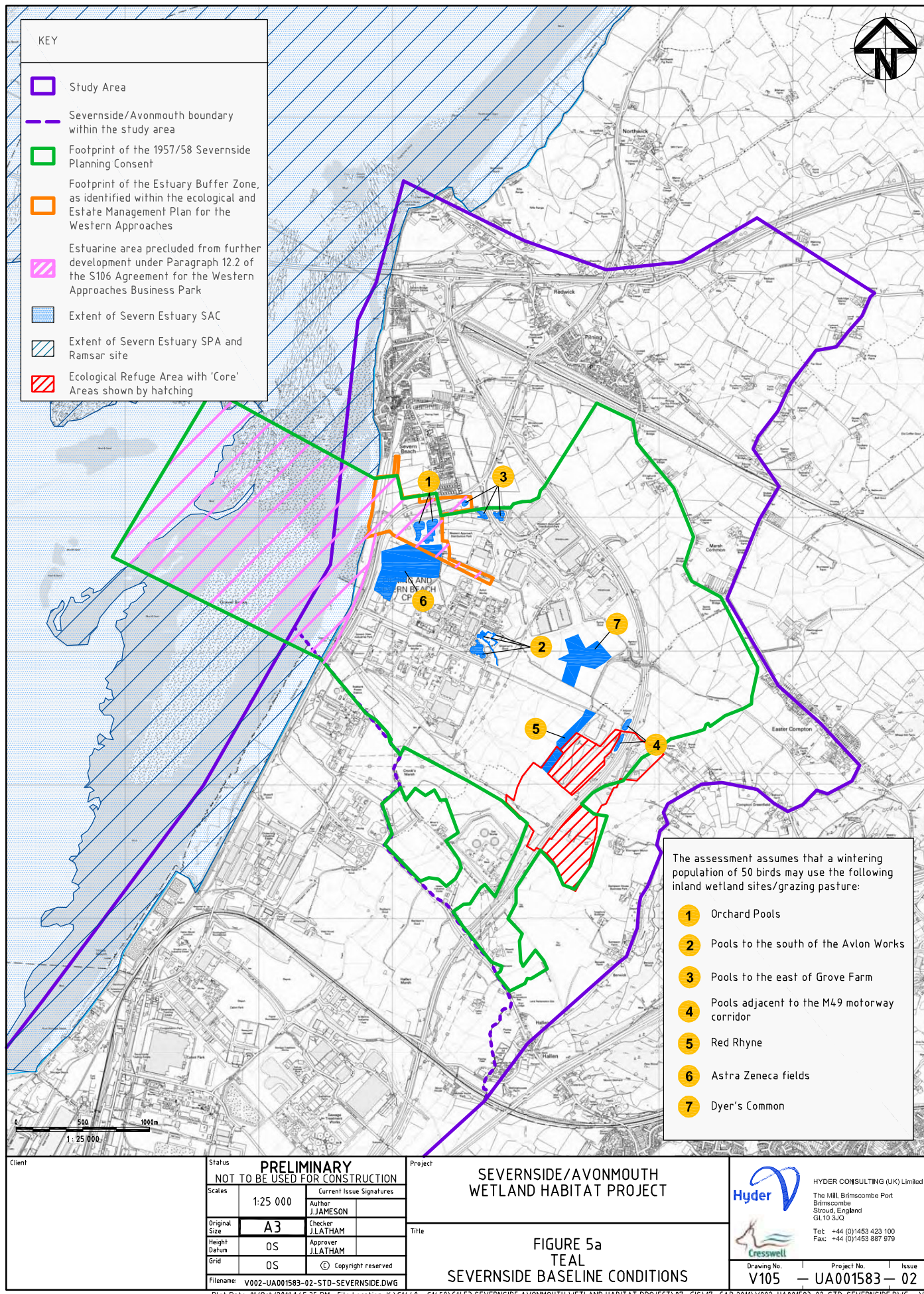
Hyder

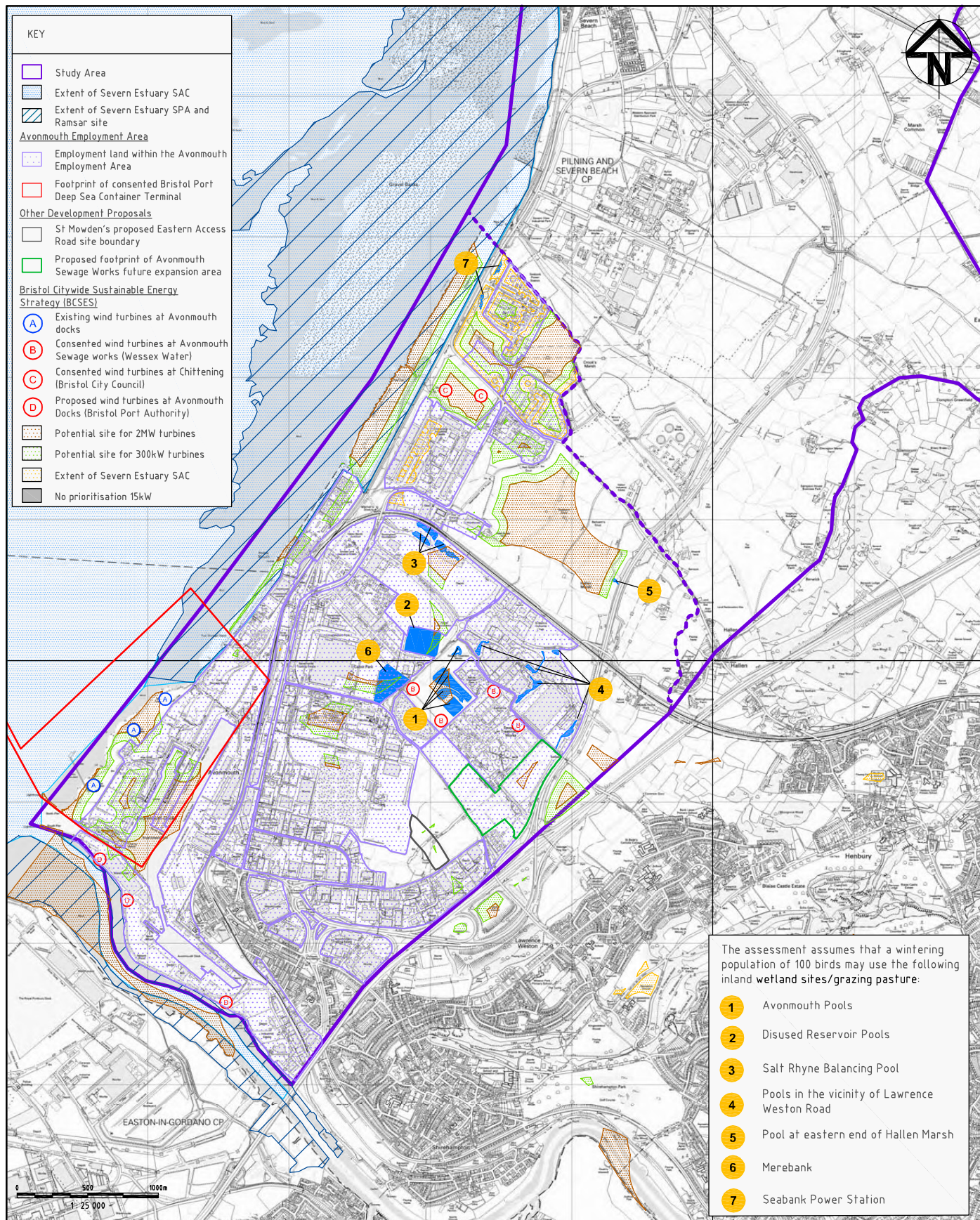
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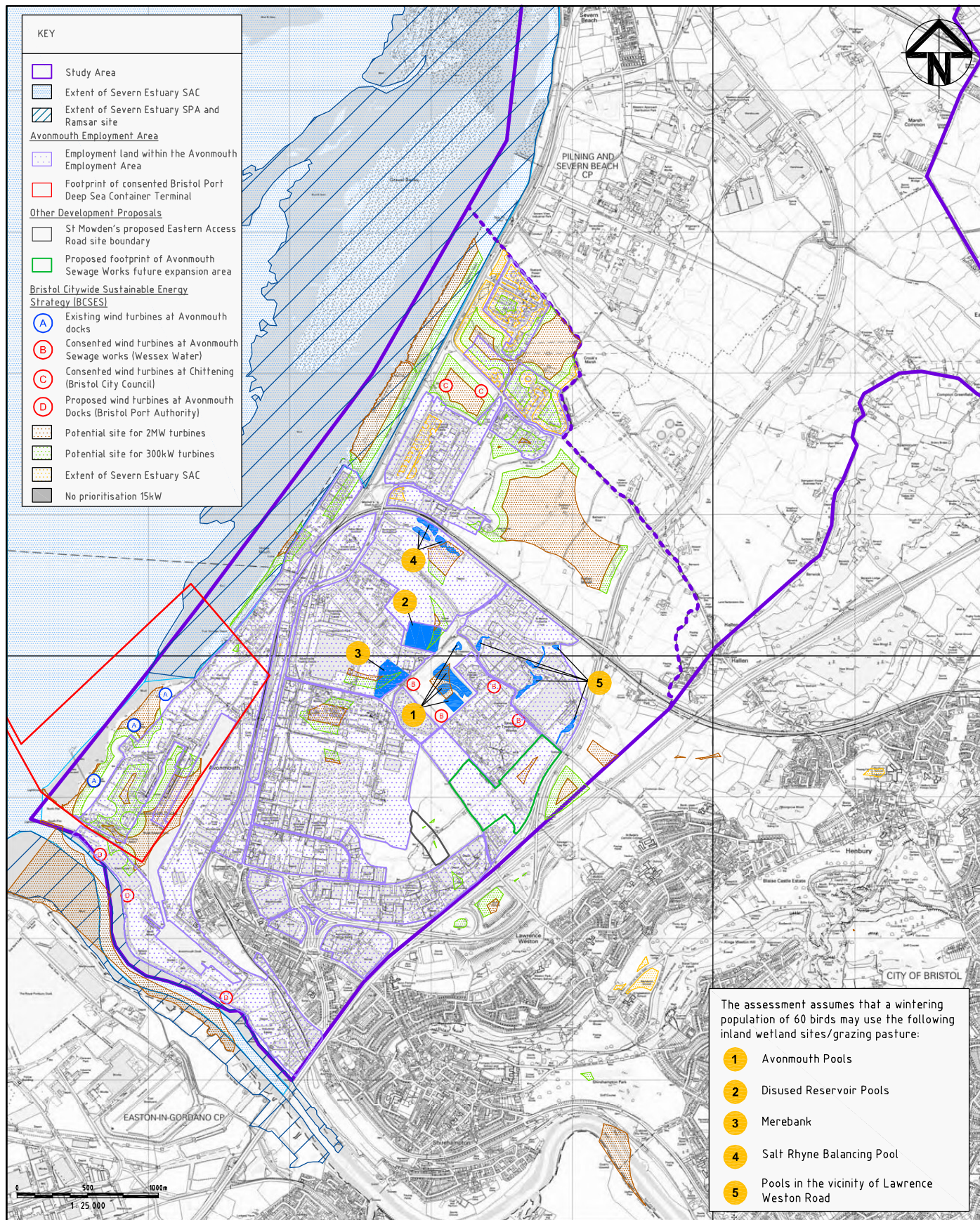


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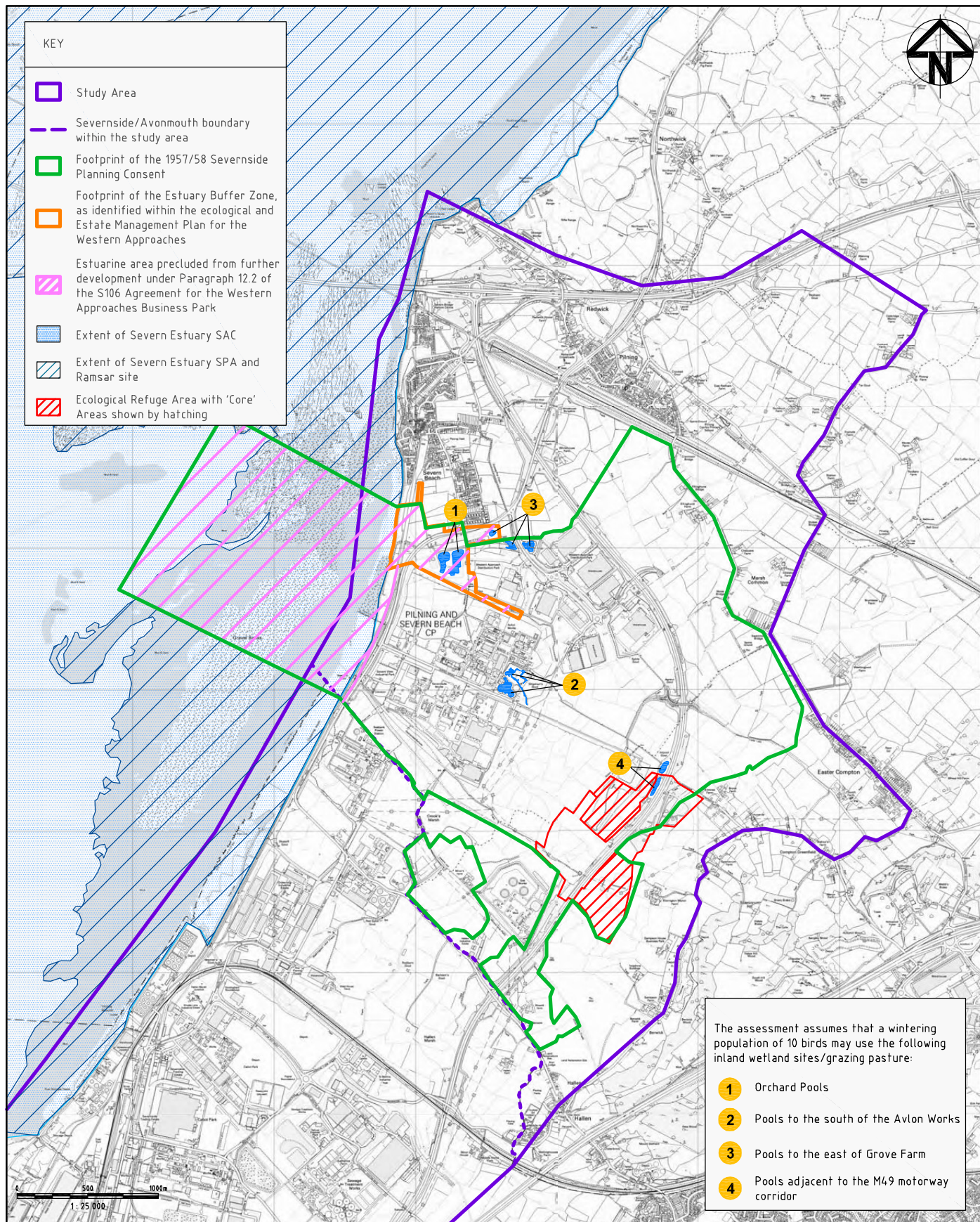
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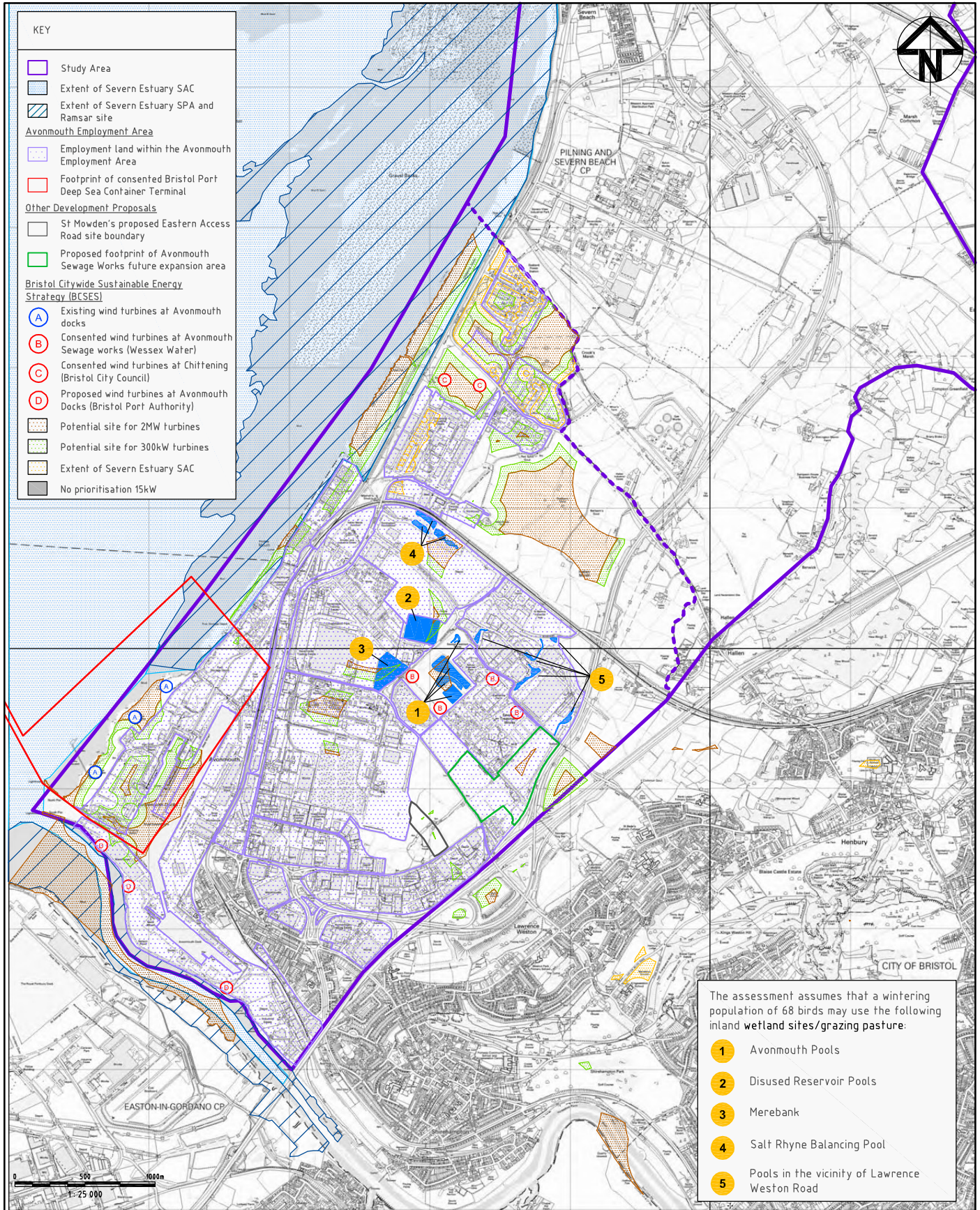
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Client		Status PRELIMINARY NOT TO BE USED FOR CONSTRUCTION		Project SEVERN/AVONMOUTH WETLAND HABITAT PROJECT	
Scales 1:25 000		Current Issue Signatures		Title FIGURE 7a TUFTED DUCK SEVERN/AVONMOUTH WETLAND HABITAT PROJECT	
Original Size A3	Height OS	Checker JLATHAM	Approver JLATHAM	Drawing No. V108	
Grid OS	Copyright reserved	Project No. UA001583-02		Issue 02	
Filename: V002-UA001583-02-STD-SEVERN/AVONMOUTH WETLAND HABITAT PROJECT		HYDER CONSULTING (UK) Limited The Mill, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879 			



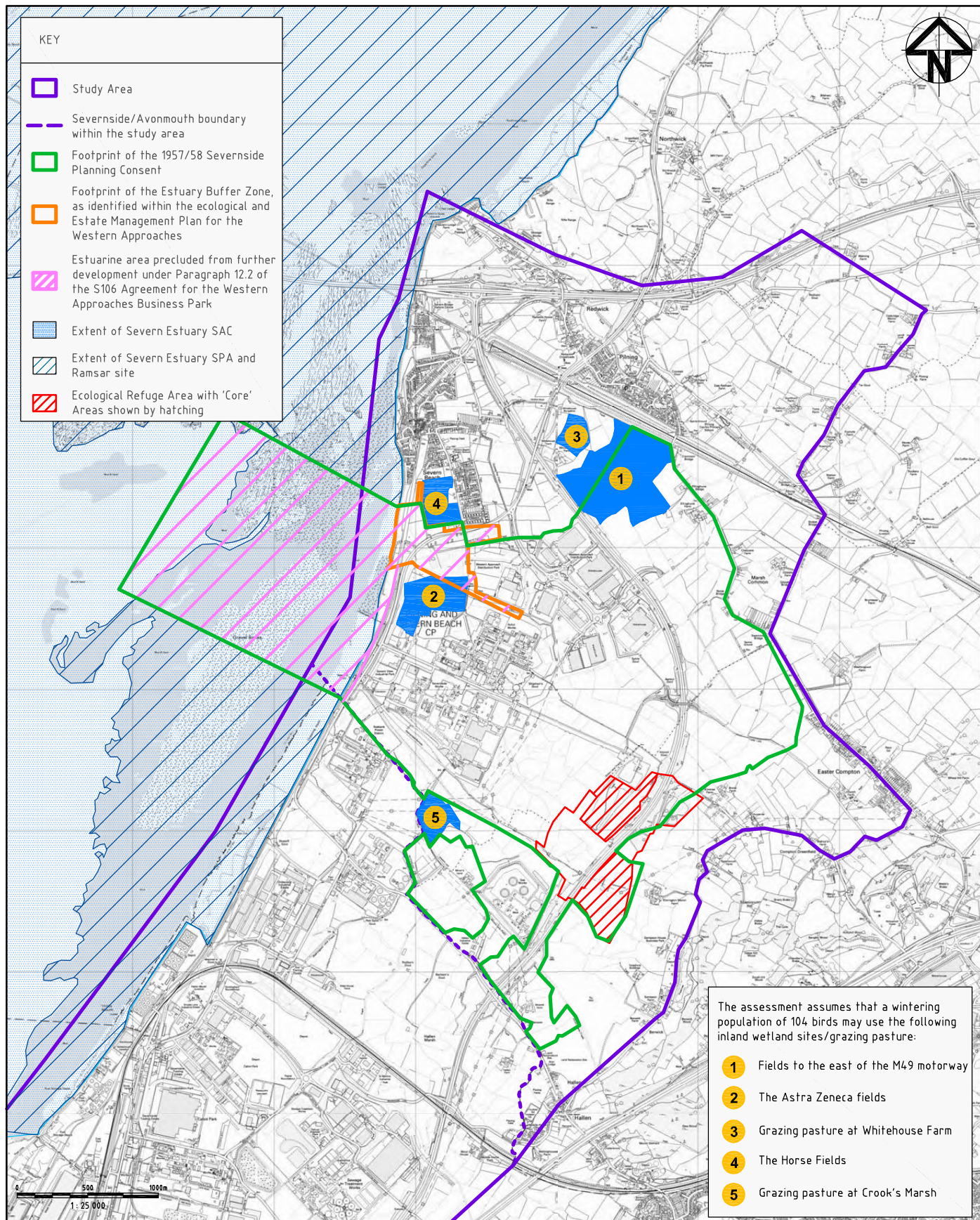
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Height Datum OS		Approver J.LATHAM		Project No. — UA001583 — 02	
Grid OS		© Copyright reserved		Issue	
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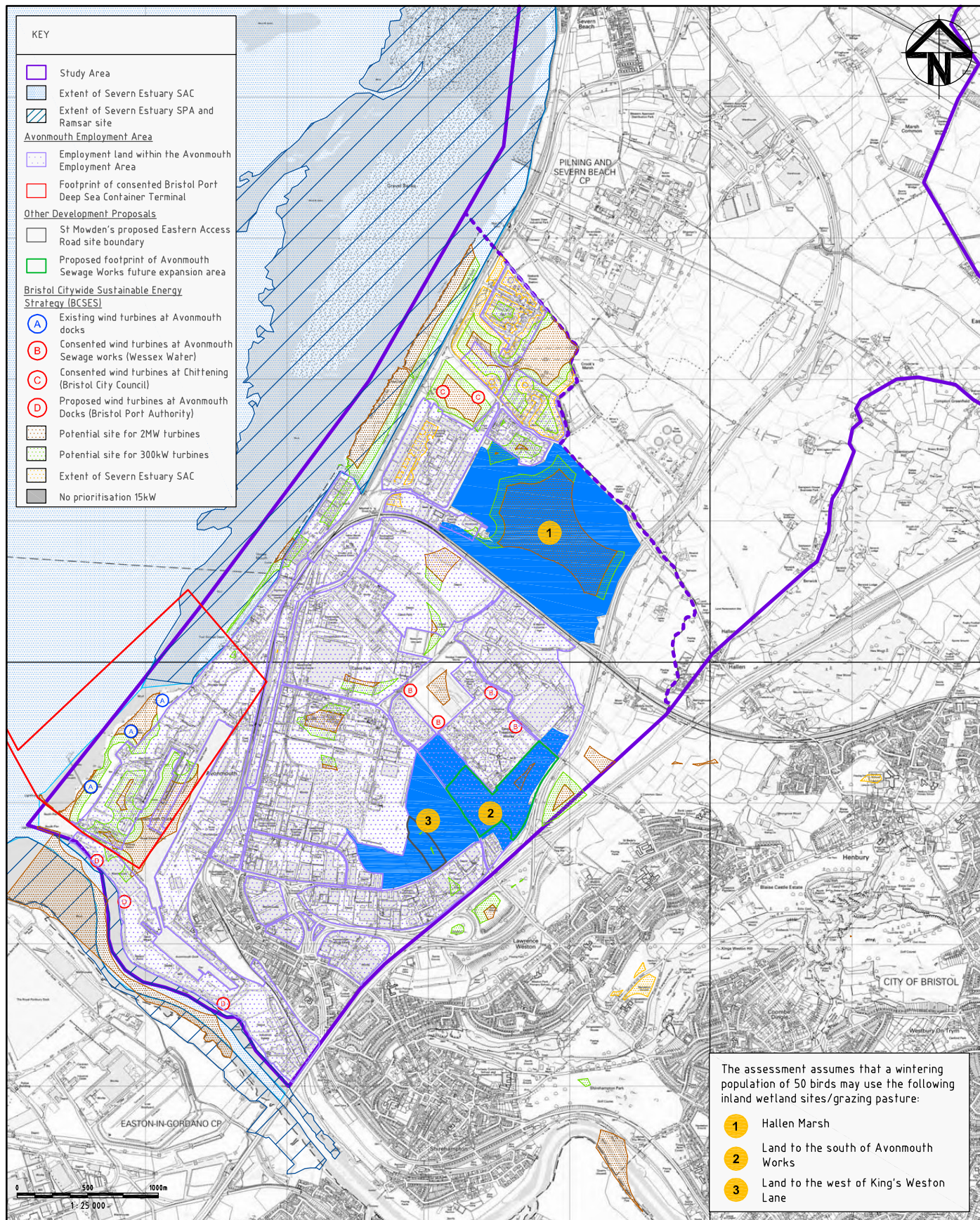
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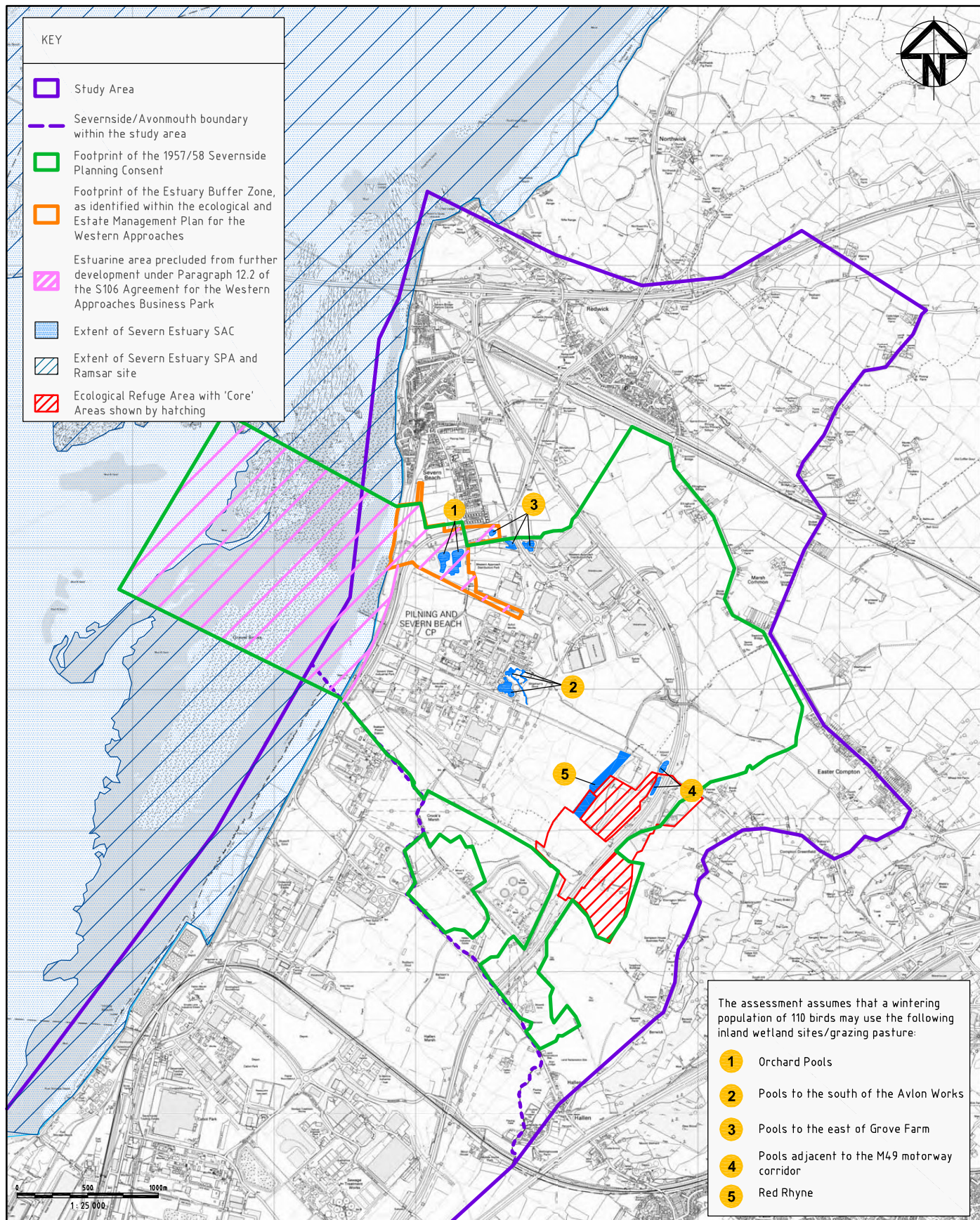


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Original Size A3		Author J.JAMESON		Drawing No. V110	
Height OS		Checker J.LATHAM		Project No. UA001583	
Datum OS		Approver J.LATHAM		Issue 02	
Grid OS		© Copyright reserved		Hyder Consulting (UK) Limited The Mill, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879	
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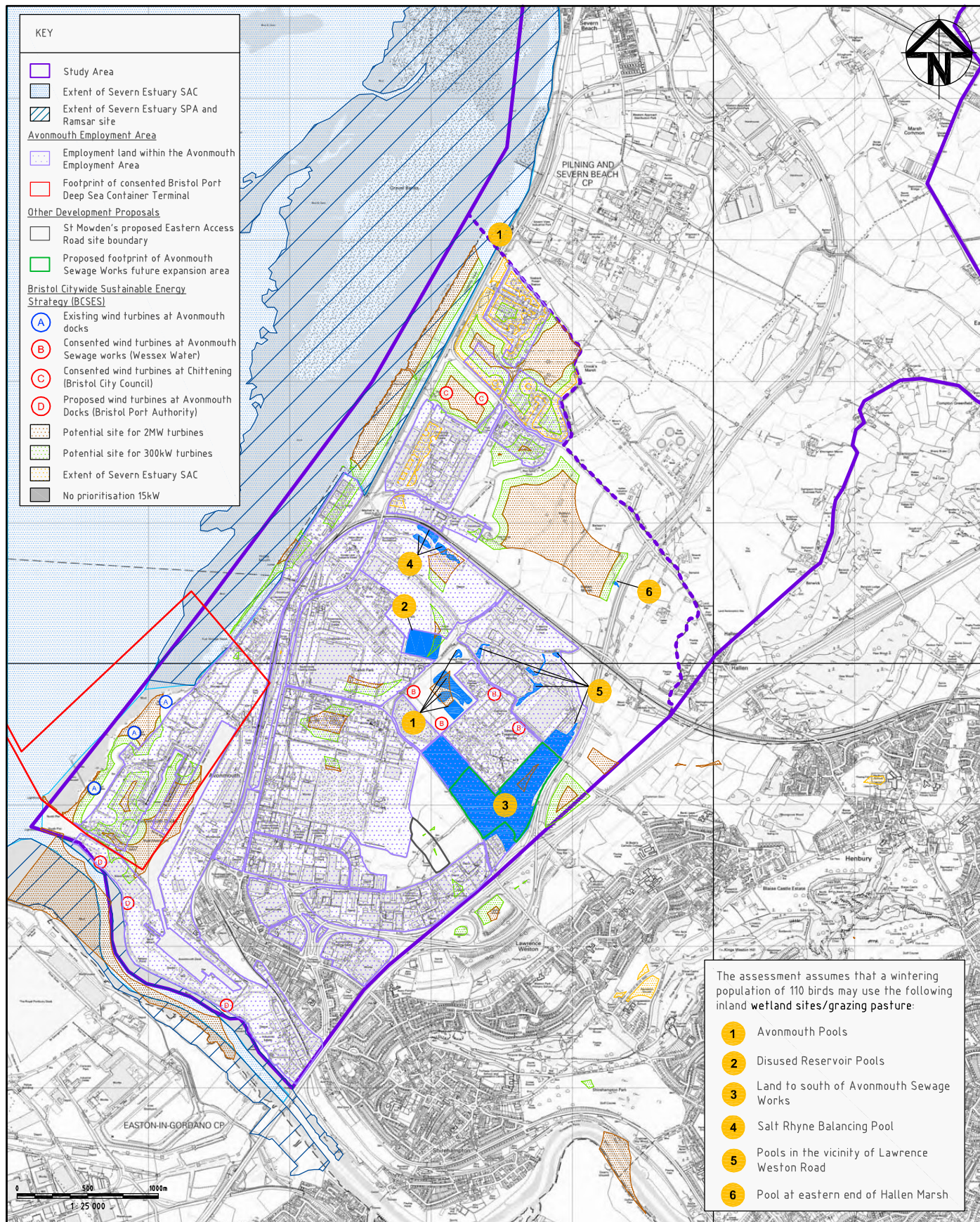


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Height Datum OS		Checker J.LATHAM		Project No. UA001583 - 02	
Grid OS		Approver J.LATHAM		Issue 02	
Filename V003-UA001583-02-STD-AVONMOUTH.DWG		Copyright reserved		Hyder Consulting (UK) Limited The Mill, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879	

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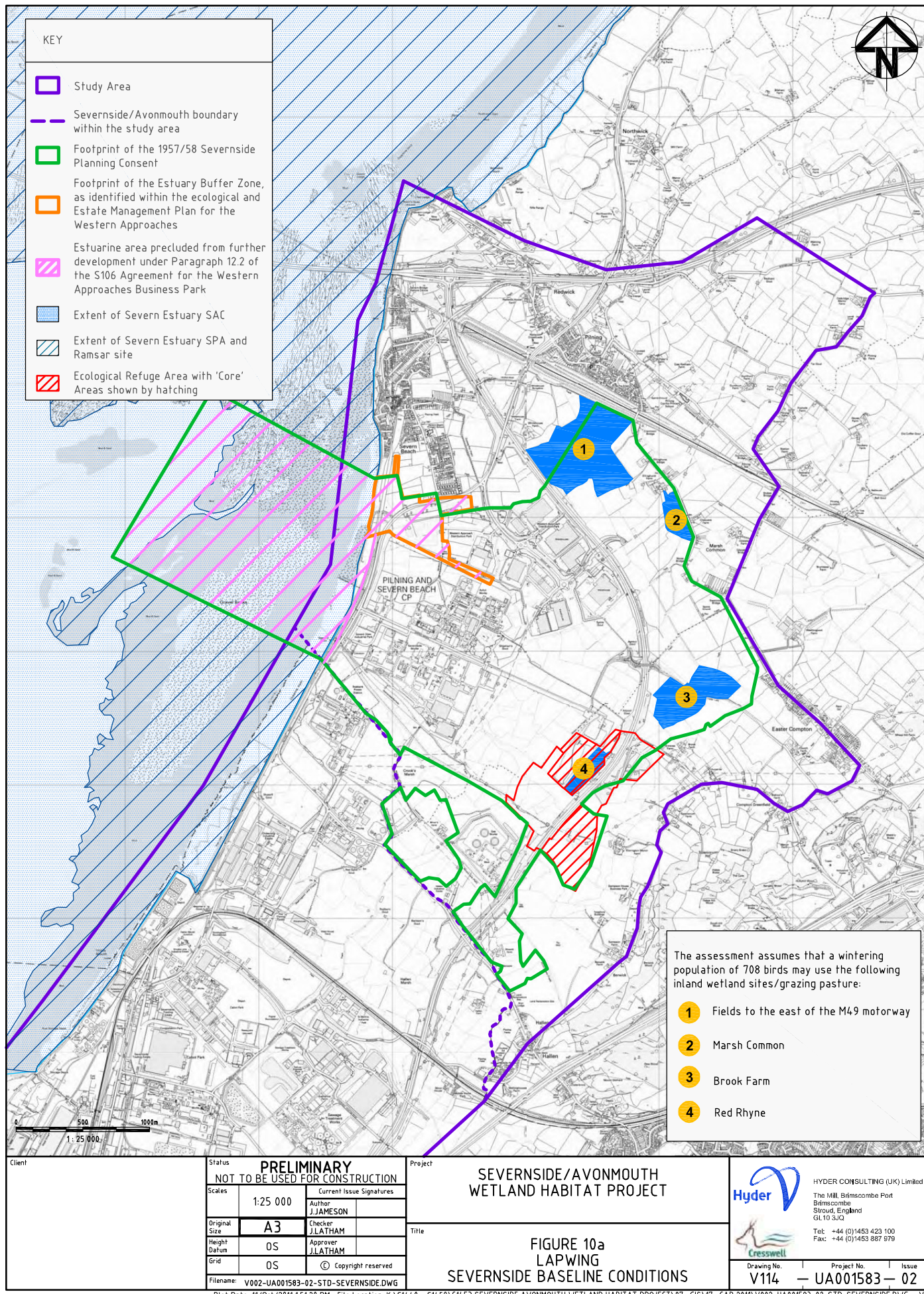


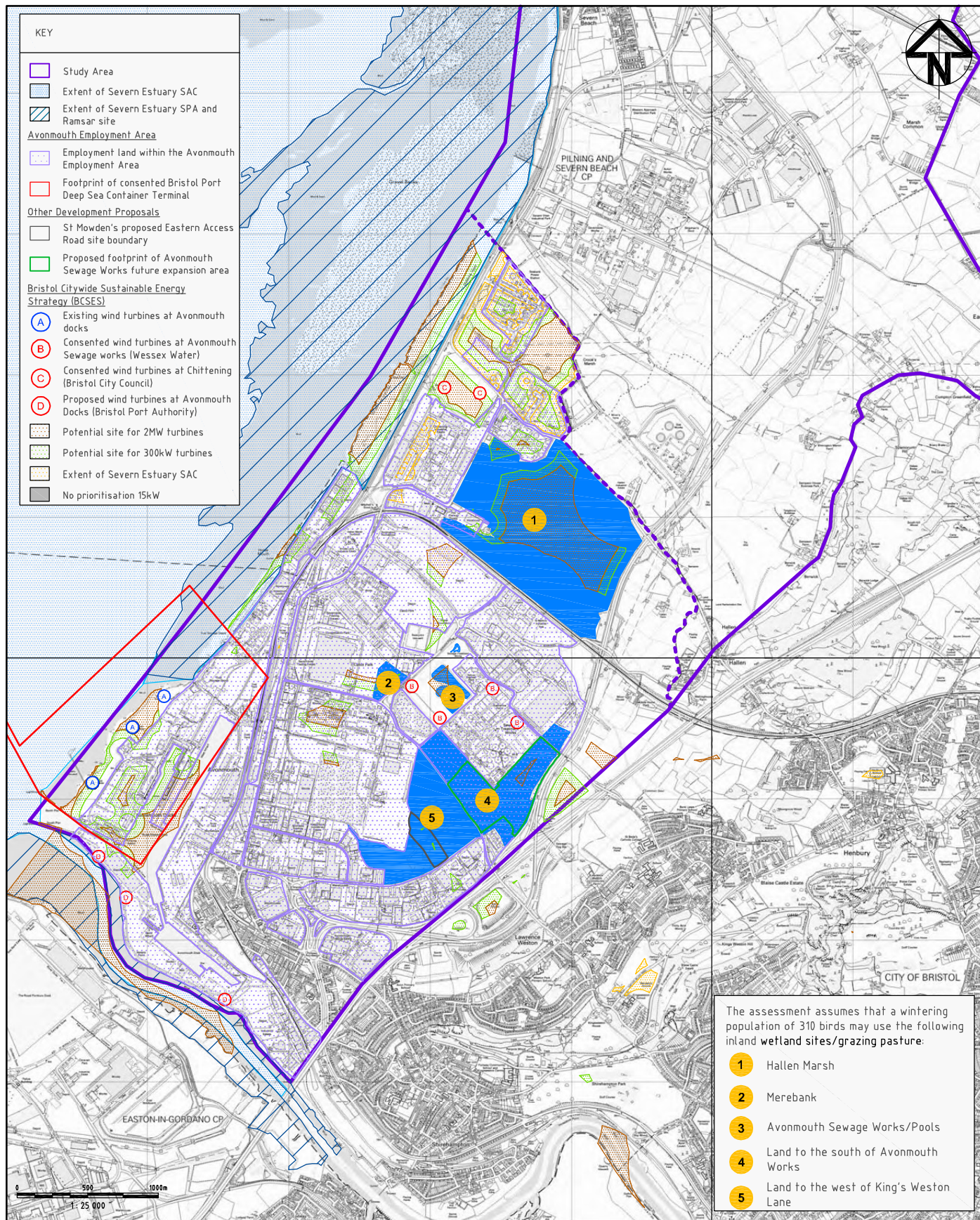
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Original Size A3	Height OS	Checker JLATHAM	Approver JLATHAM	Drawing No. V112	
Grid OS	Copyright reserved	Project No. UA001583-02		Issue 02	
Filename: V002-UA001583-02-STD-SEVERN/AVONMOUTH WETLAND HABITAT PROJECT		HYDER CONSULTING (UK) Limited The Mill, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879 			



Client		Status PRELIMINARY NOT TO BE USED FOR CONSTRUCTION		Project SEVERNSIDE/AVONMOUTH WETLAND HABITAT PROJECT	
Scales 1:25 000		Current Issue Signatures		Title FIGURE 9B MALLARD AVONMOUTH BASELINE CONDITIONS	
Original Size A3		Author J.JAMESON		Drawing No. V113	
Height Datum OS		Checker J.LATHAM		Project No. UA001583	
Grid OS		Approver J.LATHAM		Issue 02	
Filename V003-UA001583-02-STD-AVONMOUTH.DWG		Copyright reserved		Hyder Consulting (UK) Limited The Mill, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879	

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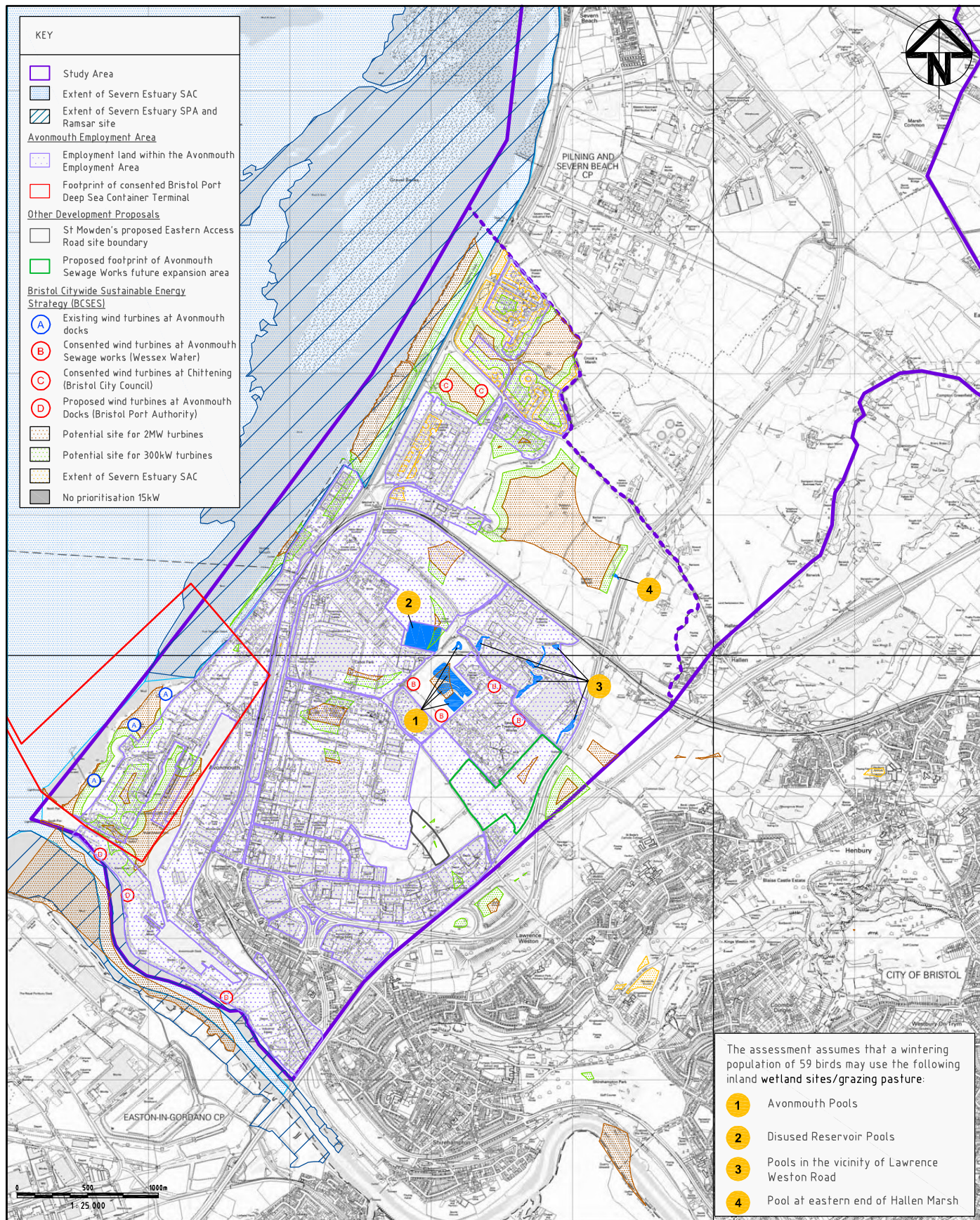
The assessment assumes that a wintering population of 310 birds may use the following inland wetland sites/grazing pasture:

1. Hallen Marsh
2. Merebank
3. Avonmouth Sewage Works/Pools
4. Land to the south of Avonmouth Works
5. Land to the west of King's Weston Lane

Client		Status PRELIMINARY NOT TO BE USED FOR CONSTRUCTION		Project SEVERNSIDE/AVONMOUTH WETLAND HABITAT PROJECT	
Scales 1:25 000		Current Issue Signatures Author J.JAMESON		Title FIGURE 10B LAPWING AVONMOUTH BASELINE CONDITIONS	
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Height OS		Approver J.LATHAM		Project No. UA001583	
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The assessment assumes that a wintering population of 59 birds may use the following inland wetland sites/grazing pasture:

- 1** Avonmouth Pools
- 2** Disused Reservoir Pools
- 3** Pools in the vicinity of Lawrence Weston Road
- 4** Pool at eastern end of Hallen Marsh

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Scales 1:25 000		Current Issue Signatures		Title FIGURE 11 SHOVERLER AVONMOUTH BASELINE CONDITIONS	
Original Size A3		Author J.JAMESON		Drawing No. V116	
Height Datum OS		Checker J.LATHAM		Project No. UA001583 - 02	
Grid OS		Approver J.LATHAM		Issue	
Filename V003-UA001583-02-STD-AVONMOUTH.DWG		Copyright reserved		The MILL, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879	



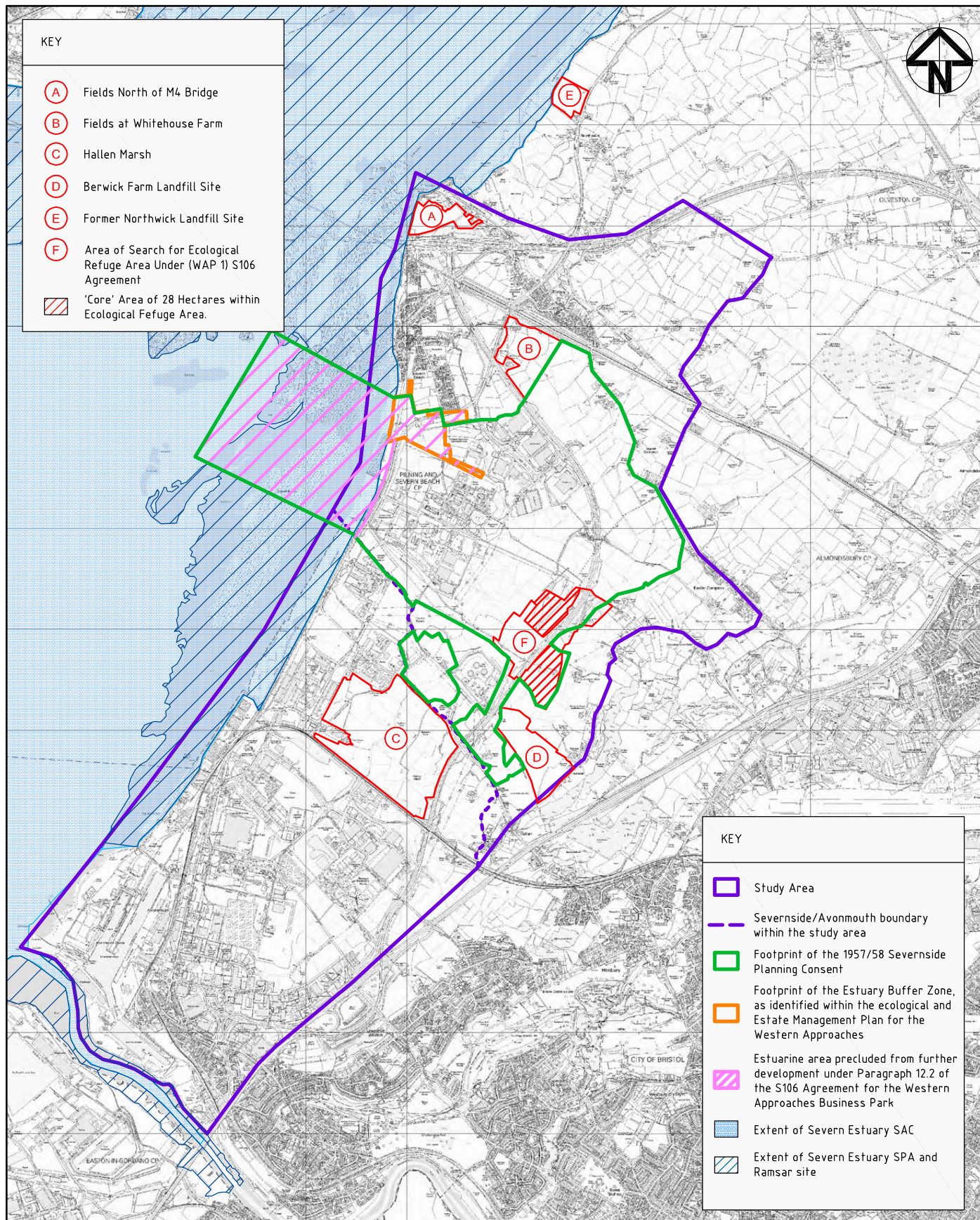
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Scales		Current Issue Signatures Author: J.JAMESON Checker: J.LATHAM Approver: J.LATHAM © Copyright reserved		Title	
Original Size		A3		FIGURE 12 POTENTIAL MITIGATION SITES	
Height Datum		OS		Drawing No. V117 Project No. UA001583 Issue 02	
Grid		OS		Hyder The Mill, Brimscombe Port Brimscombe Stroud, England GL10 3JQ Tel: +44 (0)1453 423 100 Fax: +44 (0)1453 887 879 Cresswell	
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Appendices





Appendix I: The Severn Estuary SPA and Ramsar site citations



NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type **1.2 Site code**
1.3 Compilation date **1.4 Update**

1.5 Relationship with other Natura 2000 sites

U	K	0	0	1	2	6	4	2
U	K	0	0	1	3	0	0	7
U	K	0	0	1	3	0	3	0
U	K	0	0	3	0	2	0	3

1.6 Respondent(s)

1.7 Site name

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	199507
date site designated as SAC	

2. Site location:**2.1 Site centre location**

longitude	latitude
03 02 57 W	51 13 29 N

2.2 Site area (ha) **2.3 Site length (km)**

2.5 Administrative region

NUTS code	Region name	% cover
UK611	Avon	25.04%
UK612	Gloucestershire	21.03%
UK921	Gwent	26.04%
UK632	Somerset	24.04%
UK923	South Glamorgan	4.01%

2.6 Biogeographic region

☐ Alpine
 ☒ Atlantic
 ☐ Boreal
 ☐ Continental
 ☐ Macaronesia
 ☐ Mediterranean

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

		Population				Site assessment			
		Resident	Migratory						
Code	Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
A051	<i>Anas strepera</i>			282 I		B		C	
A041a	<i>Anser albifrons albifrons</i>			2664 I		A		B	
A149	<i>Calidris alpina alpina</i>			44624 I		B		C	
A037	<i>Cygnus columbianus bewickii</i>			280 I		B		C	
A048	<i>Tadorna tadorna</i>			3330 I		B		C	
A162	<i>Tringa totanus</i>			2330 I		B		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	89.0
Salt marshes. Salt pastures. Salt steppes	6.0
Coastal sand dunes. Sand beaches. Machair	4.0
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	
Bogs. Marshes. Water fringed vegetation. Fens	
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	1.0
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Scree. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	100%

4.1 Other site characteristics

Soil & geology:

Biogenic reef, Clay, Cobble, Gravel, Limestone/chalk, Mud, Peat, Sand, Sandstone/mudstone, Sedimentary, Shingle

Geomorphology & landscape:

Cliffs, Estuary, Intertidal rock, Intertidal sediments (including sandflat/mudflat), Islands, Open coast (including bay), Pools, Subtidal rock (including rocky reefs), Subtidal sediments (including sandbank/mudbank), Tidal rapids

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

Over winter the area regularly supports:

<i>Cygnus columbianus bewickii</i> (Western Siberia/North-eastern & North-western Europe)	3.9% of the GB population 5 year peak mean 1991/92-1995/96
--	---

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

Over winter the area regularly supports:

<i>Anas strepera</i> (North-western Europe)	0.9% of the population 5 year peak mean 1991/92-1995/96
<i>Anser albifrons albifrons</i> (North-western Siberia/North-eastern & North-western Europe)	0.4% of the population 5 year peak mean 1991/92-1995/96
<i>Calidris alpina alpina</i> (Northern Siberia/Europe/Western Africa)	3.3% of the population 5 year peak mean 1991/92-1995/96
<i>Tadorna tadorna</i> (North-western Europe)	1.1% of the population 5 year peak mean 1991/92-1995/96
<i>Tringa totanus</i> (Eastern Atlantic - wintering)	1.3% of the population 5 year peak mean 1991/92-1995/96

ARTICLE 4.2 QUALIFICATION (79/409/EEC): AN INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS

Over winter the area regularly supports:

84317 waterfowl (5 year peak mean 01/04/1998)

Including:

Cygnus columbianus bewickii , *Anser albifrons albifrons* , *Tadorna tadorna* , *Anas strepera* , *Calidris alpina alpina* , *Tringa totanus* .

4.3 Vulnerability

The conservation of the site features is dependent on the tidal regime. The range is the second highest in the world and the scouring of the seabed and strong tidal streams result in natural erosion of the habitats. The estuary is therefore vulnerable to large scale interference, including human actions. These include land-claim, aggregate extraction/dredging, physical developments such as barrage construction flood defences, pollution (industrial, oil spillage), eutrophication and tourism based activities and disturbance. These issues are being addressed through existing control measures and as part of the Severn Estuary Strategy.

Since June 1995 the Severn Estuary Strategy has been working towards the sustainable management of the site, through the involvement of local authorities, interested parties and local people. This integrated approach is being further developed in conjunction with the SAC management scheme for the nature conservation interest of the estuary.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	9.0
UK04 (SSSI/ASSI)	100.2

Information Sheet on Ramsar Wetlands (RIS)

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

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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

Joint Nature Conservation Committee

Monkstone House

City Road

Peterborough

Cambridgeshire PE1 1JY

UK

Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948

Email: RIS@JNCC.gov.uk

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DD MM YY

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

Designated: 13 July 1995

3. Country:

UK (England/Wales)

4. Name of the Ramsar site:

Severn Estuary

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

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

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

a) Site boundary and area:

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

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

7. Map of site included:

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

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

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

b) Describe briefly the type of boundary delineation applied:

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

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

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

8. Geographical coordinates (latitude/longitude):

51 13 29 N

03 02 57 W

9. General location:

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

Nearest town/city: Bristol

In the south-west of the United Kingdom, between Wales and England

Administrative region: Bro Morgannwg/ Vale of Glamorgan; Caerdydd/ Cardiff; Casnewydd/ Newport; Avon; City of Bristol; Fynwy/ Monmouthshire; Gloucestershire; Gwent; North Somerset; Somerset; South Glamorgan; South Gloucestershire

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 24662.98

Min. -4
Max. 17
Mean 0

12. General overview of the site:

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

The estuary's classic funnel shape, unique in Britain, is a factor causing the Severn to have the second-largest tidal range in the world (after the Bay of Fundy, Canada). This tidal regime results in plant and animal communities typical of the extreme physical conditions of liquid mud and tide swept sand and rock. The species-poor invertebrate community includes high densities of ragworms, lugworms and other invertebrates forming an important food source for passage and wintering waders.

A further consequence of the large tidal range is the extensive intertidal zone, one of the largest in the UK, comprising mudflats, sand banks, shingle, and rocky platforms.

Glassworts and annual sea-blite colonise the open mud, with beds of all three species of eelgrass *Zostera* occurring on more sheltered mud and sandbanks. Large expanses of common cord-grass also occur on the outer marshes. Heavily grazed saltmarsh fringes the estuary with a range of saltmarsh types present. The middle marsh sward is dominated by common saltmarsh-grass with typical associated species. In the upper marsh, red fescue and saltmarsh rush become more prominent.

13. Ramsar Criteria:

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

1, 3, 4, 5, 6, 8

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

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

Ramsar criterion 1

Due to immense tidal range (second-largest in world), this affects both the physical environment and biological communities.

Habitats Directive Annex I features present on the pSAC include:

- H1110 Sandbanks which are slightly covered by sea water all the time
- H1130 Estuaries
- H1140 Mudflats and sandflats not covered by seawater at low tide
- H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Ramsar criterion 3

Due to unusual estuarine communities, reduced diversity and high productivity.

Ramsar criterion 4

This site is important for the run of migratory fish between sea and river via estuary. Species include Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla*. It is also of particular importance for migratory birds during spring and autumn.

Ramsar criterion 8

The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla* use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly allis shad *Alosa alosa* and twaite shad *A. fallax* which feed on mysid shrimps in the salt wedge.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:

70919 waterfowl (5 year peak mean 1998/99-2002/2003)

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

Qualifying Species/populations (as identified at designation):

Species with peak counts in winter:

Tundra swan , <i>Cygnus columbianus bewickii</i> , NW Europe	229 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9- 2002/3)
Greater white-fronted goose , <i>Anser albifrons albifrons</i> , NW Europe	2076 individuals, representing an average of 35.8% of the GB population (5 year peak mean for 1996/7-2000/01)
Common shelduck , <i>Tadorna tadorna</i> , NW Europe	3223 individuals, representing an average of 1% of the population (5 year peak mean 1998/9- 2002/3)
Gadwall , <i>Anas strepera strepera</i> , NW Europe	241 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9- 2002/3)
Dunlin , <i>Calidris alpina alpina</i> , W Siberia/W Europe	25082 individuals, representing an average of 1.8% of the population (5 year peak mean 1998/9-2002/3)
Common redshank , <i>Tringa totanus totanus</i> ,	2616 individuals, representing an average of 1% of the population (5 year peak mean 1998/9- 2002/3)

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

Species regularly supported during the breeding season:

Lesser black-backed gull , <i>Larus fuscus graellsii</i> , W Europe/Mediterranean/W Africa	4167 apparently occupied nests, representing an average of 2.8% of the breeding population (Seabird 2000 Census)
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Species with peak counts in spring/autumn:

Ringed plover , <i>Charadrius hiaticula</i> , Europe/Northwest Africa	740 individuals, representing an average of 1% of the population (5 year peak mean 1998/9- 2002/3)
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Species with peak counts in winter:

Eurasian teal , <i>Anas crecca</i> , NW Europe	4456 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)
Northern pintail , <i>Anas acuta</i> , NW Europe	756 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9- 2002/3)

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.

See Sections 21/22 for details of noteworthy species

Details of bird species occurring at levels of National importance are given in Section 22

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

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

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

16. Physical features of the site:

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

Soil & geology	alluvium, basic, biogenic reef, clay, cobble, gravel, limestone/chalk, mud, neutral, nutrient-rich, peat, sand, sandstone/mudstone, sedimentary, shingle
Geomorphology and landscape	cliffs, coastal, estuary, floodplain, intertidal rock, intertidal sediments (including sandflat/mudflat), islands, lowland, open coast (including bay), pools, subtidal rock (including rocky reefs), subtidal sediments (including sandbank/mudbank), tidal rapids
Nutrient status	eutrophic
pH	circumneutral
Salinity	brackish / mixosaline, saline / euhaline
Soil	mainly mineral
Water permanence	usually permanent
Summary of main climatic features	Annual averages (Cardiff, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/cardiff.html) Max. daily temperature: 14.3° C Min. daily temperature: 6.8° C Days of air frost: 33.0 Rainfall: 1111.7 mm Hrs. of sunshine: 1518.0

General description of the Physical Features:

The Severn Estuary is a large estuary with extensive intertidal mudflats and sandflats, rocky platforms and islands. Saltmarsh fringes the coast backed by grazing marsh with freshwater ditches and occasional brackish ditches. The seabed is rock and gravel with subtidal sandbanks. The estuary's classic funnel shape, unique in the UK, is a factor causing the Severn to have the second-highest tidal range in the world. This tidal regime results in plant and animal communities typical of the extreme physical conditions of liquid mud and tide-swept sand and rock. A further consequence of the large tidal range is an extensive intertidal zone, one of the largest in the UK.

17. Physical features of the catchment area:

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

The Severn Estuary is a large estuary with extensive intertidal mudflats and sandflats, rocky platforms and islands. Saltmarsh fringes the coast backed by grazing marsh with freshwater ditches and occasional brackish ditches. The seabed is rock and gravel with subtidal sandbanks. The estuary's classic funnel shape, unique in the UK, is a factor causing the Severn to have the second-highest tidal range in the world. This tidal regime results in plant and animal communities typical of the extreme physical conditions of liquid mud and tide-swept sand and rock. A further consequence of the large tidal range is an extensive intertidal zone, one of the largest in the UK.

18. Hydrological values:

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

Shoreline stabilisation and dissipation of erosive forces, Sediment trapping

19. Wetland types:

Inland wetland, Marine/coastal wetland

Code	Name	% Area
G	Tidal flats	84.1
H	Salt marshes	4.7
D	Rocky shores	4.7
E	Sand / shingle shores (including dune systems)	4.4
TP	Freshwater marshes / pools: permanent	1
B	Marine beds (e.g. sea grass beds)	0.9
F	Estuarine waters	0.2

20. General ecological features:

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

The large tidal range leads to strong tidal streams and high turbidity, producing communities characteristic of the extreme physical conditions of liquid mud and tide-swept sand and rock. Broad intertidal flats with areas of unstable sand and muddy flats support high densities of invertebrates. Intertidal rock platforms support a wide variety of invertebrate species. There are large areas of subtidal sand, rock and gravel with a variety of aquatic estuarine communities including *Sabellaria alveolata* reef. Areas of saltmarsh fringe the estuary, mostly grazed with a range of vegetation communities. There are gradual and stepped transitions between bare mudflat to upper marsh and grassland. Main vegetation types are: upper saltmarsh with *Festuca rubra* and *Juncus gerardii*; middle marsh dominated by *Puccinellia maritima* with *Glaux maritima* and *Triglochin maritima*; dense monocultures of *Spartina anglica* at the edge of the mudflats-brackish pools and depressions with *Phragmites australis* and *Bolboschoenus maritimus*.

Ecosystem services

21. Noteworthy flora:

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

Nationally important species occurring on the site.**Higher Plants.**

Aster linosyris (nationally rare),
Alopecurus bulbosus, *Althaea officinalis*, *Bupleurum tenuissimum*, *Hordeum marinum*, *Lepidium latifolium*, *Petroselinum segetum*, *Puccinellia rupestris*, *Trifolium squamosum*, *Zostera marina/angustifolia*, *Zostera noltei* (all nationally scarce)

22. Noteworthy fauna:

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

Birds**Species currently occurring at levels of national importance:****Species regularly supported during the breeding season:**

Herring gull, *Larus argentatus argentatus*, NW 1540 apparently occupied nests, representing an average of 1.1% of the GB population (Seabird 2000 Census)
 Europe and Iceland/W Europe)

Species with peak counts in spring/autumn:

Little egret , <i>Egretta garzetta</i> , West Mediterranean	17 individuals, representing an average of 1% of the GB population (5 year peak mean 1998/9-2002/3)
Ruff , <i>Philomachus pugnax</i> , Europe/W Africa	12 individuals, representing an average of 1.7% of the GB population (5 year peak mean 1998/9-2002/3)
Whimbrel , <i>Numenius phaeopus</i> , Europe/Western Africa	333 individuals, representing an average of 11.1% of the GB population (5 year peak mean 1998/9-2002/3 - spring peak)
Eurasian curlew , <i>Numenius arquata arquata</i> , N. a. <i>arquata</i> Europe (breeding)	2021 individuals, representing an average of 1.3% of the GB population (5 year peak mean 1998/9-2002/3)
Common greenshank , <i>Tringa nebularia</i> , Europe/W Africa	26 individuals, representing an average of 4.3% of the GB population (5 year peak mean 1998/9-2002/3)
Species with peak counts in winter:	
Eurasian wigeon , <i>Anas penelope</i> , NW Europe	4658 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Northern shoveler , <i>Anas clypeata</i> , NW & C Europe	297 individuals, representing an average of 2% of the GB population (5 year peak mean 1998/9-2002/3)
Common pochard , <i>Aythya ferina</i> , NE & NW Europe	1118 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3)
Water rail , <i>Rallus aquaticus</i> , Europe	11 individuals, representing an average of 2.4% of the GB population (5 year peak mean 1998/9-2002/3)
Spotted redshank , <i>Tringa erythropus</i> , Europe/W Africa	10 individuals, representing an average of 7.3% of the GB population (5 year peak mean 1998/9-2002/3)

Species Information

Species occurring at levels of international importance on the site.

Fish.

Alosa alosa (IUCN Red data book – threatened; Habitats Directive Annex II, Annex V (S1102)),

Alosa fallax (IUCN Red data book – threatened; Habitats Directive Annex II, Annex V (S1103))

Lampetra fluviatilis (IUCN Red data book – threatened; Habitats Directive Annex II (S1099)),

Petromyzon marinus (Habitats Directive Annex II (S1095))

Nationally important species occurring on the site.**Invertebrates.**

Tenellia adspersa (nationally rare); *Corophium lacustre* (nationally scarce); *Gammarus insensibilis* (nationally scarce)

23. Social and cultural values:

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

Aesthetic

Archaeological/historical site

Environmental education/ interpretation

Fisheries production
 Livestock grazing
 Non-consumptive recreation
 Scientific research
 Sport fishing
 Sport hunting
 Tourism
 Traditional cultural
 Transportation/navigation

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

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

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

Ownership category	On-site	Off-site
Non-governmental organisation (NGO)	+	+
Local authority, municipality etc.	+	+
National/Crown Estate	+	
Private	+	+
Public/communal	+	+
Other	+	

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	+
Fishing: commercial	+	+
Fishing: recreational/sport	+	+
Gathering of shellfish	+	
Bait collection	+	
Arable agriculture (unspecified)		+
Grazing (unspecified)	+	+
Permanent pastoral agriculture		+

Hunting: recreational/sport	+	+
Industrial water supply	+	
Industry	+	+
Sewage treatment/disposal	+	+
Harbour/port	+	+
Flood control	+	+
Mineral exploration (excl. hydrocarbons)	+	+
Mining/quarrying	+	+
Transport route	+	+
Urban development		+
Military activities	+	+

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

Explanation of reporting category:

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

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
Dredging	1		+	+	+
Erosion	1		+		+
Recreational/tourism disturbance (unspecified)	1		+	+	

For category 2 factors only.

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?

Is the site subject to adverse ecological change? NO

27. Conservation measures taken:

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

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	+

National Nature Reserve (NNR)	+	
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	+
Management agreement	+	+
Site management statement/plan implemented	+	
Other	+	
Management plan in preparation	+	+

b) Describe any other current management practices:

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

28. Conservation measures proposed but not yet implemented:

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

No information available

29. Current scientific research and facilities:

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

Contemporary.**Fauna.**

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

Wildfowl shooting monitoring. Returns received annually from Wildfowling Clubs.

Completed.**Flora and Fauna.**

CCW/EN Marine Intertidal Phase 1 survey of the biotopes of the Severn Estuary in 2003/4 BTO Research report 335 for CCW/EN (November 2003). Low tide distribution of waterbirds of Severn Estuary SPA. Results of 2002/03 WeBS low tide counts and a historical analysis (Burton *et al.* 2003).

WWT Wetlands Advisory Service. Report for CCW (April 2003). Baseline bird monitoring of the River Severn.

Joint Nature Conservation Committee (1997) Subtidal biotope survey at mouth of the River Parrett.

Joint Nature Conservation Committee (1997) Upper estuary intertidal rocky shore survey.

Mettam, C (1997) *Biotopes in the subtidal sandbanks of the Severn estuary*. Report to English Nature

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

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

There are fixed interpretation panels and hides at Bridgwater Bay, Newport Wetlands Reserve, Flat Holm LNR and field centre. Interpretation boards at Black Rock.

31. Current recreation and tourism:

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

Activities, Facilities provided and Seasonality.

Walking, dog walking, and birdwatching are concentrated along the sea walls all the year round and on the saltmarsh and sandy beaches.

Bathing, beach recreation, including sand yachting and wind surfing are practised on the sandy beaches, mainly in the summer.

There are boat clubs/marinas in the sub-estuaries with sailing, motor boats, and jet skiing. Angling is carried out from the shore and small boats. There is a certain amount of bait digging. Wildfowling is carried out from September to February all around the Estuary; consents and further management measures are being addressed. There are agreed refuge areas for the birds.

32. Jurisdiction:

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

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs,
European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay, Bristol,
BS1 6EB

Head, Countryside Division, Welsh Assembly Government, Cathays Park, Cardiff, CF1 3NQ

33. Management authority:

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

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House,
Northminster Road, Peterborough, PE1 1UA, UK / Site Safeguard Officer, International
Designations, Countryside Council for Wales, Maes-y-Ffynnon, Penrhosgarneidd, Bangor,
Gwynedd, LL57 2DW

34. Bibliographical references:

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

Site-relevant references

Association of Severn Estuary Relevant Authorities (2003) *Severn Estuary European Marine Site. Foundation document for the management scheme*. Association of Severn Estuary Relevant Authorities.
www.severnestuary.net/asera/pubs/Final%20version.doc

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

Bratton, JH (2002) Aquatic invertebrates recorded in the Gwent levels: introduction, checklist and bibliography. *CCW Natural Science Report*, No. 02/5/2

Buck, AL (ed.) (1993) *An inventory of UK estuaries. Volume 2. South-west Britain*. Joint Nature Conservation Committee, Peterborough

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Countryside Council for Wales (2004) CCW Phase 1 Intertidal Survey dataset (unpublished data)

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

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Dargie, T (1999) NVC survey of saltmarsh habitat in the Severn estuary 1998. Final report to the Countryside Council for Wales and English Nature. *CCW Contract Science Report*, No. 341

Dargie, T (1999) Scarce plants survey of saltmarsh on the Welsh side of the Severn estuary. *CCW Contract Science Report*, No. 367

Dargie, T (2000) Description of the Severn estuary survey sectors identified in the 1998 NVC survey. *CCW Contract Science Report*, No. 399

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Appendix II: Waterfowl abundance and distribution within the Study Area and entire Severn Estuary SPA and Ramsar site



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Sevenside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
Annex I and migratory species also listed as qualifying assemblage species	Bewick's swan	289 (4.1% of the GB population)	205	The only record of this species relates to two birds which were present at Severn Beach in December 2004.	The desk study has not identified any records of Bewick's swan within the Avonmouth area in recent years.
	European white- fronted goose	3,002 (50% of the GB population)	601	The only recent records of this species relate to small flocks of up to 17 birds which were recorded at Severn Beach on a sporadic basis between 2003 & 2006.	The desk study has not identified any records of this species within the Avonmouth area in recent years.
	Shelduck	2,892 (3.9% of the GB population)	4,431	The areas of saltmarsh have been found to support up to 44 birds in recent years, with smaller numbers (up to two birds) recorded at a small number of inland sites.	Peak winter counts of up to 44 birds have been recorded from the areas of saltmarsh and intertidal habitat in recent years, with smaller numbers (up to six birds) recorded at a small number of inland sites. In addition, peak counts of up to 29 shelducks have been recorded from intertidal habitats within the southern half of the study area during the 2007 autumn passage period.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Gadwall	330 (5.5% of the GB population)	253	Peak counts of up to 21 birds have previously been recorded at Orchard Pools, with smaller numbers in neighbouring fields, Crook's Marsh and a number of estuarine sites.	Counts of up to 62 birds have previously been recorded at a number of estuarine sites (particularly, the saltmarsh 'pills'), as well as Avonmouth Pools and other inland sites. During 2008 spring migration bird surveys, peak counts of 18 birds have previously been recorded within the southern half of the study area.
	Redshank	2,013 (2.6% of the GB population)	2,269	Desk study records relate exclusively to estuarine sites, with counts of up to 200 birds at New Pill Gout and nearby areas of saltmarsh.	Desk study records relate exclusively to estuarine sites, with counts of up to 170 birds at Hole's Mouth and intertidal habitat to the south of the study area, as well as smaller concentrations at Chittering Warth.
	Dunlin	41,683 (9.6% of the GB population)	19,996	Counts of between 100 and 1100 birds have previously been recorded at Severn Beach and Chittering Warth North on a regular basis. These were identified as roost sites for this species during the Severnside bird surveys in 2001/02 and/or 2006/07	Peak winter counts of between 310 and 1900 birds have been recorded at Chittering Warth and the area of intertidal habitat in the southern half of the study area. Smaller flocks (up to 30 birds) have also been recorded at Hole's Mouth on occasions.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
Qualifying assemblage species: Original SPA citation	Wigeon	3,977 birds (1.6% of the GB population)	8,548 birds	No more than six birds have been recorded at any location during the Severnside bird surveys; however, BRERC data and WeBS counts indicate that this survey information for estuarine sites is likely to be an under-estimate.	No more than 22 birds have been recorded at any site in the Avonmouth area, which could represent an under-estimate of this species' abundance and distribution.
	Teal	1,998 birds (2.0% of the GB population)	4,251 birds	At estuarine sites, counts of up to 75 birds have previously been recorded, with New Pill Gout identified as supporting concentrations of (roosting) birds. Low numbers have also been recorded at several inland sites.	The largest concentrations of teal were associated with Hole's Mouth with peak counts of 140 birds previously recorded. Stupp Pill and Mitchell's Salt Rhynes have also been found to support peak counts of between 19 and 70 birds. Furthermore, counts of up to 200 birds have also previously been recorded at a number of inland sites.
	Pintail	523 birds (2.1% of the GB population)	911 birds	The most recent WeBS data covering the Severnside estuarine area (i.e. 2003/04-2007/08) indicate a low abundance of pintail within this part of the Severn Estuary, with a peak count of only three birds in January 2005. These data are consistent with the findings from other desk study sources.	Low numbers of pintail (fewer than 10 birds) have been reported from a small number of estuarine and inland sites on a sporadic basis.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Sevenside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Pochard	1,686 birds (3.8% of the GB population)	735 birds	Virtually no records of this species have been identified in the Severnside area.	Historic desk study data include counts of up to 103 pochard at Avonmouth Pools between the late-1980s and early 2000s; however, more recent comparable records have not been identified.
	Tufted duck	913 birds (1.5% of the GB population)	554 birds	Low numbers of birds have been identified from all desk study sources, with peak counts of up to 10 birds recorded at Orchard pools and 13 birds at Crook's Marsh (although the reservoir used by these birds at Crook's Marsh has subsequently been drained).	Avonmouth Pools have regularly supported aggregations of up to 68 tufted ducks since the mid- 1980s, with numbers appearing to have increased slightly at this site in recent years. Only small numbers of birds (fewer than five) have been identified from other sites at Avonmouth.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Ringed plover	227 birds (1.0% of the GB population)	1,054 birds	Peak numbers of ringed plover occur during the passage periods. WeBS data and Avon Bird Reports indicate that in excess of 175 birds have previously been recorded at Severnside (and its wider surroundings). The Severnside surveys are likely to have under-recorded plover numbers, since they did not coincide with the peak passage periods.	Smaller numbers of plovers have been recorded on passage during WeBS surveys at Avonmouth (up to 26 birds). These count data, as well as the absence of this species from the Severnside surveys are considered to potentially represent an under- estimate of bird abundance in the area. Breeding attempts involving nine pairs of ringed plover have taken place at Avonmouth Docks in recent years.
	Grey plover	781 birds (3.7% of the GB population)	355 birds	The desk study includes peak winter counts of between 16 and 38 birds at estuarine sites between 2003 and 2008 (suggesting that the corresponding WeBS data (9 birds) may be an under-estimate of grey plover numbers).	A record of single bird at Hole's Mouth during winter 2007/08 has been identified.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Sevenside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Curlew	3,096 birds (3.4% of the GB population)	2690 birds	Flocks of up to 104 birds have been recorded at Severn Beach and the adjacent area of saltmarsh to the south, as well as Stupp Pill. Flocks of up to 58 curlew have also been recorded at a number of inland sites.	Peak winter counts of between 47 and 120 birds have been recorded within the central section of Chittening Warth (with roost sites for this species identified in this area). Smaller numbers of birds have also been identified at Chittening Warth South, the intertidal habitats in the southern half of the study area (including Holes Mouth) and Hallen Marsh.
	Whimbrel	246 birds (4.9% of the GB population)	2 birds (162 birds*)	Peak numbers of whimbrel occur during the passage periods. The Avon Bird Reports indicate that up to 120 birds have previously been recorded at Sevenside (and its wider surroundings) since 2003. The findings of the Sevenside surveys are likely to have under-recorded whimbrel numbers, since they did not coincide with the peak passage periods.	Smaller numbers of whimbrel have been recorded on passage during WeBS surveys at Avonmouth (up to 2 birds). These count data, as well as the absence of this species from the Sevenside surveys are considered to potentially represent an under-estimate of bird abundance in the area.
	Spotted redshank	3 birds (1.5% of the GB population)	9 birds	WeBS data indicate a peak count of up to two birds has been recorded in recent years.	WeBS data and the findings of the Sevenside bird surveys indicate a peak count of up to two birds has been recorded in recent years



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
Qualifying assemblage species: 2001 Severn Estuary SPA amendment	Mallard	3,800 birds	2,713 birds (3,338 birds ¹)	Counts of up to 100 birds have previously been recorded at Severn Beach and Chittening Warth North. In addition, counts of up to 40 mallard have also been recorded at a number of inland sites.	Counts of up to 110 birds have previously been recorded on a regular basis at Chittening Warth and the intertidal habitats in the southern half of the study area (including Hole's Mouth). Up to 35 birds have previously been recorded at a number of inland sites. In addition, autumn passage counts of up to 140 birds have previously been recorded at the intertidal habitats in the southern half of the study area during surveys in 2007.
	Lapwing	3,976 birds	12,919 birds	The largest count of lapwing identified during the desk study relates to up 625 birds from the fields to the east of the M49 (winter 2008/09). Smaller numbers of birds (less than 110) have also been recorded from a range of other sites.	Peak counts of up to 630 birds have been recorded at Chittening Warth Central and the intertidal habitats between Stupp Pill and Hole's Mouth. Counts of up to 318 birds have also previously been recorded from a number of inland sites.
	Shoveler	73 birds	518 birds	The only desk study records for this species relate to small numbers of birds (no more than six individuals) at a limited number of sites.	Concentrations of shoveler (up to 90 birds) have previously been recorded at Hole's Mouth, Avonmouth Sewage Works, Avonmouth Pools and Disused Reservoir Pools.



Qualifying assemblage species: Other nationally important populations	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Grey heron	n/a	48 birds (59 birds [†])	There are existing records of small numbers of grey heron (usually no more than two birds) present at sites throughout the study area.	There are existing records of small numbers of grey heron (usually no more than two birds) present at sites throughout the study area.
	Little egret	n/a	41 birds (79 birds [†])	Peak counts of up to six birds have been recorded in recent years; however, no further site-specific information regarding their distributions has been identified from any of the desk-based sources reviewed for this project.	The desk study findings indicate that small numbers of little egrets (up to two birds) have previously been recorded at Avonmouth Sewage Works and its surroundings.
	Mute swan	n/a	420 birds	Flocks of up to 10 birds have previously been recorded at a small number of sites, most frequently at Orchard Pools.	Flocks of up to 10 birds have previously been recorded at a small number of sites, most frequently at Avonmouth Sewage Works.
	Common snipe	n/a	434 birds	This species is likely to be under-recorded within the study area, with the only site-specific record comprising a count of up to 53 birds from Dyer's Common during winter 2008/09.	This species is likely to be under-recorded within the study area. There are existing records of small numbers of birds (no more than ten individuals) being present at the following inland sites: Chittingen Warth; Seabank Power Station; Avonmouth Pools; land to the south of Avonmouth Sewage Works; Merebank; Pools at Brook Farm; and Salt Rhyne Balancing Pool.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Black-tailed godwit	n/a	295 birds (347 birds [†])	A review of all relevant desk study sources indicates that peak counts of up to 85 birds (Avon Bird Report, 2006) have been recorded in the Severnside area since 2003. The only site-specific wintering records of this species comprise a count of 50 birds recorded at Severn Beach (December 2004) and a single bird at the area of saltmarsh to the south of Severn Beach in February 2006.	A desk study record of a single bird at an area of intertidal habitat between Stupp Pill and Hole's Mouth in autumn 2007 has been identified.
	Bar-tailed godwit	n/a	49 birds (76 birds*)	Peak numbers of bar-tailed godwit occur during the passage periods and, therefore (to some extent) this species is likely to be under-recorded. Counts of up to 223 birds have previously been recorded at Salmon Pools, with smaller numbers recorded at a limited number of other estuarine sites.	No site-specific information pertaining to this species' abundance and distribution within the study area has been identified from any of the desk-based sources reviewed as part of this study.
	Knot	n/a	2598 birds	Peak counts of up to 170 birds (Avon Bird Report, 2005) have been recorded in the Severnside area since 2003. Site-specific records of up to 30 birds have also been identified for a limited number of other estuarine sites.	No site-specific information pertaining to this species' abundance and distribution within the study area has been identified from any of the desk-based sources reviewed as part of this study.



	Species	SPA population (based upon the 5 year peak mean: 1988/9 - 1992/3)	SPA population (based upon the 5 year peak mean: 2003/4 – 2007/8)	Abundance and distribution at Severnside (Cresswell Associates, 2010)	Abundance and distribution at Avonmouth (Cresswell Associates, 2010)
	Turnstone	n/a	287 birds	Peak counts of up to 170 birds (Avon Bird Report, 2005) have been recorded in the Severnside area since 2003. Site-specific records of up to 30 birds have also been identified for a limited number of other estuarine sites.	No site-specific information pertaining to this species' abundance and distribution within the study area has been identified from any of the desk-based sources reviewed as part of this study.
	Golden plover	n/a	2,859 birds	Severn Beach and its adjacent area of saltmarsh have previously been found to support up to 66 birds, with similar numbers recorded at New Pill Gout.	The Severnside bird surveys have previously recorded peak winter counts of up to 200 birds at Chittening Warth and Hole's Mouth. Furthermore, a count of 75 birds was also recorded at Chittening Warth (2005-2007), during bird surveys associated with Bristol City Council's proposed wind energy development.
	Water rail	n/a	14 birds	A review of all relevant desk study sources indicates that peak counts of at least six birds (Avon Bird Report, 2004) have been recorded at locations through the study area since 2003. However, owing to this species' cryptic nature, the desk-based records are likely to be under-representative of baseline conditions.	A review of all relevant desk study sources indicates that peak counts of at least six birds (Avon Bird Report, 2004) have been recorded at locations through the study area since 2003. However, owing to this species' cryptic nature, the desk-based records are likely to be under-representative of baseline conditions.
Total waterfowl in assemblage		68,026 ^Δ	69,803 [†]	-	-



n/a species not listed within the qualifying assemblage on the original SPA designation and, therefore, a SPA population based upon the 5 year peak mean (1989/9-1992/3) is not presented.

* derived from a 5 year peak mean for the spring migratory period.

† derived from a 5 year peak mean for the autumn migratory period.

Δ cited within the Regulation 33 Advice for the Severn Estuary SPA and Ramsar site (Natural England and Countryside Council for Wales, 2009).

1 This figure equates to the sum of the 5 year peak mean counts (2003/4-2007/8) for each of the species within the SPA qualifying assemblage.



Appendix III: Study of Soils and Habitats

South Gloucestershire Council, Bristol City Council &
Natural England

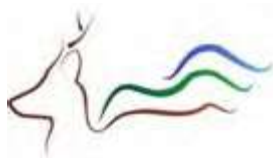
Severnside & Avonmouth Wetland Habitat Project

Baseline Study of Soils and Habitats



15th June 2010

C1453/Soils&Habitats/v1



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South Gloucestershire Council, Bristol City Council &
Natural England

Severnside & Avonmouth Wetland Habitat Project

Baseline Study of Soils and Habitats

Author: Bruce Lascelles/James Latham



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Report no: C1453/Soils&Habitats/v1

Date: 15th June 2010

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1.0 INTRODUCTION

The identification of land at Severnside/Avonmouth in which to create new wetland habitat relies in part on the understanding of which areas have been and are currently being used by birds associated with the Severn Estuary Special Protection Area (SPA) and Ramsar site. However, additional information will also be needed in relation to the physical environment within the study area to assess the feasibility of restoring or enhancing sub-optimal wetland habitat and to inform the process of identifying a series of target sites.

To that end, a sampling approach was ~~also~~ undertaken to validate the findings of the Stage 1 desk study exercise, by undertaking a habitat-based assessment of a proportion of the sites within study area, to determine their likely suitability for use by wintering wildfowl and waders.

The methodology and findings of the soils and habitat assessments is presented in the paragraphs below.



2.0 METHODOLOGY

The methodology used has been broken down into two stages, as detailed below:

2.1 Stage 1 - Baseline desk study of existing wetland areas

A significant amount of information has been published in relation to soils, hydrology and land use. The information sources listed below have been reviewed:

- Published soil survey maps (Soil Survey of England and Wales), associated soil memoirs and Soil Survey LANDIS database information;
- MAFF published Agricultural Land Classification (ALC) maps (1:250 000);
- Published geological maps;
- Existing Phase 1 information.

This information has been used to characterise the physical environment within the study area in order that existing and potential wetland areas can be identified.

2.2 Stage 2 – Habitat Assessment

An understanding of the physical characteristics of the land, linked to the assessment of the areas birds currently and historically have utilised, has been undertaken to inform impact assessment and the development of mitigation options.

A site walkover was undertaken on 26th March 2010 to:

- (a) ground truth the findings of the Stage 1 desk-based study, in terms of the abundance and distributions of wintering waterfowl throughout the study area (particularly within areas of grazing pasture within each of the development zones under consideration as part of this study; and
- (b) determine (to some extent) how existing wetland areas, or areas with potential to be used for wetland creation (in particular areas of degraded wetland habitat), currently function, and what measures would be necessary to achieve the required wetland characteristics (and at the required scale).



3.0 RESULTS

3.1 Stage 1 - Baseline desk study of existing wetland areas

3.1.1 Landform and drainage

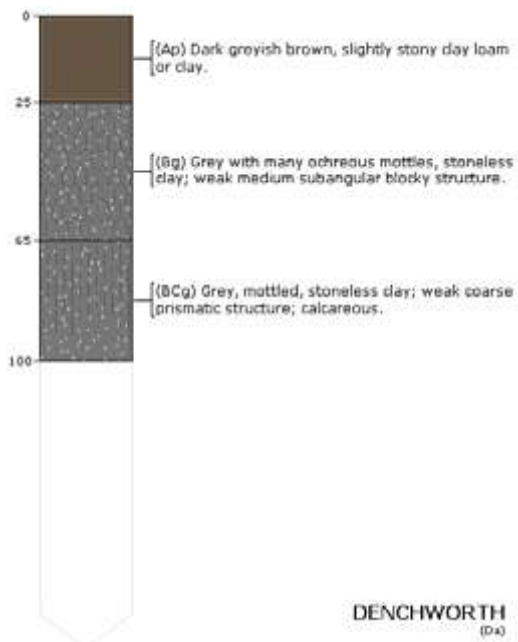
The study area is predominantly flat, lying at lower than 10m AOD across the site. The majority of field boundaries are marked by ditches, which form an intricate drainage network across the site. Given the lack of topographical difference across the site, flow within the ditch network is likely to result predominantly from rainfall inputs raising water levels (i.e. creating a head of water) in one part of the site, resulting in flow across the site.

3.1.2 Soils

The soils within the study area predominantly fall within the Newchurch Series. These soils are characterised as being “deep stoneless mainly calcareous soils developed in marine alluvium”. A typical profile is shown opposite (from Soil Site Report). The majority of these soils are recorded as being waterlogged to within 30cm of the soil surface.

There is a small area in the extreme eastern part of the site (south of Easter Compton) where the soils belong to the Whimpole Series, characterised as being “reddish fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging”.

The Soil Site Reports reviewed list the following as the key characteristics of soils of the Newchurch Series:



1. HOST (Hydrology Of Soil Type) category 9 – soils seasonally waterlogged by fluctuating groundwater and with relatively slow lateral saturated conductivity;
2. High ground movement potential, relating to the potential for the clays within the soil to experience seasonal swelling and shrinkage. It is noted that the soils in this location would be likely to have a Very High ground movement potential if drained to an effective depth of at least 2m (i.e. the soils would be likely to experience greater water content fluctuations and thus be at risk of more extensive shrinkage/swelling);
3. Major flood risk potential;



4. Very Highly Aggressive in relation to the risk of corrosion to ferrous iron (related to soil acidity, sulphide content, aeration and wetness, all of which influence the corrosivity of the soil);
5. High leaching capacity. In these soils this is likely to relate for the propensity of groundwater to lie at a shallow depth;
6. Moderate runoff potential and moderate adsorption potential;
7. High leaching potential (Groundwater Protection Policy Class H1) where there is a risk that the soils will readily transmit liquid discharges because they are either shallow or susceptible to rapid bypass flow into the groundwater (see point 5 above);
8. Suitable for permanent grassland with winter cereals in Somerset and Avon and can support wet brackish coastal flood meadows;
9. Lime-rich, moderate natural fertility;
10. Loamy texture.

The key characteristics of the Whimpole Series are given as:

1. HOST (Hydrology Of Soil Type) category 21 – slowly permeable soils with slight seasonal waterlogging and low storage capacity over slowly permeable substrates with negligible storage capacity;
2. Moderate ground movement potential, relating to the potential for the clays within the soil to experience seasonal swelling and shrinkage;
3. Minor flood risk potential;
4. Moderately Aggressive in relation to the risk of corrosion to ferrous iron (related to soil acidity, sulphide content, aeration and wetness, all of which influence the corrosivity of the soil);
5. Intermediate leaching capacity. In these soils this is likely to relate for the propensity of groundwater to lie at a shallow depth;
6. High runoff potential and moderate adsorption potential;
7. Intermediate leaching potential (Groundwater Protection Policy Class I1) where the soil has a moderate ability to attenuate a wide range of diffuse source pollutants but in which it is possible that some non-adsorbed diffuse source pollutants and liquid discharges could penetrate the soil layer;
8. Suitable for dairying and stock rearing, winter cereals and short-term grassland and can support a wide range of grassland and woodland types;
9. Moderate to high natural fertility;



10. Loamy texture.

In summary, the soils across the study area are likely to be fairly uniform in their characteristics, being slowly permeable and seasonally waterlogged and noted as being able to support natural wet grassland habitats.

In the absence of any further soil, hydrological and/or topographical analysis due to funding constraints, this at least indicates that there is predominantly a uniformity of soil type across the study area: and that its characteristics confirms that it is suitable for new wetland creation.



3.2 Stage 2 - Habitat Assessment

The following table presents the findings of the habitat-based assessment of the study area, in relation to: (a) its (likely) suitability for supporting substantial concentrations of over-wintering wildfowl and waders; and (b) its characteristics as existing wetland habitat (or potential for wetland habitat creation and/or enhancement). See Figure 1 for corresponding site locations).

	Description of terrestrial habitats										Description of aquatic habitats			Bird survey findings
	Existing land use	Topography	Substrate/vegetation cover	Ground softness	Connectivity with other potentially suitable sites (see Figure 1)	Sightline distance(s)	Description of boundary features	Description of adjacent areas	Standing water features	Ditch/rhine characteristics	Presence of field drainage outfalls	Waterfowl presence (numbers, species, behaviour, etc)	Suitability for overwintering waterfowl	
A	Commercial car storage area	Flat	Concrete hardstanding (100%)	N/a	Yes - Disused Reservoir Pools	Up to 100m	Security fencing with landscape planting	Predominantly industrial setting; however, Adjacent to Disused Reservoir Pools	None	N/a	N/a	None	None	
B	Derelict industrial/commercial	Flat	Concrete hardstanding (100%)	N/a	Yes - Salt Rhine Balancing Pond (Area A) and Hallen Marsh (Area E)	Up to 100m	Security fencing with landscape planting	Predominantly industrial setting; however, Salt Rhine Balancing Pond and Hallen Marsh (Area E) located adjacent to the site	None	N/a	N/a	None	Potentially suitable (but sub-optimal) habitat for roosting lapwing/golden plover (given extent of sightlines and flat topography)	
C	Greenfield – mosaic of grazing pasture and unmanaged grassland	Flat	Predominantly grassland/rushes of varying heights (90-100%), the majority <5-10cm in height, with some taller areas (up to 50cm)	Soft in places (penetration of ground by 6" nail).	Located in close proximity to Avonmouth Pools (Area D)	Up to 200m in most cases	Boundaries largely comprise mature hedgerows (up to 5m high) and tree-lines (up to 10m high)	Predominantly industrial/commercial setting; however, Avonmouth Pools (Area D) in close proximity.	Small (<5m wide), isolated areas of standing water scattered throughout the site	Majority of ditches ~1.5-2.0m deep, with ~0.5-0.8m water depth. No obvious signs of flow, but good levels of connectivity	-	2 x mallard within ditch network	Ditch network likely to support wildfowl (e.g. mallard & teal), with snipe likely to be present in areas of tussocky grassland. Closely grazed areas potentially suitable for use by roosting/foraging lapwing and curlew.	
D	Avonmouth Sewage Works and Pools	Flat	Sewage works – predominantly concrete hardstanding with relatively small areas of amenity grassland	N/a	Yes – located adjacent to Area C	<50m	Security fencing with mature hedgerows and scrub (up to 5m high) and	Predominantly industrial/commercial setting to the north & east; however, greenfield land (Area C) to the south and west.	Concrete pools associated with operational works	N/a	N/a	None	None of the remaining habitats within the operational sewage works site appear to provide potentially suitable habitat for over-wintering waterfowl.	



Description of terrestrial habitats							Description of aquatic habitats				Bird survey findings	
Existing land use	Topography	Substrate/vegetation cover	Ground softness	Connectivity with other potentially suitable sites (see Figure 1)	Sightline distance(s)	Description of boundary features	Description of adjacent areas	Standing water features	Ditch/rhine characteristics	Presence of field drainage outfalls	Waterfowl presence (numbers, species, behaviour, etc)	Suitability for overwintering waterfowl
		Pools – Mosaic of, grasses, ruderal herbs, reeds and scrub	-			tree-lines (up to 10m high)		Small network of waterbodies which comprise good quality habitat for waterfowl and which are designated as an Avon Wildlife Trust Reserve.	-	-	Small numbers (fewer than five) of mallard, coot and teal.	Avonmouth Pools represent good quality habitat for over-wintering waterfowl (particularly wildfowl) (see Cresswell Associates, 2010 for further details).
E	Pasture – generally flat with ridge and furrow. Arable - flat	Pasture comprises improved grassland, with remaining arable areas supporting crops. The majority of vegetation <15cm in height.	Soft in places (penetration of ground by 6" nail).	Yes – Located adjacent to Salt Rhyme Balancing Pool and Crook's Marsh (Area L & K).	Up to 200m in some arable areas	Boundaries largely comprise mature hedgerows and tree-lines, mainly 2-5m in height (but up to >5m in some cases)	Predominantly industrial/commercial setting to the south and west; however, more extensive area of grazing pasture to the north (Crook's Marsh (Area L) and east. Avonmouth Railway Line and M49 motorway corridor also located adjacent to the site.	Small number of isolated waterbodies (<10m diameter) scattered throughout the site.	Majority of ditches ~0.8-2.5m deep, with ~0.1-0.5m water depth. No obvious signs of flow, but good levels of connectivity.	Yes, small number of outfalls present	2 x teal in ditch network	The presence of arable land and larger field sizes (compared to other greenfield land in the study area) may offer overwintering waterfowl improved feeding, roosting and loafing opportunities. Re-wetting of fields and increasing sightlines would represent a further enhancement.
F	Minor undulations in topography (~0.2-0.4m)	Grassland (vast majority <2cm in height) with isolated stands of bramble scrub (up to 1.5m in height).	-	No – however, Orchard Pools and the foreshore located nearby.	Up to 100m	Boundary features largely comprise mature hedgerows with trees (5-10m high). In several cases, internal boundaries removed and replaced with post and wire fences.	Predominantly residential (Severn Beach) to the north and east. Orchard Pools/Astra Zeneca fields, and the Severn estuary foreshore located in close proximity to the south and west, respectively.	Several small ponds shown on OS map; however, this was not possible to ground truth, due to lack of land access permission.	Ditches appear to be deep (~2.0m) with ~0.5m water depth. No signs of flow; however, good levels of connectivity.	-	None	This site represents potentially suitable roosting/foraging habitat for waterfowl (particularly waders such as curlew, lapwing and possibly golden plover). The findings of the Stage 1 desk study have confirmed the site's usage by curlew (see Cresswell Associates, 2010).



	Description of terrestrial habitats										Description of aquatic habitats			Bird survey findings
	Existing land use	Topography	Substrate/vegetation cover	Ground softness	Connectivity with other potentially suitable sites (see Figure 1)	Sightline distance(s)	Description of boundary features	Description of adjacent areas	Standing water features	Ditch/rhyme characteristics	Presence of field drainage outfalls	Waterfowl presence (numbers, species, behaviour, etc)	Suitability for overwintering waterfowl	
G	Grazing pasture	Largely flat with some minor undulations in topography (~0.2-0.4m).	Grassland (vast majority <5cm in height) with isolated areas of scattered rushes (up to 30m in height).	Soft in places (penetration of ground by 6" nail).	Relatively isolated due to fragmentation by South Wales Mainline, M49 corridor and Severn Road	>200m in most cases	Boundary features largely comprise mature hedgerows with trees (5-10m high). In several cases, internal boundaries removed and replaced with post and wire fences.	The South Wales Main Line and Piling to the north, commercial development to the east, the M49 motorway and commercial development to the south and Severn Road to the west. These land use areas are interspersed by relatively small and isolated areas of greenfield land.	Several small ponds are thought to be present; however, this was not possible to ground truth, due to lack of land access permission.	-	-	None	The larger field sizes (compared to other greenfield land in the study area) likely to offer overwintering waterfowl good feeding, roosting and loafing opportunities. The findings of the Stage 1 desk study have confirmed the site's usage by flocks of over 600 lapwings (see Cresswell Associates, 2010).	
H	Grazing pasture	Largely flat with some minor undulations in topography (~0.2-0.4m).	Grassland (vast majority <5cm in height) with isolated areas of scattered rushes (up to 30m in height).	Soft in places (penetration of ground by 6" nail).	Good levels of connectivity with comparable habitat to the south, east and north (beyond the South Wales Mainline).	Up to 100m in most cases	In most cases, managed hedgerows (<2.0m), although some taller hedgerows and tree-lines also present (5-10m)	The South Wales Main Line to the north (with greenfield land beyond), comparable areas of greenfield land to the east and south, with recently built commercial development to the west.	-	Ditches appear to be relatively deep (~1.0-1.5m) with ~0.5m water depth. Relatively good levels of connectivity, although no signs of flow.	-	None	The fields could provide potentially suitable roosting sites for lapwing and golden plover, and/or feeding sites for curlew; however, their usage by these species may be limited due to restricted sightlines.	



	Description of terrestrial habitats										Description of aquatic habitats			Bird survey findings
	Existing land use	Topography	Substrate/vegetation cover	Ground softness	Connectivity with other potentially suitable sites (see Figure 1)	Sightline distance(s)	Description of boundary features	Description of adjacent areas	Standing water features	Ditch/rhyme characteristics	Presence of field drainage outfalls	Waterfowl presence (numbers, species, behaviour, etc)	Suitability for overwintering waterfowl	
I	Horse-grazed pasture	Flat	Grassland (vast majority <5cm in height). Pre-construction hedgerow/tree clearance works recently completed at the time of the survey	Soft in places (penetration of ground by 6" nail).	Good levels of connectivity to the south with Dyer's Common (Area J).	Extensive following site clearance (>500m in places); however, likely to have been <200m previously.	All boundary features within the site have been removed.	Commercial/industrial development to the north and west, the M49 motorway to the east (with greenfield land beyond), comparable greenfield land to the south.	None	Ditches appear to be ~1.0-1.2m deep, with 0.5m water depth. No signs of water flow.	-	None	Prior to hedgerow/tree clearance, the fields could have provided potentially suitable roosting sites for lapwing and golden plover, and/or feeding sites for curlew; however, their usage by these species may have been limited due to restricted sightlines. Following hedgerow/tree clearance works, the likely suitability of the site for roosting/foraging waterfowl (particularly lapwing and curlew) appears to have increased due to the increased sight-lines.	
J	Horse-grazed pasture	Generally flat with ridge and furrow (~0.2-0.3m) present across the majority of fields. In addition, there is an area of raised ground (up to 10m) in the north-eastern corner.	Predominantly grassland (<5-10cm) with some areas of ruderal herbs/scrub.	Generally firm, with some softer areas (2.5" penetration of ground by 6" nail).	Good levels of connectivity with comparable habitat to the north (Area I), and Crook's Marsh (Area K) to the south.	Up to 100m in most cases	The majority of boundary features comprise mature hedgerows with trees (up to 10m high).	Derelict brownfield land to the west (Area M), the M49 motorway to the west (with greenfield land beyond), and comparable greenfield land to the north (Area I) and south (Crook's Marsh (Area K)).	Small pond (<10m diameter) at the western end of the site.	Ditches appear to be ~1.0-1.2m deep, with 0.5m water depth. No signs of water flow.	None identified	Snipe flushed from small stand of reeds.	The site supports a well-established network of mature hedgerows/trees which restrict the extent of sight-lines and, therefore, could limit the attractiveness of this area for use by waterfowl. However, the ditch network could be used by moderate numbers of wildfowl (particularly mallard and teal), and snipe are likely to utilise water-logged field margins, and small stand of reeds.	



Description of terrestrial habitats													Description of aquatic habitats			Bird survey findings



Habitat Characteristics

The majority of the greenfield land within the study area comprised pasture, which (in most cases) was subject to heavy levels of on-going grazing by horses and sheep.

However, several fields containing arable crops were also present within Hallen Marsh (Area E). The overall profile of the study area is flat, although many of the fields contain a 'ridge and furrow' landform which provides some small-scale topographical variation and is likely to support areas of standing water following periods of heavy rainfall, or during periods of water-logging. At the time of the habitat survey, several parts of the study area were found to comprise soft ground conditions (particularly Hallen Marsh (Area E) and the land to the south of Avonmouth Sewage Works (Area C)). Whilst this finding is not necessarily representative of the ground conditions throughout any given winter period (since ground softness is to a large extent dependent upon previous rainfall levels), it was noted that these sites generally appeared to comprise softer ground than other areas of ('greenfield') land within the study area (e.g. Areas I to L).

The study area was intersected by a well-established network of rhynes and ditches, which appeared to provide an effective means of carrying water from the associated areas of pasture/arable farmland. In general, the ditches were estimated to be between 1.0m – 2.5m in depth (with the deepest ditches recorded at Crook's Marsh (Areas L & K) and Hallen Marsh (Area E)). Water depths of up to 0.5m were recorded within these features. Although no obvious signs of water flow were recorded within the ditches, they appeared to provide good levels of connectivity throughout the study area. Furthermore, it is likely that levels of surface water flow into the Severn Estuary are to some extent dependent upon estuary outfall structures (which may moderate flow rates depending upon the tidal cycle).

The vast majority of the ditches/rhynes were associated with mature hedgerows/tree-lines. In most cases, these boundary features did not appear to have been subject to recent management.

Bird/Habitat Associations

As described above, the greenfield land within the study area was generally found to consist of grazing pasture. In principle, this habitat type appeared to be potentially suitable for use by roosting and (to some extent) foraging wintering waterfowl. However, the surrounding hedges and trees restricted the line of sight to below 200m in many cases (in particular, the grazing pasture at Dyer's Common and Crook's Marsh (Areas I, J, K and L on Figure 1) was intersected by a well-established network of hedges which limited the field sizes). As a result, it was considered less likely that these areas would support large flocks of wildfowl and waders particularly lapwing (*Vanellus vanellus*), golden plover (*Pluvialis apricaria*), and curlew (*Numenius arquata*), and this appears to reflect the findings of the 2001-2008 Severnside Bird Surveys (see Cresswell Associates, 2010). Nonetheless, the Severnside Bird Surveys confirmed that Area F regularly supports flocks of up to 58 curlews during the winter months. Whilst these fields offer good foraging and roosting opportunities for the species since they comprise horse-grazed pasture which (at times) contains areas of water-logged ground, they are surrounded by a well-established network of mature hedgerows/trees (5-10m high) which restrict sight-lines across the wider area. Nevertheless, this does not appear to inhibit their use



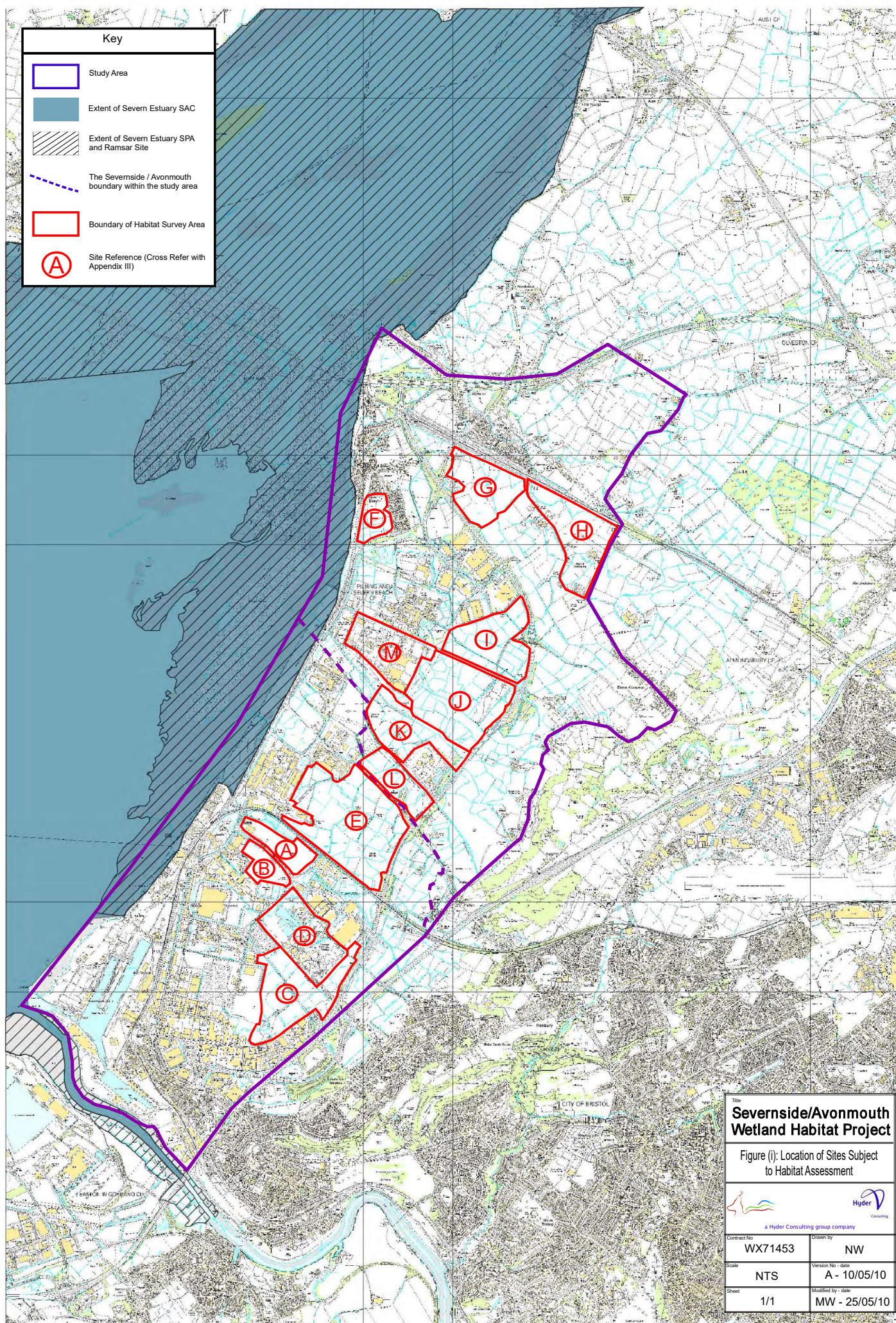
by curlew. Indeed, the Severnside bird surveys indicate that curlew have previously been recorded foraging within three to four metres of mature hedgerows.

Notwithstanding Area F, the remaining areas of greenfield land with the greatest potential for use by wintering waterfowl appeared to be: an area of land to the south of Avonmouth Sewage Works (Area C); Hallen Marsh (Area E); and fields in the vicinity of Whitehouse Farm (Area G). These sites generally contain larger field sizes than the areas described above and, therefore, appeared to provide more extensive sight-lines for wintering wildfowl. In addition to the grazing pasture, Hallen Marsh also supported areas of arable land, which appeared to have the potential to provide improved foraging opportunities for 'farmland' waders (e.g. lapwing, golden plover and curlew). Whilst Areas G and (to a lesser extent) C, have previously been found to support large aggregations of over-wintering lapwings (see Cresswell Associates, 2010), desk-study records indicate that Hallen Marsh has previously supported relatively low numbers of birds, relative to its large size, diversity of habitat types, low levels of disturbance, etc.

In many cases, the ditches/rhynes were associated with mature hedgerows/trees and the 'enclosed' nature of these watercourses made it unlikely that these would support a diverse range of waterfowl. Notwithstanding this, mallard (*Anas platyrhynchos*) and teal (*Anas crecca*) were recorded from the ditch/rhyne network on a small number of occasions and it was considered that these species were likely to be present in the greatest abundance along these water features. In addition, areas of unmanaged grassland (e.g. within Area C adjacent to the Avonmouth Sewage Works) and waterlogged ground supporting rushes/reeds were identified across parts of the greenfield land, providing potential habitat for roosting and/or foraging snipe (*Gallinago gallinago*) during the winter months.

Key

-  Study Area
-  Extent of Severn Estuary SAC
-  Extent of Severn Estuary SPA and Ramsar Site
-  The Severnside / Avonmouth boundary within the study area
-  Boundary of Habitat Survey Area
-  Site Reference (Cross Refer with Appendix III)



**Severnside/Avonmouth
Wetland Habitat Project**

Figure (i): Location of Sites Subject
to Habitat Assessment



a Hyder Consulting group company

Contract No	WX71453	Drawn by	NW
Scale	NTS	Version No - date	A - 10/05/10
Sheet	1/1	Modified by - date	MW - 25/05/10