BTO Research Report No. 267

Effects of Reductions in Organic and Nutrient Loading on Bird Populations in Estuaries and Coastal Waters of England and Wales Phase 1 Report ANNEX

Authors

N.H.K. Burton, E. Paipai, M.J.S. Armitage, J.M. Maskell, E.T. Jones, J. Struve, C.J. Hutchings & M.M. Rehfisch

Final report of work carried out by
The British Trust for Ornithology
in conjunction with HR Wallingford
under contract to
English Nature,
Countryside Council for Wales
and the Environment Agency

April 2002

The National Centre for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU
Registered Charity No. 216652

CONTENTS

Page No.

SUMMARY

This report forms an Annex to the report of Burton *et al.* (2002) investigating the effects of reductions in organic and nutrient loading on bird populations in estuaries and coastal waters of England and Wales and should be read in conjunction with that report.

Data collected in part for the Geographical Information System (GIS) Project component of that report are summarised in Table 1 below in order to provide an assessment of the risk to waterbird (grebe, cormorant, heron, wildfowl and wader) and seabird (petrel, tern, gull and auk) species within coastal Special Protection Areas (SPAs) within England and Wales from past and current improvements to waste water treatment implemented as a result of the Urban Waste Water Treatment Directive (UWWTD).

The assessment of risk to birds was made for two periods: 1990-2000 and 2000-2005. The first period covered the implementation of Asset Management Plans (AMP) 1 and 2 by Water and Sewerage Companies, which defined the sewerage /sewage treatment improvements which would be provided during the periods 1990-1994 and 1995 to 1999 respectively (see Burton *et al.* 2002). The second period covers the implementation of AMP3.

The table provides information on the waterbird population of each SPA and the species amongst those for which the SPA is designated which are potentially at risk from the implementation of the UWWTD (as defined in Burton *et al.* 2002).

Four categories of risk are defined. Firstly, 'NONE' – either there are no changes to the Biochemical Oxygen Demand (BOD) load from discharges within the SPA, or there are no known discharges within the SPA, or those species for which the SPA is designated are not included amongst those potentially at risk from the implementation of the UWWTD. 'LOWER' – the estimate of the change in the BOD load from discharges into the SPA over the period is less than 1 t/day (i.e. a relative low change in BOD load) and the species for which the SPA is designated are amongst those potentially at risk from the implementation of the UWWTD. 'HIGHER' – the estimate of the change in BOD load over the period is equal to or greater than 1 t/day and the species for which the SPA is designated are amongst those potentially at risk from the implementation of the UWWTD. 'UNKNOWN' – there are discharges within the SPA, but the change in BOD load is not known and the species for which the SPA is designated are amongst those potentially at risk from the implementation of the UWWTD. As a result of the crudity of BOD estimates (see note 4 below), it was not possible to define the risk to waterbirds in any greater detail.

For the first period, there was a 'higher' risk to birds in 13 SPAs: Exe Estuary, Hamford Water, Humber Flats, Marshes & Coast, Medway Estuary & Marshes, Mersey Estuary, Morecambe Bay, Ribble & Alt Estuaries, Severn Estuary, Solent & Southampton Water, Stour & Orwell Estuaries, Tamar Estuaries Complex, Thames Estuary & Marshes and Thanet Coast & Sandwich Bay. There was a lower risk in two SPAs: Duddon Estuary and The Dee Estuary and an unknown risk in 14 SPAs: Blackwater Estuary, Burry Inlet, Chichester & Langstone Harbours, Colne Estuary, Lindisfarne, Mersey Narrows & North Wirral Foreshore, North Norfolk Coast, Northumbria Coast, Pagham Harbour, Poole Harbour, Teesmouth & Cleveland Coast, The Wash, Traeth Lafan and Upper Solway Flats and Marshes.

For the second period, there was a higher risk to birds in three SPAs: Mersey Narrows & North Wirral Foreshore, Morecambe Bay and Severn Estuary. There was also a lower risk in 15 SPAs: Burry Inlet, Duddon Estuary, Exe Estuary, Humber Flats, Marshes & Coast, Medway Estuary & Marshes, Northumbria Coast, Pagham Harbour, Ribble & Alt Estuaries, Solent & Southampton Water, Stour & Orwell Estuaries, Tamar Estuaries Complex, Thanet Coast & Sandwich Bay, The Dee Estuary, The Wash and Traeth Lafan.

References

Burton, N.H.K., Paipai, E., Armitage, M.J.S., Maskell, J.M., Jones, E.T., Struve, J., Hutchings, C.J. & Rehfisch, M.M. (2002) *Effects of Reductions in Organic and Nutrient Loading on Bird Populations in Estuaries and Coastal Waters of England and Wales. Phase 1 Report March 2002*. BTO Research Report No. 267. BTO, Thetford.

Musgrove, A.J., Pollitt, M.S., Hall, C., Hearn, R.D., Holloway, S.J., Marshall, P.E., Robinson, J.A. & Cranswick, P.A. (2001) *The Wetland Bird Survey 1999-2000: Wildfowl and Wader Counts*. BTO/WWT/RSPB/JNCC, Slimbridge.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5] Past	Current
Alde-Ore Estuary	31,979	**AV**, **BW**, **DN**, **L.**, **RK** EW, **SU**, SV, **T.**, **WN** AF, BH, HG, LB, TE	No known discharges within SPA		NONE NONE NONE	NONE NONE NONE
Benacre-Easton Bavents	[f]	- - AF, BI	No known discharges within SPA		- - NONE	- - NONE
Benfleet & Southend Marshes	156,425 [a]	**DN**, **GV**, **KN**, **OC**, RP **DB** -	No known discharges within SPA		NONE NONE -	NONE NONE -
Blackwater Estuary (Mid-Essex Coast Phase 4)	80,574	**AV**, **BW**, **CU**, **DN**, GP, **GV**, **L.**, **RK**, RP, RU **DB**, **GN**, **PT**, RM, **SU**, SV, **T.**, **WN** AF, CA, GG	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE
Breydon Water	58,557 [b]	**AV**, **BW**, **DN**, GP, **L.** EW, SV, BS, **WN** CA, CN	No known discharges within SPA		NONE NONE NONE	NONE NONE NONE
Burry Inlet	51,461	**BW**, **CU**, **DN**, **KN**, **OC**, WM **PT**, **SU**, SV -	?	-0.50	UNKNOWN UNKNOWN -	LOWER LOWER -
Chesil Beach & The Fleet	12,499	- **DB** AF	No known discharges within SPA		- NONE NONE	- NONE NONE
Chichester & Langstone Harbours	89,315	**BA**, **BW**, **CU**, **DN**, **GV**, **KN**, **L.**, **OC**, **RK**, RP, SS, WM **DB**, **PT**, RM, **SU**, SV, **T.**, **WN** AF, CA, ET, LG, TE	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE

Table 1 An assessment of the risk to waterbird (grebe, cormorant, heron, wildfowl and wader) and seabird (petrel, gannet, tern, gull and auk) species within coastal SPAs within England and Wales from past and current improvements to waste water treatment implemented as a result of the Urban Waste Water Treatment Directive.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5]	
					Past	Current
Colne Estuary	35,579	**AV**, **BW**, **DN**, GP, **GV**, **L.**, **RK**, RP	?	0	UNKNOWN	NONE
(Mid-Essex Coast Phase 2)		**DB**, **SU**			UNKNOWN	NONE
		AF, CA, GG			NONE	NONE
Coquet Island	[f]	-	No known discharges within		-	-
		-	SPA		-	-
		AE, BH, CN, ET, PU, RS			NONE	NONE
Crouch & Roach Estuaries	22,490	-	No known discharges within		-	-
(Mid-Essex Coast Phase 3)		**DB**	SPA		NONE	NONE
		-			-	-
Deben Estuary	16,796	**AV**	No known discharges within		NONE	NONE
		-	SPA		-	-
		-			-	-
Dengie	34,442	**BA**, **BW**, **DN**, **GV**, **KN**, **L.**, **OC**	No known discharges within		NONE	NONE
(Mid-Essex Coast Phase 1)		**DB**	SPA		NONE	NONE
		CA, GG			NONE	NONE
Duddon Estuary	34,766	**CU**, **DN**, **KN**, **OC**, **RK**, RP, SS	-0.24	-0.03	LOWER	LOWER
		PT, RM, **SU**			LOWER	LOWER
		TE			NONE	NONE
Dungeness-Pett Level	25,950	-	No known discharges within		-	-
		BS, SV	SPA		NONE	NONE
		AF, CN, MU			NONE	NONE
Dyfi Estuary	11,574	-	No known discharges within		-	-
		EW	SPA		NONE	NONE
		-			-	-

Table 1 Continued.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5]	
					Past	Current
Exe Estuary	23,506	**AV**, **BW**, **DN**, **GV**, **L.**, **OC**, WM **DB**, RM, **WN** CA, SZ	-15.39	-0.05	HIGHER HIGHER NONE	LOWER LOWER NONE
Farne Islands	[f]	- - AE, CA, CN, GU, KI, PU, RS, SA, TE	No known discharges within SPA		- - NONE	- - NONE
Flamborough Head & Bempton Cliffs	[f]	- - GU, GX, HG, KI, PU, RA	?	?	- - NONE	- - NONE
Foulness (Mid-Essex Coast Phase 5)	156,425 [a]	**AV**, **BA**, **BW**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK** **DB**, **SU**, **WN** AF, CN, LG, TE	No known discharges within SPA		NONE NONE NONE	NONE NONE NONE
Gibraltar Point	[f]	**BA**, **GV**, **KN**, **OC** - AF	No known discharges within SPA		NONE - NONE	NONE - NONE
Glannau Aberdaron & Ynys Enlli / Aberdaron Coast & Bardsey Island	[f]	- - MX	No known discharges within SPA		- - NONE	- - NONE
Grassholm	[f]	- - GX	No known discharges within SPA		- - NONE	- - NONE
Great Yarmouth North Denes	[f]	- - AF	No known discharges within SPA		- - NONE	- - NONE

Table 1 Continued.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5]	
					Past	Current
Hamford Water	55,417	**AV**, **BW**, **DN**, GP, **GV**, **L.**, **RK**, RP, RU **DB**, **SU**, **T.**, **WN** AF	-1.71	0	HIGHER HIGHER NONE	NONE NONE NONE
Humber Flats, Marshes & Coast	151,009	**BA**, **BW**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP, SS, WM **DB**, **GN**, MA, **PO**, **SU**, **T.**, **WN** AF, BI, CA	-32.40	-0.84	HIGHER HIGHER NONE	LOWER LOWER NONE
Isles of Scilly	[f]	- - **GB**, LB, SA, TM	No known discharges within SPA		- - NONE	- - NONE
Lindisfarne	41,912	**BA**, **DN**, GP, **GV**, **KN**, **L.**, **RK**, RP CX, E., GJ, **PB**, PG, RM, **SU**, **WN**, WS AF	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE
Medway Estuary & Marshes	56,372	**AV**, **BW**, **CU**, **DN**, **GV**, **L.**, **OC**, **RK**, RP, WM **DB**, **PT**, **SU**, **T.**, **WN** AF, CA, GG, LG	-14.19	-0.14	HIGHER HIGHER NONE	LOWER LOWER NONE
Mersey Estuary	104,784 [c]	**BW**, **CU**, **DN**, GP, **GV**, **L.**, **RK**, RP **PT**, **SU**, **T.**, **WN** GG	-38.96	0	HIGHER HIGHER NONE	NONE NONE NONE
Mersey Narrows & North Wirral Foreshore	104,784 [c]	**DN**, **GV**, **KN**, **OC**, **RK**, **TT** - CA	?	-2.44	UNKNOWN - NONE	HIGHER - NONE
Minsmere – Walberswick	[f]	**AV** - AF, BI	No known discharges within SPA		NONE - NONE	NONE - NONE

Table 1 Continued.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5]	
					Past	Current
Morecambe Bay	259,042	**BA**, **BW**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP, SS, **TT**, WM E., **GN**, MA, PG, **PT**, RM, **SU**, **T.**, **WN** AF, CA, GG, HG, LB, TE	-48.71	-5.78	HIGHER HIGHER NONE	HIGHER HIGHER NONE
North Norfolk Coast	141,975	**AV**, **BA**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP, RU, SS, WM CX, **DB**, EW, GA, PG, **PT**, **SU**, SV, **T.**, VS, **WN** AF, BI, CA, CN, MU, RS, TE	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE
Northumbria Coast	[f]	**PS**, **TT** - AF	?	-0.22	UNKNOWN - NONE	LOWER - NONE
Pagham Harbour	17,292	RU **PT** AF	?	-0.02	NONE UNKNOWN NONE	NONE LOWER NONE
Poole Harbour	28,429	**AV**, **BW**, **CU**, **DN**, **L.**, **RK** **DB**, **GN**, **PO**, RM, **SU**, SV CA, CN, ET, MU	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE
Portsmouth Harbour	11,251	- **DB** -	No known discharges within SPA		- NONE -	- NONE -
Ribble & Alt Estuaries	316,296	**BA**, **BW**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP, RU, SS BS, CX, PG, **PT**, **SU**, **T.**, **WN**, WS BH, CA, CN, LB,	-23.42	-0.03	HIGHER HIGHER NONE	LOWER LOWER NONE
Severn Estuary	72,828	**CU**, **DN**, **GV**, **L.**, **RK**, RP, WM BS, EW, GA, MA, **PO**, **PT**, **SU**, SV, **T.**, **TU**, **WN** -	-6.89	-17.41	HIGHER HIGHER -	HIGHER HIGHER -

Table 1 Continued.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5]	
					Past	Current
Skokholm & Skomer		- - LB, MX, TM	No known discharges within SPA		- - NONE	- - NONE
Solent & Southampton Water	47,983 [d]	**BW**, **CU**, **DN**, **GV**, **L.**, **RK**, RP **DB**, GA, **PT**, RM, **SU**, SV, **T.**, **WN** AF, CA, CN, GG, LG, MU, RS, TE	-7.22	-0.04	HIGHER HIGHER NONE	LOWER LOWER NONE
Stour & Orwell Estuaries	68,111	**BW**, **CU**, **DN**, **GV**, **KN**, **L.**, **OC**, **RK**, RP, **TT** **DB**, **GN**, **PT**, **SU**, **WN** CA, GG	-7.21	-0.03	HIGHER HIGHER NONE	LOWER LOWER NONE
Tamar Estuaries Complex	[f]	**AV** - ET	-6.10	-0.12	HIGHER - NONE	LOWER - NONE
Teesmouth & Cleveland Coast	33,483	**KN**, **L.**, **RK**, RP, SS **SU** AF, CA, TE	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE
Thames Estuary & Marshes	156,425 [a]	**AV**, **BW**, **DN**, **GV**, **L.**, **RK**, RP, WM EW, GA, **PT**, **SU**, SV LG	-4.74	0	HIGHER HIGHER NONE	NONE NONE NONE
Thanet Coast & Sandwich Bay	8,982 [e]	**TT** - -	-9.70	-0.54	HIGHER - -	LOWER - -
The Dee Estuary	121,954	**BA**, **BW**, **CU**, **DN**, **GV**, **KN**, **L.**, **OC**, **RK**, SS MA, **PT**, **SU**, **T.**, **WN** AF, CA, CN, TE	-0.18	-0.37	LOWER LOWER NONE	LOWER LOWER NONE

Table 1 Continued.

SPA Name[1]	Waterbird Population[2]	Species[3]	BOD Change 1990-2000 (t/day)[4]	BOD Change 2000-2005 (t/day)[4]	Assessment of Risk[5]	
					Past	Current
The Swale	81,801	**AV**, **BA**, **BW**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP **DB**, EW, GA, **PT**, **SU**, SV, **T.**, **WN** CA, LG, MU	No known discharges within SPA		NONE NONE NONE	NONE NONE NONE
The Wash	322,964	**AV**, **BA**, **BW**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP, SS, **TT**, WM BS, **DB**, EW, **GN**, MA, PG, **PT**, **SU**, **WN**, WS AF, CA, CN, LG	?	-0.13	UNKNOWN UNKNOWN NONE	LOWER LOWER NONE
Traeth Lafan / Lavan Sands, Conway Bay	11,524	**OC** - -	?	-0.01	UNKNOWN - -	LOWER - -
Upper Solway Flats & Marshes	148,775	**BA**, **CU**, **DN**, GP, **GV**, **KN**, **L.**, **OC**, **RK**, RP BY, **GN**, MA, PG, **PT**, **SP**, **SU**, WS CA, GG	?	0	UNKNOWN UNKNOWN NONE	NONE NONE NONE
Ynys Feurig, Cemlyn Bay & The Skerries	[f]	- - AF, CN, RS, TE	No known discharges within SPA		- - NONE	- - NONE
Ynys Seiriol / Puffin Island	[f]	- - CA	No known discharges within SPA		- - NONE	- - NONE

Table 1 Continued.

Notes to Table 1:

1. The table only includes coastal SPAs designated for waterbirds and seabirds.

2. Data on waterbird (grebe, cormorant, heron, wildfowl and wader) populations using SPAs are taken from the 1999-2000 report of the Wetland Bird Survey (WeBS) (Musgrove *et al.* 2001) and are averages of peak counts for the winters of 1995-96 to 1999-2000. Although the boundaries of the areas surveyed by the WeBS do not always precisely match those of the SPAs, these figures provide a good indication of the waterbird populations using most sites. The following exceptions should be noted, however:

   a The waterbird population is given for the Thames Estuary as a whole, which includes the Benfleet & Southend Marshes SPA, Foulness SPA & Thames Estuary & Marshes SPA.
   b The waterbird population given for the Breydon Water SPA also includes data from Berney Marshes.
   c The waterbird population is given for the Mersey Estuary as a whole, which includes both the Mersey Estuary SPA and Mersey Narrows & North Wirral Foreshore SPA.
   d The waterbird population given for the Solent & Southampton Water SPA excludes data for the Isle of Wight (as these are not provided in Musgrove *et al.* 2001).
   e The waterbird population given for the Thanet Coast & Sandwich Bay SPA excludes data for Sandwich Bay (as these are not provided in Musgrove *et al.* 2001).
   f These sites hold relatively small populations of waterbirds; no figures are provided in Musgrove *et al.* (2001).

3. Species are listed for each SPA in three groupings:

   First Row – Waders
   Second Row – Wildfowl
   Third Row – Other Waterbirds and Seabirds

   AE = Arctic Tern *Sterna paradisaea*, AF = Little Tern *Sterna albifrons*, AV = Avocet *Recurvirostra avosetta*, BA = Bar-tailed Godwit *Limosa lapponica*, BH = Black-headed Gull *Larus ridibundus*, BI = Bittern *Botaurus stellaris*, BS = Bewick's Swan *Cygnus columbianus*, BW = Black-tailed Godwit *Limosa limosa*, BY = Barnacle Goose *Branta leucopsis*, CA = Cormorant *Phalacrocorax carbo*, CN = Common Tern *Sterna hirundo*, CO = Coot *Fulica atra*, CU = Curlew *Numenius arquata*, CX = Common Scoter *Melanitta nigra*, DB = Dark-bellied Brent Goose *Branta bernicla bernicla*, DN = Dunlin *Calidris alpina*, E. = Eider *Somateria mollissima*, ET = Little Egret *Egretta garzetta*, EW = European White-fronted Goose *Anser albifrons*, GA = Gadwall *Anas strepera*, GB = Great Black-backed Gull *Larus marinus*, GD = Goosander *Mergus merganser*, GG = Great Crested Grebe *Podiceps cristatus*, GJ = Greylag Goose *Anser anser*, GN = Goldeneye *Bucephala clangula*, GP = Golden Plover *Pluvialis apricaria*, GU = Guillemot *Uria aalge*, GV = Grey Plover *Pluvialis squatarola*, GX = Gannet *Morus bassanus*, HG = Herring Gull *Larus argentatus*, KI = Kittiwake *Rissa tridactyla*, KN = Knot *Calidris canutus*, L. = Lapwing *Vanellus vanellus*, LB = Lesser Black-backed Gull *Larus fuscus*, LG = Little Grebe *Tachybaptus ruficollis*, MA= Mallard *Anas platyrhynchos*, MS = Mute Swan *Cygnus olor*, MU = Mediterranean Gull *Larus melanocephalus*, MX = Manx Shearwater *Puffinus puffinus*, OC = Oystercatcher *Haematopus ostralegus*, PB = Light-bellied Brent Goose *Branta bernicla hrota*, PG = Pink-footed Goose *Anser brachyryhnchus*, PO = Pochard *Aythya ferina*, PS = Purple Sandpiper *Calidris maritima*, PT = Pintail *Anas acuta*, PU = Puffin *Fratercula artica*, RA = Razorbill *Alca torda*, RK = Redshank *Tringa totanus*, RM = Red-breasted Merganser *Mergus serrator*, RP = Ringed Plover *Charadrius hiaticula*, RS = Roseate Tern *Sterna dougallii*, RU = Ruff *Philomachus pugnax*, SA = Shag *Phalacrocorax aristotelis*, SP =

Scaup *Aythya marila*, SS = Sanderling *Calidris alba*, SU = Shelduck *Tadorna tadorna*, SV = Shoveler *Anas clypeata*, SZ = Slavonian Grebe *Podiceps auritus*, T. = Teal *Anas crecca*, TE = Sandwich Tern *Sterna sandvicensis*, TM = Storm Petrel *Hydrobates pelagicus*, TT = Turnstone *Arenaria interpres*, TU = Tufted Duck *Aythya fuligula*, VS = Velvet Scoter *Melanitta fusca*, WM = Whimbrel *Numenius phaeopus*, WN = Wigeon *Anas penelope*, WS = Whooper Swan *Cygnus cygnus*.

Species highlighted in bold are those that studies have shown may benefit from the food resources associated with waste water discharges and that, therefore, are potentially at risk from the implementation of the Urban Waste Water Treatment Directive (UWWTD) (see Burton *et al.* 2002).

4. Changes in Biochemical Oxygen Demand (BOD) loads between 2000 and 2005 were calculated from current (2000) and future (2005) consented flows and the current and future BOD consent. In many cases no numerical BOD consent was available. In those cases a value was assumed that is related to the current and future level of treatment. For crude discharges a value of 400 mg/l was assumed, while for primary and secondary treatment, respective discharge BOD concentrations of 260 and 100 mg/l were assumed. These values correspond to the percent reductions during different treatment stages quoted in Table 3.1 of Burton *et al.* (2002). The crude discharge concentration is based on an assumed BOD mass load of 82 g/head/day (see Table 3.1 of Burton *et al.* 2002) and an average water consumption of 180 l/day. In many cases, consented flows were only specified for the new consent. In those cases, it was assumed that the future consented flow is equal to the past consented flow. The changes in BOD loads between 1990 and 2000 were calculated in a similar way. However, population equivalents and an assumed daily consumption of 180 l were used to estimate flows.

It should be noted that these load estimates are mostly crude guesses and that there were large gaps in the data available for this exercise, especially for the load estimates relating to the period 1990-2000. Also, consents do not necessarily reflect the actual loads that come from an outfall, although they may be used as an indicator if, as in this case, performance data are unavailable. Population equivalents, too, are a crude measure of the discharge. They are based on short-term measurements of the inflow and an assumed daily consumption per head of 180 l. Generally, load estimates are capable of indicating major changes, but individual values should not be over-interpreted.

5. **Assessment of Past (1990-2000) and Current (2000-2005) Risk to Waterbirds and Seabirds.**
NONE – either there are no changes to the BOD load from discharges within the SPA, or there are no known discharges within the SPA, or those species for which the SPA is designated are not included amongst those potentially at risk from the implementation of the UWWTD.
LOWER – change in BOD load of less than 1 t/day (i.e. a relative low change in BOD load) and the species for which the SPA is designated are amongst those potentially at risk from the implementation of the UWWTD.
HIGHER – change in BOD load equal to or greater than 1 t/day (i.e. a relative high change in BOD load) and the species for which the SPA is designated are amongst those potentially at risk from the implementation of the UWWTD.
UNKNOWN – there are discharges within the SPA, but the change in BOD load is not known and species for which the SPA is designated are amongst those potentially at risk from the implementation of the UWWTD.