Chichester District Council

Chichester District Council Water Quality Assessment

Final Report

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Amec Foster Wheeler Environment
& Infrastructure UK Limited

Report for

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Contents

Glossary

ASP	Activated Sludge Process
BAT	Best Available Technology
BOD	Biological Oxygen Demand
BC	Borough Council
dpa	dwellings per annum
GES	Good Ecological Status
IFAS	Integrated fixed-film activated sludge
m^2	Square metres
mg/l	Milligrams per litre
Ml/d	Megalitres per day
MLE	Modified Ludzack-Ettinger
P	Phosphorous
RQP	River Quality Planning Tool
RBMP	River Basin Management Plan
SIMCAT	Environment Agency water quality model
WFD	Water Framework Directive
WQA	Water Quality Assessment
WwTW	Wastewater Treatment Works

Summary

Chichester District Council ("the Council") are required to develop and maintain a Local Plan outlining how sustainable growth will be achieved, taking into account (inter alia):

- Population growth and associated housing needs; and
- Increased transport, power and infrastructure growth.

The Local Plan, which should be consistent with the National Planning Policy Framework (NPPF), must be underpinned by a sound evidence base that identifies potential risks to the water environment from future growth, and appropriate mitigation of those risks.

The Local Plan identifies a number of growth areas which are currently served by nine Wastewater Treatment Works (WwTWs) located at Apuldram (Chichester), Bosham, Kirdford, Loxwood, Pagham, Sidlesham, Tangmere, Thornham and Wisborough Green. This report describes the outcomes of a water quality assessment supported by modelling work to estimate the potential impact of increased discharge volumes from these WwTWs on water quality in the receiving waterbodies. Specifically, the modelling work considers:

- The impacts on water quality in receiving watercourses (no new modelling was undertaken for coastal waters) from future housing growth downstream of the nine WwTWs (i.e. from increases in discharges of treated sewage effluent from 2015 onwards);
- If that future housing growth will impact on Water Framework Directive (WFD) environmental objectives of the receiving waterbodies which are:
  - No Deterioration in class of any element.
  - Ensuring that the WFD waterbodies will achieve the 2027 objectives as set out in the 2015 RBMPs.
  - Limiting in class deterioration to less than a 10% deterioration threshold from current conditions (an aspirational objective set by the Environment Agency).
- What the potential future discharge permit standards from the WwTWs will need to be to reverse potential deterioration in downstream river quality; and
- Identify if there are any cumulative impacts from increases in discharges from WwTWs within the same catchment.
- Whether the future housing growth would impact on the conservation status or condition of designated sites, specifically Special Area of Conservation (SACs) and Special Protection Areas (SPAs), Ramsar sites, Marine Conservation Zones (MCZ) and Sites of Special Scientific Interest (SSSI).

This report sets out the evidence for the water environment with regards to 13 points set out by the Council, specifically:

- Assessment of current requirements at the WwTWs in the Local Plan Area and potential improvement opportunities in light of advances in available technology and emerging standards;
- The environmental capacity of all WwTWs' receiving waters, when assessing necessary improvements to expand capacity to at least 2036. Environmental capacity also needs to be considered with regards to possible impacts on improvement works at treatment facilities, new facilities, pipelines or other options that may impact any designated site;
- The allowable phosphorous load and the associated likely limits on the volume of wastewater that can be discharged at a given site and hence the viability of a chosen option. Some of the WwTWs servicing the Local Plan area may require upgraded phosphorous permits in order to meet the requirements of the WFD;

- The impact of large scale growth on the sewer network capacity and the need for strategic enhancements to this capacity;
- A review of the methodology currently used for assessing the estimated remaining headroom at WwTW (DWF calculations), research of other methods and evidence for alternatives that could provide a more robust output;
- A review of the estimated headroom figures for Apuldram WwTW and through remodelling assess whether there is further capacity;
- Natural disturbance, impact on the water network and flooding, planning permission feasibility, cost and Ofwat funding cycles, as part of the assessment of viable options. All options proposed must be supported by evidence that they can be delivered and given a timeframe for delivery;
- A risk assessment of whether the options proposed will come forward as anticipated, if funding were available. Opportunities for overcoming constraints to delivering options are considered as part of the risk assessment;
- All the options considered will be shown, even if, after investigation, they are considered unsuitable.
- Alternatives and improvement opportunities within or close to the Local Plan Area will be considered;
- Investigate demonstrably deliverable ways of dealing with wastewater treatment capacity limitations. Innovative solutions may be considered provided that delivery is demonstrated to be achievable;
- Ensure that relevant agencies and organisations such as the Environment Agency, Southern Water, Natural England, Chichester Harbour Conservancy, Crown Estates, Local Planning Authorities, Marine Management Organisation, as well as any others considered applicable, are consulted when assessing options; and
- Provide robust evidence to inform the decision making process for the Review of the Local Plan. It will be a key piece of evidence for the examination of the plan and the options for improvement works therefore need to be agreed as being viable future options by the Environment Agency, Southern Water and Natural England.

In addition to the above objectives the water quality assessment identified relevant protected areas and designated sites which could be impacted by changes in water quality caused by future housing growth. This included sites such as European sites, bathing waters, shellfish waters and Ramsar sites.

The assessment included examined nine different sized WwTWs. Based on the modelling results for rivers and assessments using EA source apportionment data, the water quality assessment found that the projected housing growth should not lead to any deterioration in WFD class downstream of any of the nine works, but there is a predicted deterioration in water quality of more than 10% downstream of the works at Kirdford and Tangmere. Mitigation against this predicted deterioration will be required, and indicative estimates are provided of the improvements in effluent quality that would be needed to prevent this deterioration.

Modelling could not be undertaken for coastal waters, and in these cases the assessment of impacts was based on the calculated increase in Dry Weather Flow from each works due to housing growth and an assumption of no change in effluent quality. The calculated increase in nutrient loadings was then assessed in the context of the overall nutrient loadings to coastal waters. It is noted that further work will be required as part of a Habitats Regulations Assessment where these increased nutrient loadings could impact protected areas and designated sites.

The WwTWs discharge volumes range in size from 165 to 13,524 m^3/d, and their scale of impact will vary accordingly. A review of headroom capacity for increases in sewage effluent at each WwTW, based on permitted discharge volume and measured Dry Weather Flow, indicated that all works except Apuldram will require either a new permit or a physical upgrade at some point during the period of the Local Plan. A

similar review of capacity of the sewer networks indicated that there are few identified sewage pollution incidents recorded on national databases at the nine WwTW catchments, as well as anecdotal evidence of sewage spills, particularly at Apuldram and Bosham, and data from Southern Water indicate that storm tanks discharge to the environment relatively frequently at Apuldram and Loxwood. Sewer capacity is likely to be a constraint in some catchments and detailed studies are likely to be required once the details of the proposed housing developments are identified.

In addition, mitigation against increased nitrate loading into Chichester Harbour (part of the Solent Maritime SAC, and the Solent and Chichester and Langstone Harbours SPA and Ramsar site, and Chichester Harbour SSSI) from the WwTWs at Apuldram, Thornham and Bosham will also be required to protect this designated area. It should be noted that there is already a problem with nitrogen loading into the coastal waters impacting on WFD water bodies and designated habitats e.g. in Chichester Harbour. This report aimed to provide evidence on how to mitigate against the impacts of future housing growth in the context of current water quality problems that must be resolved as well. Additionally the evidence set out in this report indicates that there could be increased risk to protected areas such as bathing waters and shellfish waters from limited capacity in sewer networks and increases in storm related overflows due to limitations in capacity at treatment works. These will need to be addressed in order to protect these areas.

A review of the types of measures and likelihood of their implementation within the timeframe of the Local Plan indicated that measures to improve the quality of effluent are the most reliable, in terms of ease of delivery, funding options and confidence in outcomes. Measures such as catchment management have a lower level of certainty in funding and the improvements they will generate. In order to support growth within the lifetime of the local plan it is recommended that 'end of pipe' solutions are employed to prevent deterioration in the short term, in conjunction with a programme of catchment management and water efficiency measures to support sustainable growth in the longer term.

A summary of the key results is provided in tables 1 and 2 below.

Table 2 is colour coded indicating the perceived risk of failure of delivery of the improvements identified, according to the criteria shown in Figure 1.

Figure 1 Risk matrix for the potential delivery of measures to support future housing growth

		Funding		
Delivery		Set funding streams and processes in place (e.g. water companies NEP)	Potential funding streams	No confirmed funding stream or uncertainty
	Mitigation and improvements can be delivered within the local plan timescale	LOW	LOW	MEDIUM
	Unlikely that the mitigation and\or improvements can be delivered within the local plan timescale	LOW	MEDIUM	HIGH
	Unlikely that the mitigation and\or improvements can be delivered within the local plan timescale	MEDIUM	HIGH	HIGH

Table 1 Outcomes of assessments for the nine WwTWs and WFD water bodies. (Y = a problem to be addressed to support future housing growth).

WwTW	Receiving waterbody	Consent limit (m3/d)	Habitats	Deterioration (WFD class)*	Deterioration (10% threshold)	WwTW Capacity constraint	Sewerage network constraint	Mitigation required (permits)	Optimum solution for WwTW upgrades
Apuldram (Chichester)	Chichester Harbour GB580705210000	13524	Y	n/a[1]	n/a	Y	Y	Y[3]	Modify/extend ASP-MLE to IFAS-MLE for additional capacity; extend with denitrifying sand filters with external COD (methanol) dosing to achieve lower TN
Bosham	Chichester Harbour GB580705210000	1221	Y	n/a[1]	n/a	Y	N	Y[3]	Extend Biofilter (nitrifying) and denitrifying sand filters with additional capacity; enhance denitrification with additional external COD (methanol) dosing to achieve lower TN
Kirdford	Kird GB107041012300	165	N	N	Y	Y	N	Y	Extend Biofilter (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction.
Loxwood	Loxwood Stream GB107041017970	767	N	N	N	Y	Y	N	N/A
Pagham	Pagham Rife GB107041012880	2309	Y	N	Y	Y	N	Y	Extend Biofilter (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction.
Sidlesham	Broad Rife GB107041006580	5800	Y	N	N	Y	Y	N	N/A
Tangmere	Aldingbourne Rife GB107041011980	3000	Y	N	Y	Y	N	Y[2]	Rebuild with nitrifying activated sludge MBR for additional capacity and achieve extremely low BOD; incorporate ferric (iron) dosing for chemical phosphorus reduction to achieve very low TP.
Thornham	Chichester Harbour GB580705210000	6565	Y	n/a[1]	n/a	Y	N	Y[3]	Modify/extend activated sludge (nitrifying) with IFAS for additional capacity and extend denitrifying sand filters with additional capacity; and enhance denitrification to achieve lower TN.
Wisborough Green	Kird GB107041012300	324	N	N	N	Y	N	N	N/A

1. For discharges to coastal waters the focus was on ensuring growth had a neutral impact rather than specifically focussing on No Deterioration in WFD class
2. This is based on ensuring there is enough treatment capacity in the future, although the EA have indicated that it should not be required.
3. Mitigation may be required against increased nitrogen loading to Chichester Harbour.

Table 2 Summary of timescales for required improvements to WwTW to ensure compliance with objectives along with risks of failing

WwTW	Main WFD Catchment	Relevant downstream catchment and Designated area	Indicative required permit	Catchment solutions[1]	By 2020 (End AMP 6)	By 2025 (End AMP 7)	By 2030 (End AMP 8)[2]
Apuldram (Chichester)	Chichester Harbour	Chichester Harbour SSSI; Solent Maritime SAC; Solent and Chichester and Langstone Harbours SPA	Nitrogen permit may be required	Recommended for nitrate (high) Water efficiency measures	Sewer network upgrade (medium)		nitrate (low)
Bosham	Chichester Harbour	Chichester Harbour SSSI; Solent Maritime SAC; Solent and Chichester and Langstone Harbours SPA	Nitrogen permit may be required	Recommended for nitrate (high) Water efficiency measures		WwTW capacity upgrade (medium)	nitrate (low)
Kirdford	River Kird	Arun (u/s of Pallingham)	Phosphate 3mg/l	Recommended for phosphate (high) Water efficiency measures		WwTW capacity upgrade (medium) phosphate (low)	
Loxwood	Loxwood Chidding	Arun (u/s of Pallingham)	N/A	Water efficiency measures		WwTW capacity upgrade (medium)	
Pagham	Pagham Rife	Pagham Harbour SSSI & SPA	Phosphate 2mg/l	Water efficiency measures	Phosphate	Phosphate (low)	WwTW capacity upgrade (medium)
Sidlesham	Broad Rife	Pagham Harbour SSSI & SPA	N/A	Water efficiency measures		WwTW capacity upgrade (medium)	
Tangmere	Aldingbourne Rife	Sussex TraCs	Phosphate 0.6mg/l	Water efficiency measures	BOD[3]		WwTW capacity upgrade (low) phosphate (low)
Thornham	Chichester Harbour	Chichester Harbour SSSI; Solent Maritime SAC; Solent and Chichester and Langstone Harbours SPA	Nitrogen permit may be required	Recommended for nitrate (high) Water efficiency measures		WwTW capacity upgrade (medium)	nitrate (low)
Wisborough Green	River Kird	Arun (u/s of Pallingham)	N/A	Water efficiency measures			WwTW capacity upgrade (medium)

1 Due to the nature of catchment solutions it is recommended that they commence as soon as possible to ensure achieving the required levels of reduction.
2 Schemes needed by 2036 have been put against 2030 in order to ensure they are in place before the end of the Local Plans
3 Noted although EA indicate it should not be required based on recent work they have undertaken

1. Introduction

This section provides an overview of drivers for the Water Quality Assessment.

1.1 Purpose of the Water Quality Assessment

1.1.1 Chichester District Council (CDC) are currently compiling an evidence base which will inform a review of the Local Plan, intended for adoption in 2020. This Wastewater Treatment Works Study will contribute towards the evidence base, by highlighting potential options for future wastewater treatment which would enable growth in the Local Plan area and support CDC in their Habitats Regulations Assessment (HRA).

1.1.2 The purpose of this Water Quality Assessment (WQA) is to understand the potential environmental impact of phosphate, ammonia and Dissolved Oxygen from proposed future housing growth within the Chichester District Council area, and associated increases in wastewater production, on the receiving waters which receive discharges of treated sewage effluent from Wastewater Treatment Works (WwTWs). Nine WwTWs were identified as serving the identified growth areas within the Local Plan: Apuldram (Chichester), Bosham, Kirdford, Loxwood, Pagham, Sidlesham, Tangmere, Thornham and Wisborough Green (Figure 1.1).

1.1.3 Any impacts are to be investigated in line with the objectives of the Water Framework Directive (WFD) (2000/60/EC). The WFD is a key directive that seeks to protect and improve the water environment and its ecology. Its overarching aim is to prevent deterioration in the status of water bodies and to achieve 'Good Status' for rivers, lakes, transitional and coastal waters, and groundwater by no later than 2027. This includes:

- Protecting all forms of water (inland, surface, transitional, coastal and ground);
- Restoring the ecosystems supported by these bodies of water; and
- Reducing pollution in water bodies.

1.1.4 Along with the above WFD objectives, the WQA was based on guidance from the Environment Agency (Solent and South Downs Area) and the Water Cycle Study Guidance and Requirements (Environment Agency, November 2015).

1.1.5 The evidence base should also be sufficient to underpin (for effluent impacts from growth) CDC's :

- Assessment of its local plan under Conservation of Habitats and Species Regulations, 2017,
- Sustainability appraisal with regards to their obligations to conserve and enhance SSSIs under the Wildlife and countryside Act,1981, as amended.
- Sustainability appraisal with regards to their obligations to priority habitats and species under the Natural Environment and Rural Communities Act, 2006
- Sustainability appraisal with regards to their obligations to MCZs under Marine and Coastal Access Act (2009)

1.2 Aims and objectives

1.2.1 In agreement with the Environment Agency a number of objectives were set for the WQA, as follows:

- Review the treatment technologies currently in place at the nine WwTWs, and whether improvements in water quality can be achieved through changes in treatment processes;

- To identify the potential impacts of future housing growth on water quality in receiving watercourses[1] downstream of the nine identified WwTWs (i.e. from increases in discharges of treated sewage effluent from 2015 onwards);
- Clarify if future housing growth will impact on the WFD objectives for phosphate, ammonia and BOD (a proxy for Dissolved Oxygen) to:
  - Ensure No Deterioration in WFD class of any element;
  - Ensure the WFD water bodies can achieve the 2027 objectives as set out in the 2015 River Basin Management Plans (RBMPs);
  - Limit in-class deterioration to less than 10% (an aspirational objective set by the Environment Agency).
- Where necessary, model potential future discharge permit standards from the WwTWs to reverse potential deterioration in downstream river quality;
- Assess any potential impacts of housing growth on sewer network capacity;
- Identify if there are any cumulative impacts from increases in discharges from multiple WwTWs within the same catchment; and
- Provide estimates of changes in nutrient loadings in relation to conservation sites (e.g. Natura 2000 sites) to clarify if future housing growth could affect the condition or undermine the recovery of designated sites.
- Provide evidence for CDC to assess if increased effluent from growth will have a likely significant effect on any European or Ramsar sites both alone and in combination.

[1] No new modelling was undertaken for coastal waters.

1.3 Local Plan and the potential growth areas

1.1.1 The Local Plan covers the Chichester District outside the South Downs National Park (SDNP). The South Downs National Park Authority is preparing a separate local plan for the entire National Park and has commissioned a separate evidence base.

1.1.2 The Chichester Local Plan therefore covers two areas: one area to the north of the SDNP including Plaistow, Loxwood, Kirdford and Wisborough Green; and a further area to the south of SDNP extending from Westbourne in the west to Boxgrove in the east, and south to the coast between West Wittering and Selsey (Figure 1.1).

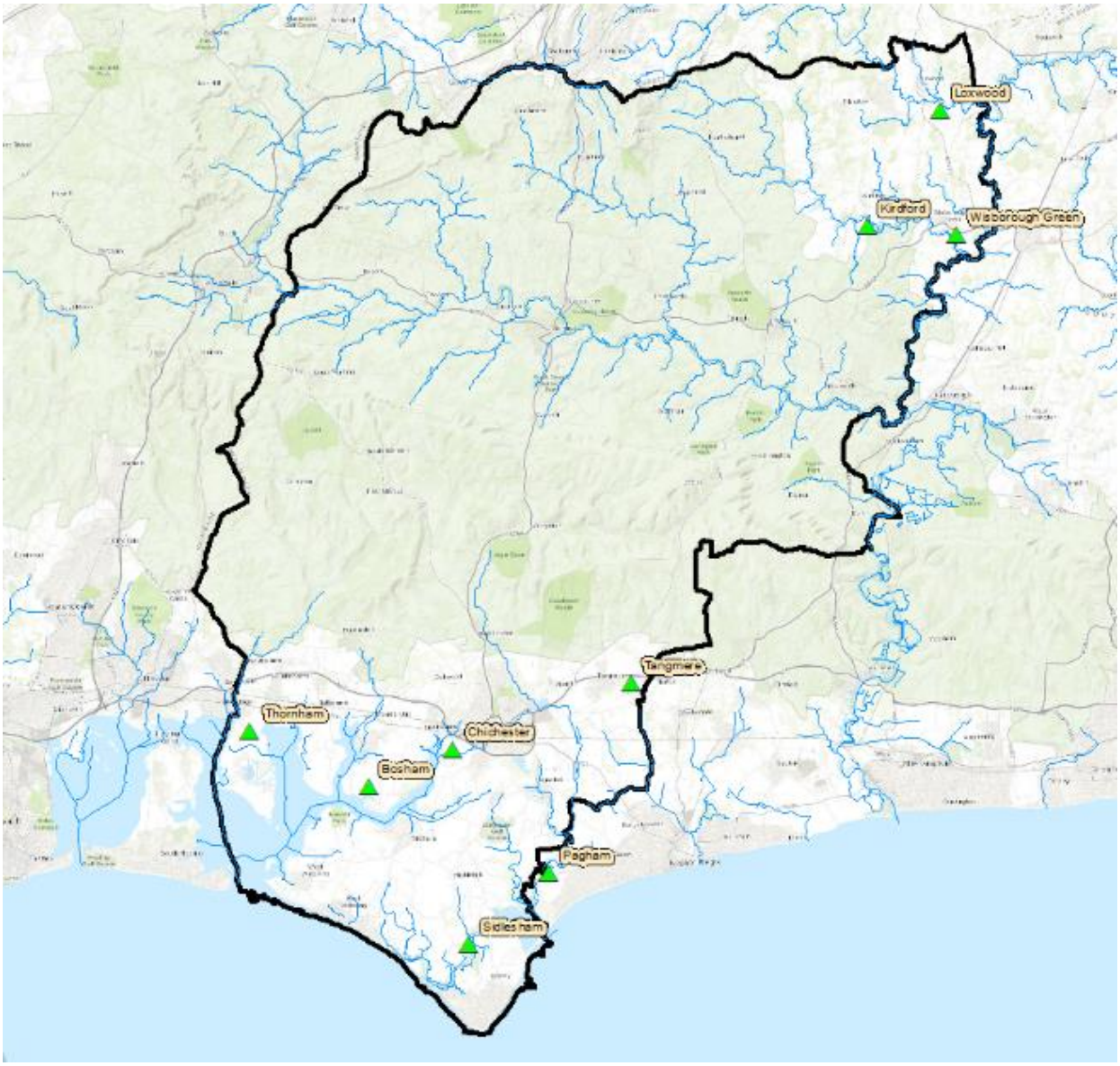
1.1.3 At this early stage there is little information available about the locations or magnitudes of future housing developments. However, a projection of increases in household numbers was provided by the Council. Based on these numbers this assessment therefore considers nine WwTWs that serve areas that fall within the Chichester Local Plan area, and which Chichester District Council have identified as potential "growth areas". These works, and the settlements they serve are as shown in Table 1.1.

Table 1.1 WwTWs included in this assessment, and the settlements they serve

WwTW	Settlements in Chichester District
Apuldram (Chichester)	Chichester Stockbridge Fishbourne
Bosham	Broadbridge and Bosham
Kirdford	Kirdford
Loxwood	Loxwood
Pagham	Hunston North Mundham
Sidlesham	East Wittering/Bracklesham Selsey Birdham West Wittering
Tangmere	East of Chichester/Shopwhyke Area Oving Tangmere Boxgrove Westhampnett
Thornham	Southbourne Hambrook/Nutbourne area
Wisborough Green	Wisborough Green

Data supplied by Chichester District Council

Figure 1.1 Chichester District Council Area and the nine Wastewater Treatment works reviewed in this WQ assessment



2. Water Quality Assessments

This section summarises the data, methods and results for the Water Quality Assessments for the nine WwTWs within the Chichester District Local Plan area.

2.1 Overview

2.1.1 The Water Quality Assessment (WQA) comprises the following steps:

- Data collation and review;
- Setting baseline water quality;
- Specifying the growth scenarios;
- Modelling the water quality impact of future housing growth on the receiving watercourses; and
- Modelling any new environmental permit standards that might be required to support growth.

2.1.2 Growth plans were supplied by Chichester District Council which provided current populations and projected population growth data for settlements within the Local Plan area. From these data, the nine WwTWs that serve the potential growth areas were identified for assessment.

2.1.3 The SIMCAT model was used to simulate current (baseline) and future projected water quality in all non-coastal receiving WFD water bodies (i.e. all water bodies downstream of one or more of the nine WwTW discharges). The use of this tool allowed for assessments of length of river impacted as well.

2.1.4 Where a deterioration in WFD class was predicted or the deterioration in water quality exceeded 10% at the downstream point, the River Quality Planning tool (RQP) was used (a modelling tool used to calculate impacts or potential permits at the point of discharge). This enabled understanding of indicative consent requirements at the individual WwTWs to mitigate any impact. Further detail on these steps are described in the sections below, and assumptions and caveats used in the modelling are summarised.

2.1.5 For coastal and estuarine waterbodies, the increase in nitrogen loadings associated with housing growth was estimated and assessed qualitatively against WFD status and objectives, based on the calculated increase in Dry Weather Flow from each works due to housing growth and assuming no change in effluent quality. The calculated increase in pollutant loading was then assessed in the context of the overall pollutant loading to the receiving waterbody.

2.1.6 The assessment of impacts on the designated nature conservation sites is described in Section 3.

2.2 Assessment methodology

Previous study

2.2.1 A study was undertaken by MWH in 2010[2]. This assessed the impacts of housing growth based on data available at the time and looked a number of options that may offer a solution to treatment deficit, identified in the south of the district. As a result the report made recommendations on the viability and sustainability of each option, including four main options:

- Reduction of infiltration into the Chichester catchment

[2] http://www.chichester.gov.uk/CHttpHandler.ashx?id=10619

- Reduce consumption of water by existing and new customers
- Transfer flows from Chichester to an alternative discharge location
- Treat wastewater to standards more stringent than those which can currently be achieved using Best Available Technology (BAT). (This has subsequently been replaced for phosphorous by the Technically Achievable Limit (TAL) of 0.25 mg/lP).

2.2.2 The report included reviews of Bosham, Chichester, Pagham, Sidlesham, Tangmere and Thornham WwTWs and included a range of options that could be implemented at the WwTWs which could support future housing growth.

2.2.3 The key findings of the report with regard to feasibility of treatment options are further discussed in Section 4.

Data collation

2.2.4 Data were supplied by Chichester District Council, the Environment Agency and Southern Water. Details of the various datasets used in the WQA are shown in Table 2.1.

2.2.5 All data sets were reviewed to ensure that information was complete and suitable (i.e. in a format that could be used in the modelling), before being converted to a format for use within the model. Where water quality sample data was not available existing model data from the Environment Agency's SIMCAT tool were used instead[3].

Table 2.1 Data sources used in the Water Quality Assessment

Data	Detail	Source
WwTW effluent quality data (2013-2015)	Current WwTW effluent quality (BOD, ammonia*, nitrate* and phosphate) discharged to receiving waters. For input to the SIMCAT and RQP modelling tools.	Environment Agency / Southern Water
WwTW flow data (2013-2015)	Current WwTW flows discharged to receiving waters. For input to the SIMCAT and RQP modelling tools.	Environment Agency
River quality data (2013-2015)	Current river quality (BOD, ammonia*, nitrate* and phosphate) in receiving waters upstream and downstream of WwTWs (where available). For input to the SIMCAT and RQP modelling tools.	Environment Agency
River flow data (2013-2015)	Current river flow in receiving waters upstream of WwTWs (where available). For input to the SIMCAT and RQP modelling tools.	Environment Agency
SIMCAT model (SSD catchment)	Water quality model for the Solent and South Downs Catchment, used to undertake the WQA	Environment Agency
WFD class boundaries	Pollutant concentrations that define the boundaries between WFD classes (high, good, moderate, poor, bad).	Environment Agency
Current and future projected housing numbers	Proposed future dwelling numbers in each potential growth area. For input to the SIMCAT and RQP modelling tools to understand potential discharge increase at WwTWs	Chichester District Council
Sewer network capacity	Pollution incident data and third party information to highlight where there is evidence of an issue. Storm tank discharge data.	Southern Water . Environment Agency / Chichester District Council
Designated site information	Condition tables, site maps, citations, conservation objectives and condition assessments	Natural England

* = ammonia and nitrate are chemically related. In the environment ammonium oxidises quickly to nitrate and so it is justified to consider ammonium-N as equivalent to nitrate-N in the environment.

[3] Any data gaps were filled based on guidance from the Environment Agency and are noted in the later sections.

Baseline data

2.2.6 This section provides a high level summary of the current conditions of the watercourses associated with the growth areas and their WwTWs.

2.2.7 The growth areas lie within seven WFD water bodies, in the South East River Basin District (RBD). As reported in the 2015 Cycle 2 RBMPs all of the water bodies are at less than Good Ecological Status (Table 2.2).

2.2.8 Table 2.3 shows the WFD standards for phosphorous that were used for sample points downstream of the WwTWs in the assessments when calculating any permits. Ammonia and BOD standards are the same for all sample points, and are shown in Table 2.4. Data were provided by the Environment Agency. No phosphate standards were provided for transitional and coastal waterbodies, and this includes Pagham Rife, although it is noted that Pagham WwTW discharges to a short freshwater watercourse which then flows into the harbour.

Table 2.2 Receiving water body for each WwTW, and associated WFD classifications for Surface Water Bodies (2015 Cycle[4])

WwTW	Receiving Water body	Overall water body status	Element(s) Not achieving Good Status	Element(s) at Good or High Status
Apuldram (Chichester)	Chichester Harbour GB580705210000	Moderate	Invertebrates, Macroalgae, Dissolved Inorganic Nitrogen	Phytoplankton, Dissolved Oxygen
Bosham	Chichester Harbour GB580705210000	Moderate	Invertebrates, Macroalgae, Dissolved Inorganic Nitrogen	Phytoplankton, Dissolved Oxygen
Kirdford	Kird GB107041012300	Poor	Invertebrates, Macrophytes and Phytobenthos, Dissolved Oxygen, Phosphate	Fish, Ammonia
Loxwood	Loxwood Stream GB107041017970	Poor	Macrophytes and Phytobenthos, Dissolved Oxygen, Phosphate	Fish, Invertebrates, Ammonia
Pagham	Pagham Rife GB107041012880	Moderate	Fish, Invertebrates, Dissolved Oxygen, Phosphate	Macrophytes and Phytobenthos, Ammonia
Sidlesham	Broad Rife GB107041006580	Bad	Invertebrates, Dissolved Oxygen, Phosphate	Ammonia
Tangmere	Aldingbourne Rife GB107041011980	Moderate	Fish, Invertebrates, Ammonia, Phosphate	Macrophytes and Phytobenthos, Dissolved Oxygen
Thornham	Chichester Harbour GB580705210000	Moderate	Invertebrates, Macroalgae, Dissolved Inorganic Nitrogen	Phytoplankton, Dissolved Oxygen
Wisborough Green	Kird GB107041012300	Poor	Invertebrates, Macrophytes and Phytobenthos, Dissolved Oxygen, Phosphate	Fish, Ammonia

[4] More information available on the Environment Agency's Catchment Data Explorer website - http://environment.data.gov.uk/catchment-planning/

Table 2.3 WFD phosphate water quality objectives (mg/l) for receiving water bodies

WwTW	Receiving Water body	High Standard	Good Standard	Moderate Standard	Poor Standard
Apuldram (Chichester)	Chichester Harbour GB580705210000	-	-	-	-
Bosham	Chichester Harbour GB580705210000	-	-	-	-
Kirdford	Kird GB107041012300	0.035	0.066	0.169	0.993
Loxwood	Loxwood Stream GB107041017970	0.03	0.058	0.152	0.95
Pagham	Pagham Rife GB107041012880	0.054	0.097	0.225	1.12
Sidlesham	Broad Rife GB107041006580	0.055	0.098	0.228	1.125
Tangmere	Aldingbourne Rife GB107041011980	0.053	0.095	0.223	1.114
Thornham	Chichester Harbour GB580705210000	-	-	-	-
Wisborough Green	Kird GB107041012300	0.035	0.066	0.169	0.993

Table 2.4 WFD ammonia and BOD water quality objectives (mg/l) for receiving water bodies.

Determinand	High Standard	Good Standard	Moderate Standard	Poor Standard
Ammonia (all sites)	0.3	0.6	1.1	2.5
BOD (Loxwood Stream GB107041017970)	3	4	6	7.5
BOD (all other sites)	4	5	6.5	9

2.2.9 European sites have conservation objectives and SSSIs have favourable condition tables which set objectives for achieving favourable condition. The objectives that are related to, or could be impacted by water quality, include[5]:

- Solent Maritime SAC - Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species.
- Pagham SPA (also a marine conservation zone) - Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features, and,
  - The distribution of the qualifying features within the site.
  - The distribution of qualifying species within the site.
- Chichester and Langstone Harbour SPA - Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features, and,
  - The distribution of the qualifying features within the site.
- Chichester Harbour SSSI – is part of the Chichester and Langstone Harbour SPA and has overlapping and additional objectives. SSSI condition tables and maps are included at Appendix D.
- The conservation objectives for Pagham MCZ are that the protected habitats:
  - are maintained in favourable condition if they are already in favourable condition.
  - be brought into favourable condition if they are not already in favourable condition.
- For each protected feature, favourable condition means that, within a zone:
  - its extent is stable or increasing.
  - its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or

[5] Information taken from Natural England's conservation objectives records available online at http://publications.naturalengland.org.uk/category/3212324

inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

- For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining:
  - the quality and quantity of its habitat.
  - the number, age and sex ratio of its population.

2.2.10 Additional sites located in Chichester area, although not directly included in this report include Solent and Dorset Coasts potential marine SPA, Upper Arun SSSI, Arun Valley SAC, SPA and Ramsar sites. These sites are subject to potential impacts from growth upstream of the study area and further work is needed to assess the potential cumulative impacts on them. The Solent and Dorset pm SPA has not yet been designated but overlaps with the marine conservation zone and Pagham Harbour. As such it is included in that part of this evidence base.

2.2.11 In line with the needs of supporting a full Habitats Regulations Assessment (HRA) this report used an approach which could support habitats assessments by indicating the scale of impacts from future growth. However, it is acknowledged that there are current issues in and additional unknowns about sources and in water processes for nitrogen that could impact on marine designated areas.

2.2.12 Other protected areas that could be impacted by water quality included:

- Bathing Waters – ten along the coastline reviewed in this study all at good or excellent. Without appropriate treatment they could be impacted by increases in effluent and associated discharges from future housing growth (treated and storm overflows).
- Shellfish waters – including Chichester Harbour, Langstone Harbour and Thornham Channel. Without appropriate treatment they could be impacted by increases in effluent and associated discharges from future housing growth (treated and storm overflows).

2.2.13 Baseline water quality data is provided in Appendix A. The following data were collated for each site:

- WwTW effluent quality and volume;
- River quality data from upstream and downstream of the WwTWs;
- SIMCAT estimates of river flow and quality where no other data was available; and
- Estimate of the increase in volume of effluent due to proposed housing growth.

2.2.14 A summary of baseline water quality data is shown in Table 2.5. Based on the volumes of effluent they treat the WwTWs ranged in size from 165 to 13,524 m^3/d. This range in sizes was relevant for assessments of impacts and the feasibility and scale of any mitigation required.

Table 2.5 Summary of mean baseline river water quality data for the period 2013-2015 used for the Simcat modelling.

WwTW	Sample point(s)	Ammoniacal Nitrogen (mg-N/l)	BOD (5 day ATU) (mg/l)	Reactive orthophosphate (mg-P/l)	Nitrate (mg-N/l)
Apuldram (Chichester)	F0003446	WwTW discharges to estuary or coastal waters (ii)			
Bosham	F0003378	WwTW discharges to estuary or coastal waters (ii)			
Kirdford	F0003059 (iii)	0.12		0.11 (i)	1.43
	F0003060 (iv)	1.18	6.91	4.11	12.7
Loxwood	F0003106 (iv)	0.6	5.2	0.03	13
	F0003111 (iv,v)	0.08		0.30	2.66
Pagham	G0006386	WwTW discharges to a small stretch of river before going to estuary or coastal waters (ii)			
Sidlesham	F0003357 (v)	0.47	3.71	0.46 (i)	9.54
	F0003358 (iv)	0.14	3.5	0.5	12
Tangmere	F0003328 (v)	0.21	1.93	1.81 (i)	16.39
Thornham	F0003415	WwTW discharges to estuary or coastal waters (ii)			
Wisborough Green	F0003057	0.12		0.11	1.43
	F0003056	0.08		0.57 (i)	4.42

i = Currently above WFD standards for Good Status

ii = Not included in SIMCAT model

iii = river sample point

iv = WwTW sample point

v = data taken from Simcat

Growth Scenarios

2.2.15 The Council provided projections of potential increases in numbers of households in each of the catchments served by the nine WwTWs. Potential economic development growth proposals were not considered. The projected increases in population are as shown in Table 2.6. In each case the upper end of each range of values was used in the modelling, representing a "worst case" scenario. These increases were applied in the modelling work as an annual growth rate in each catchment over the period of the Local Plan, to 2035/6.

2.2.16 Models were run for each period showing what the potential water quality impacts could be on the receiving watercourses by 2020, 2025, 2030 and 2036 in order to be able to link any required improvements to Southern Water's business plan cycles. The model results were assessed against the WFD objectives and the WQA objectives as set out in section 1.2.

Table 2.6 Projected increase in household numbers in each WwTW catchment

WwTW	Projected increase in households
Apuldram (Chichester)	1600 – 3000
Bosham	50 – 500
Kirdford	50 – 250
Loxwood	50 – 250
Pagham	100 – 500
Sidlesham	600 – 1000
Tangmere	2100 – 3000
Thornham	1000 – 1500
Wisborough Green	50 – 250

Use of SIMCAT and River Quality Planning (RQP) tool

2.2.17 For all of the WwTW discharging to inland waters, SIMCAT and RQP models were identified to be the most appropriate tool to undertake the modelling as they use Monte Carlo calculations[6]. This allows probable scenarios to be modelled when assessing future impacts. The SIMCAT model allows for more complex scenarios to be modelled e.g. catchments where either multiple WwTWs might interact or other sources or pollutants need to be accounted for. The RQP tool is more simplistic and can be used for modelling point source impacts of single discharges. By using both tools to model the impacts of the WwTW discharges on phosphate, ammonia and BOD concentrations in receiving watercourses different scales of impact may be assessed.

2.2.18 SIMCAT was used to model the potential water quality impacts of increased discharges of treated sewage effluent from the proposed future housing growth. This was done in order to account for upstream impacts from growth areas as well as impacts from individual WwTWs and to demonstrate the impact of increasing the discharge from a WwTW on both the receiving water and all downstream waterbodies. The RQP tool was used to model any indicative permit standards for individual WwTWs.

2.2.19 It is expected that any upgrade to the WwTWs would include increasing the capacity to mitigate any emergency discharges which could occur for example during storm events. However, these have not been modelled in this WQA as they are intermittent events and no volumetric data was

[6] A standard mathematical method used for probabilistic modelling.

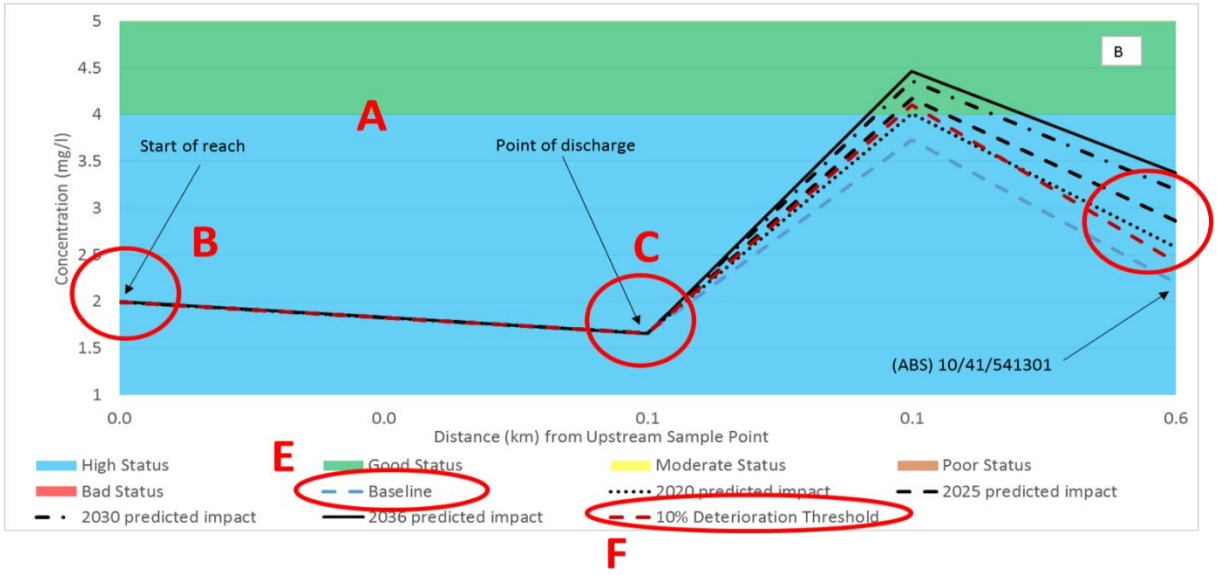
available. Additionally, the scale of their impact on long term WFD compliance is very uncertain[7]. Combined sewer overflow (CSO) spills will discharge nitrogen and phosphorous to the environment, however, albeit in a relatively dilute effluent.

Graphical representation of Results

2.2.20 To more easily assess the extent of water quality impacts due to increased discharges of treated sewage effluent to rivers caused by future housing growth, the model outputs from SIMCAT are provided in graphical format. The graphs were designed to show the potential impacts at the end of each period of housing growth, estimates of the length of river reach impacted, as well as showing whether the impacts would cause significant deterioration. Note that the distances shown on the x-axis are not to scale. Figure 2.1 shows an example of the graphs which specifically show:

- WFD class boundaries specific to the determinand and watercourse (marked as A);
- The upstream actual or estimated river quality (marked as B);
- The point and immediate impact of the WwTW discharge (marked as C);
- The downstream point used for the deterioration assessments (marked as D);
- The 2015 baseline set using current data from which the impact of increase in volume of treated effluent was modelled (marked as E);
- The results showing the level of impact of the increases in the treated effluent at the end of each growth period; and
- The 10% deterioration threshold, set based on the 2015 baseline and used as an aspirational target by the Environment Agency (marked as F).

Figure 2.1 Example graph showing SIMCAT model results.



2.2.21 If the future predictions of water quality (i.e. at 2020, 2025, 2030 and 2036 in Figure 2.1) were above the baseline, then potential deterioration was identified. However, it was only deemed to be significant if the results showed that at the downstream sample point, the predicted concentrations led to a change in WFD class or were greater than 10% above the baseline value. For example Figure 2.1 shows that although all future predictions show a deterioration from the baseline by the downstream point the waterbody would still be at High Status, and there is no deterioration. By

[7] Although it should be noted that they can increase the loading of nitrogen. However, without knowing what the loading would be or where it would settle after a storm event it is not known what, or where, an impact could be seen.

2026, however, the predictions indicate an exceedance of the 10% deterioration threshold, and therefore an indicative permit value would need to be calculated in order to show how to prevent the deterioration.

Assessment of sewer network capacity

2.2.22 A review of the potential capacity of the sewer networks related to the WwTWs was undertaken to clarify if there is any evidence of a lack of headroom in the network to support future housing growth or if upgrades will be required. As no details on specific housing sites were available and no drainage surveys had been undertaken the review was carried out at a strategic level to give an indication of issues. The review was based on the following:

- Data supplied by Southern Water on the frequency of storm tank discharges at the nine WwTWs being investigated;
- Environment Agency records of sewage related pollution incidents; and
- Any available third party information on issues.

2.2.23 The review aimed to identify any significant issues with the intention that developers and Southern Water will work together to identify any site specific constraints as and when developments are brought forward for construction.

2.2.24 Sewer network capacity can be impacted by flooding from surface water drainage and groundwater infiltration as well as increases in foul water. Whereas increases in foul water can be calculated it is more difficult to assess the potential increases in flows from rainfall events, particularly if there are combined sewers or if the sewer network is damaged and can therefore receive inputs from groundwater. EA flood maps[8] indicate that the main areas at risk of flooding from surface waters are limited to the land in the river corridors and along the coastal areas (e.g. harbours).

Calculations for designated sites

2.2.25 The results were set out in order to help support the HRA for the Chichester Local Plan. Discharges to coastal waters were reviewed based on predicted increases in loadings and the condition or class of the waters. The increase in loading was calculated and then assessed against the estimated overall loading to the waterbody (information provided by the Environment Agency) to provide an assessment of where the increase in loading (at waterbody scale) could have impacts on designated sites. However, given the small scale of some of the designated sites it is not possible to assess potential impacts at site scale with the information available, and further work in this regard will be required as part of the HRA.

Options assessments

2.2.26 If the models or assessments indicated that mitigation might be required at a WwTW, a high level assessment of potential options was investigated. This entailed looking at treatment and upgrade options for the individual WwTWs, options for the sewer networks and highlighting the justification for recommended optimum solutions as well as the reasoning behind not pursuing other options.

Assumptions and caveats for all water quality assessments

2.2.27 A number of assumptions and caveats have been identified and used when undertaking the water quality modelling work. These were based on standard approaches to water quality assessment in the UK and help to improve the confidence in the predictions, whilst providing a precautionary approach due to uncertainties in data (e.g. number of people who will eventually live in the dwellings). The assumptions and caveats are:

[8] https://flood-map-for-planning.service.gov.uk

- A single dwelling has an occupancy of 5 people (this follows national guidance but represents a worst-case scenario compared to the national average of 2.5)[9]
- 150l /per person/per day residential waste water flow loading to a WwTW[10] (e.g. based on 5 people this would mean 750 l per house per day);
- There has been no consideration of future climate change within the modelling. Climate change may cause reductions in flows in inland surface waters, leading to increased pollutant concentrations, and this requires further investigation;
- The water quality modelling was based on predicted flow estimates for growth on top of current mean discharge volume irrespective of the WwTW Dry Weather Flow (DWF) permit (i.e. the volume of effluent going to the works during dry conditions). It is assumed that the permitted DWF will be increased in line with growth predictions and other required permit changes based on the model results and upgrades to wastewater treatment works;
- Future impacts were assessed based on the current quality of effluent the WwTWs produce (e.g. a baseline set using 2013-2015 data) as set out in Appendix A. This assumes that there will be no deterioration in effluent quality as population growth takes up any current headroom at each WwTW; in reality this may not be the case, and this should be considered when reviewing the outcomes of the assessment.
- Where no data or information on WwTW upgrades were available or provided in time for modelling undertaken in this study, 2006-09 historic data has been used. This provided a conservative prediction of future impacts and as such might overestimate the potential future effects.

[9] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/population

[10] British Water, 2015. Flows and Loads – 4 Sizing Criteria, Treatment Capacity for Sewage Treatment Systems, British Water (standard document which details values to use for water planning activities)

3. Results

This section provides the results of the WQA undertaken for the projected housing growth in Chichester District Council area.

3.1 Overview

3.1.1 This section describes the results of water quality modelling to estimate the impacts of the projected housing growth on receiving waters for the WwTWs, using the approach detailed in Section 2. Results are presented for each growth area, together with a cumulative assessment for all growth areas. This takes account of the impact of growth plans at 2020, 2025, 2030 and 2036 to allow understanding of the timescales of the impacts.

3.1.2 For each growth area consideration is made of:

- The baseline receiving water classification followed by any potential for changes in WFD class or deterioration in excess of the 10% threshold;
- The potential to reach the WFD objective of Good Status where this is not currently the case;
- Any possible impacts downstream of the main water body are also considered;
- Whether sewer network capacity could constrain growth;
- Potential impacts on designated sites;
- Potential treatment options to mitigate against increased effluent discharges.

3.2 WwTW and sewer capacity reviews

WwTW capacity review

3.2.1 Information on the estimated remaining headroom at each of the WwTWs as at December 2017 (February 2018 for Apuldram) was provided by Chichester District Council and is shown in Table 3.2.

3.2.2 As part of this study a review of the DWF methodology was undertaken and a separate review of the DWFs against permits.

Calculating DWF

3.2.3 The MWH report provides a useful description of the derivation of DWF using the statistical 20th percentile of actual flow data;

- “Dry Weather Flow (DWF) is the flow to the treatment works based on a dry period of time. The traditional EA definition is “the average daily flow to the treatment works during seven consecutive days without rain following seven days during which the rainfall did not exceed 0.25 millimetres on one day”. During this dry period, flows to the works are considered to be resultant from residential and trade usage and not from rainfall entering the catchment. The EA has recently revised the definition of DWF in consents adopting the 20th percentile (%ile) of an annual flow record (i.e. the Q80) for planning purposes. There is variability in this statistic from year to year due to weather effects. Compliance is assessed by comparison with the measured Q90 (known as the measured DWF). For this study, the current DWF has been calculated as the largest 20%ile of the previous three years.”

3.2.4 This text was written in 2010, when the EA was ‘trialling’ this statistical approach. It is unclear at this stage whether the EA has now ‘formally’ adopted this approach.

3.2.5 A review of the current and predicted future capacity of the WwTWs was undertaken to clarify if there is any headroom to support future housing growth or if upgrades will be required. Water companies design the capacity of their works based on general rules for calculating the volume of effluent that could reach a WwTW, including:

- Q80 flows;
- Assumed discharge of 120 l per person per day with potential of up to 140 l per person per day with the total volume calculated on projected population growth in an area;
- An assumed 40% infiltration rate into the sewer network from sources such as groundwater (although this will vary from site to site);
- Estimated flows from trade premises.

3.2.6 Southern Water provided 20% percentile calculated DWF for their WwTWs for the period 2013-2015. This is based on the current methodology set out by the EA, which is an update on the old method which was used to calculate the original permits. However, it can still be used as an indicator of where volumetric capacity of a WwTW could be an issue. By matching the current DWF against future predicted DWFs an indication of volumetric capacity can be derived, but this does not necessarily mean they can treat any increased flows if the works is already at BAT.

3.2.7 The method used by Southern Water provides a good process for clarifying potential increases in flow and is in line with the EA methodology noted above (although the infiltration percentage is a rough estimate which would vary and would be expected to be much lower in a new estate).

3.2.8 For comparison, Table 3.1 shows DWF for each works calculated as the 2013-2015 average 20th percentile flow and the 2011-2017 average 20th percentile flow. As noted above, differences between the two metrics are expected because of variations in annual rainfall.

Table 3.1 DWF at each works calculated as the 3-year (2013-2015) average and 7-year (2011-2017) average 20%ile flow.

WwTW	3-year (2013-2015) average 20%ile flow (m^3/d)	7-year (2011-2017) average 20%ile flow (m^3/d)	Difference (%)
Apuldram (Chichester)	9945	9832	1.1%
Bosham	1022	1031	-0.9%
Kirdford	126	126	-0.1%
Loxwood	760	796	-4.7%
Pagham	1756	1798	-2.4%
Sidlesham	6744	6045	10.4%
Tangmere	1232	1139	7.6%
Thornham	6197	6174	0.4%
Wisborough Green	215	212	1.5%

3.2.9 As is evident, the differences between the figures are generally small. Whilst some differences could be due to maintenance or upgrades to works, or changes in operational regime, the majority of the variation can be explained by variations in rainfall. Around 70% of the inter-annual variation in DWF can be explained by inter-annual variation in rainfall.

3.2.10 Met Office rainfall data from the climate station at Eastbourne[11] records an annual average rainfall of 895 mm for the period 2013-2015, significantly greater than the average for the period 2011-2017 of 791 mm. It is to be expected, therefore, that DWF for the period 2013-2015 will be greater than for the period 2011-2017 when calculated on the basis of 20th percentile flow.

3.2.11 In the period 2011-2017, 2014 was the wettest year (based on Met Office data for Eastbourne), with rainfall of 993 mm, followed by 2012 with rainfall of 952 mm. At most works, these are also the years with the highest DWF: for example, DWF at Apuldram was 10,572 m^3/d in 2014 and 10,392 m^3/d in 2012, compared with an average for the period 2011-2017 of 9,832 m^3/d.

Review of actual and permitted DWFs

3.2.12 In order to provide a review of increases in DWF that could be linked to future housing growth, this study concentrated on the additional flows from domestic properties based on a worst-case scenario increase. In undertaking a review of the headroom of capacity at each WwTW the following criteria were used:

- DWF data for each WwTW (for the period 2013-2015);
  - Provided by Southern Water to ensure the most accurate data is used;
- The DWF permit limits for each WwTW;
  - Taken from the most recent permits from the Environment Agency;
- The predicted increases in volume of effluent based on future housing growth (based on occupancy rates of 2.5 and 5 people per house);
  - Following national guidance on modelling treated sewage effluent and using the national average for sensitivity testing;
- A predicted water usage of 120 l per person per day.
  - This was chosen in line with values used by Southern Water

3.2.13 As shown in Table 3.2 some of the WwTW have been assessed as having some capacity left for future growth. However, some works are reaching their volumetric capacity and will therefore need upgrading to support future housing growth, although this should be reviewed by Southern Water.

3.2.14 The current and projected future DWF at each of the works is as shown in Table 3.3. A simple review of matching the current and future calculated DWFs against the consented limits for the WwTWs was undertaken to identify which works might require a physical upgrade to the works in order to treat the sewage effluent to the appropriate levels and to reduce any overflows. Where the calculated flows were predicted to exceed the consented flows this was taken to mean that an upgrade would be required and as such was highlighted for review.

[11] https://www.metoffice.gov.uk/public/weather/climate-historic/#?tab=climateHistoric

Table 3.2 Projected increase in household numbers in each WwTW catchment and estimated remaining headroom (at 31st December 2017 unless noted otherwise).

WwTW	Projected increase in households	Remaining headroom (households)
Apuldram (Chichester)	1600 – 3000	75 (as at February 2018)
Bosham	50 – 500	391
Kirdford	50 – 250	60
Loxwood[1]	50 – 250	0
Pagham[2]	100 – 500	593
Sidlesham	600 – 1000	525
Tangmere	2100 – 3000	0
Thornham[3]	1000 – 1500	1063
Wisborough Green	50 – 250	143

Notes:
1. Part of the catchment falls within Waverley. Development in this area will also take up headroom.
2. Part of the catchment falls within Arun. Development in this area will also take up headroom.
3. Part of the catchment falls within Havant. Development in this area will also take up headroom.

Table 3.3 Summary of predicted growth in DWF at each works. Highlighted values show when an increase in the DWF permit would be required.

WwTW	Occupancy rate	Consent limit (m^3/d)	3 year DWF 20%ile Average (2013 - 15) m^3/d	DWF 2020	DWF 2025	DWF 2030	DWF 2036
Apuldram (Chichester)	5	13,524	9,945	10,291	10,786	11,283	11,682
	2.5			10,118	10,366	10,614	10,813
Bosham	5	1,221	1,022	1,186	1,460	1,737	1,959
	2.5			1,104	1,241	1,380	1,491
Kirdford	5	165	126	157	212	268	313
	2.5			142	169	197	220
Loxwood	5	767	760	826	934	1,045	1,135
	2.5			793	847	903	948
Pagham	5	2309	1756	1,930	2,095	2,260	2,394
	2.5			1,843	1,925	2,008	2,075
Sidlesham	5	5,800	6,744	7,143	7,749	8,357	8,843
	2.5			6,943	7,247	7,550	7,793
Tangmere	5	3,000	1,232	1,955	2,661	3,913	4,819
	2.5			1,593	1,947	2,573	3,026
Thornham	5	6,565	6,197	6,567	7,062	7,559	7,958
	2.5			6,382	6,630	6,878	7,077
Wisborough Green	5	324	215	247	301	358	403
	2.5			231	258	286	309

Sewer network capacity review

3.2.15 Information from CDC on their flood risk assessments[12] indicates that the areas around west Chichester, east Chichester and Tangmere are at medium risk of groundwater flooding. As such there is the potential for increased infiltration into the sewer networks which could impact on capacity.

3.2.16 Groundwater infiltration to the sewer network to Apuldram is known to occur at a high rate. Chichester Water Quality Group issued a paper in November 2012 which stated: *"The Chichester catchment is affected by high levels of groundwater infiltration into the sewer network. When groundwater levels are high water leaks into the sewer system it causes the Chichester (Apuldram) works to operate its storm overflow. The purpose of the sewerage system and the treatment works is to convey and treat foul and combined flows, not groundwater flows that should be dealt with by land drainage. The flows into the WwTW are therefore greater than its capacity to treat fully. The groundwater becomes mixed with foul water and partially treated sewage, diluted with groundwater is pumped into Chichester Harbour through screens which remove solid matter."* (Chichester Water Quality Group Update Paper November 2012).

3.2.17 Very few sewerage related pollution incidents were reported in the Environment Agency's incident database related to the catchments to the nine WwTWs in the period 2001-2016. However, sewer capacity in areas such as Chichester is a known issue and so detailed capacity studies are likely to be required once the locations and magnitudes of the proposed housing developments are known. Information provided by CDC indicates that there have been complaints from the public about sewer flooding in Southbourne, Bosham, Birdham, East Wittering, Chichester and Ifold. It should be noted that the cause of these incidents is not confirmed, and they may not have been due to lack of network capacity. Whilst it is not possible to quantify the additional sewer network capacity required with the information available, it is evident that further work on upgrading the networks will be required to support housing growth.

3.2.18 Information was provided by Southern Water on the frequency of storm tank discharges to the environment from each of the nine WwTWs in 2016 and 2017. From this data, a qualitative assessment was made of the likelihood of sewer capacity acting as a constraint to growth in each WwTW catchment. Based on this information, it was identified that:

- There is a relatively high likelihood of sewer capacity constraints at Loxwood and Apuldram;
- There is a moderate likelihood of sewer capacity constraints at Sidlesham and Thornham;
- At Tangmere, although historically there have been relatively frequent storm tank discharges, a recent extension to the works has provided additional capacity and discharges have been infrequent since January 2016. Sewer network capacity should not be a constraint to growth;
- There is a low likelihood of sewer capacity constraints at the remaining works.

3.2.19 Further details of identified sewer network capacity constraints are provided in the remainder of this section.

[12] http://www.chichester.gov.uk/studies

3.3 Apuldram (Chichester) WwTW: Fishbourne, West of Fishbourne, Chichester Southern Gateway, South of Chichester, South of Chichester (East of Stockbridge) and Stockbridge Potential Growth Areas

Summary – Apuldram (Chichester) WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						1,600-3,000
DWF (m^3/d) (See note 2)						
2.5 per household	13,524	9,080	9253	9500	9749	9948
5 per household			9426	9921	10417	10816

Coastal waters (nitrate)	**Current**	**Percentage of total contribution to receiving waters (EA data)**	**Predicted**
No deterioration	Moderate	2%	Not calculated
Loading assessment (N kg\d)	56.7		63 (11% increase)

Exceed sewer network capacity?[1]	
EA recorded pollution incidents	No reports
Third party information	Known issues with storm discharges

Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**
Nitrate (mg-N/l)	9	3.6	Not calculated	Y
Phosphate (mg-P/l)	N/A	N/A	N/A	N/A
Ammonia (mg/l)	N/A	0.05	N/A	N/A
BOD (mg/l)	35	2.6	N/A	N/A

Mitigation (preferred option)

- Modify/extend ASP-MLE to IFAS-MLE for additional capacity; extend with denitrifying sand filters with external COD (methanol) dosing to achieve lower TN

1. No projections are made of future sewer network capacity exceedance.
2. Note that whilst DWF is not predicted to exceed currently permitted levels over the simulated period, there are known issues with infiltration at Apuldram that increase sewer flow and will require attention to realise additional headroom.

3.3.1 The growth areas of Fishbourne, West of Fishbourne, Chichester Southern Gateway, South of Chichester, South of Chichester (East of Stockbridge) and Stockbridge are served by Apuldram (Chichester) WwTW which discharges into the WFD water body of Chichester Harbour which is also an SPA, SAC, SSSI, Ramsar site and Area of Outstanding Natural Beauty (AONB).

Upstream impacts

3.3.2 There are no major WwTWs included in this study that are upstream of Apuldram WwTW, and so there are no predicted impacts from growth areas upstream of Apuldram WwTW.

No deterioration – preventing class deterioration or 10% within class

3.3.3 No modelled assessment of class deterioration, or deterioration against a threshold of 10% was made for growth areas served by WwTWs that discharge into coastal waters. A qualitative assessment of the increase in loading of nitrogen from the works compared to the current condition and reasons for not achieving Good Status indicate that there is unlikely to be a deterioration in WFD class of any element, although detailed coastal modelling may be required to confirm this.

Getting to Good Status (or 2027 objective)

3.3.4 Chichester Harbour is designated as a heavily modified water body. The current WFD overall water body classification for Chichester Harbour is Moderate Status, with an objective to achieve Good Potential by 2027. Chichester Harbour has Moderate Ecological Status and Moderate Status for physico-chemical quality elements, with objectives to achieve Good Status for both by 2027. It is noted that achieving Good Status by 2027 is disproportionately expensive.

Nitrate loading assessment

3.3.5 Apuldrum WWTW was reviewed for UWWTD and Habitats directive and consequently improvements recently came on line, so it is too early to early to record an environmental improvement. Apuldrum WWTW has a new nitrogen permit with a maximum concentration limit of 10 mg/l which was tightened to 9 mg/l following the 2009 growth review. An increase in nitrogen load due to increasing flow up to the permitted flow limit will be accounted for in the concentration limit, As such the nitrogen permit has built in headroom for a small amount of growth, there will not be deterioration until headroom is used and the permit load is reached.

3.3.6 Assessment of nitrate loading from Apuldram WwTW indicated that discharges could increase by 6.3 kg/d by 2036 from the current loading of 56.7 kg/d, representing an 11.2% increase. EA evidence indicates the discharge from the works is not a large contribution (2%) of nitrate to the WFD waterbody. Mitigation will be required but only once permitted flow is reached. The investigation did not assess whether the works and associated increases in the discharge from growth are having impacts on interest features at a sub-water body scale. These should be investigated as part of the HRA.

Indicative permit calculations

3.3.7 No new indicative permit limits were calculated. However, it is noted that should it be determined that mitigation is required for nitrogen discharges to Chichester Harbour, a tighter permit may be required.

Sewer network capacity

3.3.8 There is evidence of historical sewage pollution incidents in Chichester Harbour, related to combined sewer overflow discharges during storm events or high levels of groundwater infiltration into the sewer network. This is backed up by information from the Chichester Water Quality Group:

- Apuldram WwTW has historically exceeded EA storm discharge guidelines;
- From 1 April 2012 – 31 March 2013, a total of 4,130 hours storm discharges was reported from Apuldram WwTW. This is equivalent to 172 days, against a recommendation of no more than 10 x half days per year;
- The EA issued Southern Water with an enforcement notice under the Environmental Permitting Regulations for Apuldram WwTW because of the excessive discharge of storm overflow;
- The enforcement notice compelled Southern Water to undertake investigations and other mitigation action to address the infiltration in to the sewer network. Since then the Environmental Permit has been amended and now requires that an Infiltration Reduction Plan is in place; and
- In addition UV disinfection was installed on the storm discharge at Apuldram WwTW in 2014 to address the bacteria levels entering the Harbour (although this will not address the nutrient loading from the works).

3.3.9 It is not possible with the information currently available to quantify the nutrient loadings attributable to these events. Infiltration will fluctuate from year to year with variations in rainfall, and ongoing data collection and further investigation is required.

3.3.10 There is clear evidence of an issue (as noted in Section 3.2) and sewer network capacity is very likely to be a constraint on future housing growth.

Habitats Assessment

3.3.11 Apuldram WwTW discharges into Chichester Harbour. The Harbour is part of the Solent Maritime SAC and the Chichester and Langstone Harbours SPA and Ramsar site. The area also includes the Chichester Harbour SSSI which is currently classed by Natural England as being mostly in unfavourable recovering condition (82%, although 15% is at favourable condition. There is a threat on the recovery of the majority of the Harbour due to the potential water quality changes from growth and the uncertainty around efficacy of existing measures to tackle diffuse pollution. The remainder of the units within the site are considered to be unfavourable with no change or unfavourable and declining condition.

3.3.12 In October 2007, the RoC for Chichester and Langstone Harbours Natura 2000 sites highlighted the need to reduce the nitrate discharged into water bodies. A major target was to reduce growth of algal weed from 2.5 kg/m^2 to an acceptable value of 0.5 kg/m^2 across large areas of the harbours. The discharge permit for Apuldram, was reduced from 15 mg/l to 10 mg/l and then to 9 mg/l.

3.3.13 Apuldram (Chichester) WwTW discharges into the Fishbourne Channel unit 30 of Chichester Harbour and is currently designated as unfavourable recovering and contains Annex 2 habitat and SPA/Ramsar supporting habitat 1140 Mudflats and Sandflats not covered by seawater at low tide (amongst other habitats). This unit has been identified as having a condition threat risk, and as such mitigation measures should be implemented.

3.3.14 Environment Agency source apportionment modelling indicates that Apuldram WwTW contributes approximately 2% of the total nitrate loading to the Harbour, at waterbody scale, although it is noted that further work will be required as part of an HRA to assess potential impacts at feature scale. The predicted increase in nitrogen loading by 2036 of 6 kg/d from the works represents a small but measurable proportion of the nitrogen loading to the whole of Chichester Harbour and may represent considerably more to individual harbour arms. Therefore measures will be required to mitigate this increase given that the receiving designated site is currently in an unfavourable condition due to nutrient inputs.

3.3.15 The potential mitigation solutions should be carried out in combination with other ongoing measures, which include Catchment Sensitive Farming measures, which could potentially reduce nitrogen and phosphate loads from agriculture to the designated area by approximately 12 – 16% maximum (initial estimates based on an study by ADAS commissioned by Natural England which has not yet been published which looked at the wider Solent in Hampshire and the Isle of Wight (not Chichester Harbour). Conservative estimates indicate that actual improvements would likely be less than this). Catchment management could provide headroom for increases caused by potential future housing growth, subject to the overarching objective of achieving or maintaining favourable condition at designated sites, although the confidence for this is low. It is not likely the catchment improvements will work in time to provide sufficient headroom in all catchments and the timescale for improvements could be at least 20-30 years, so putting it beyond the scope of the Local Plan if used alone, though as part of a programme of integrated measures it may be very useful. Other methods of reducing nitrogen include demand management and reduced water usage to ensure that the planned works are nitrogen neutral or a long sea outfall to discharge the treated effluent offshore away from the harbour (this may be required in the long term to deal with the current condition and pressures).

Mitigation

3.3.16 Further discussion of mitigation and treatment options is provided in Section 4.

Optimum Solution

- Modify/extend ASP-MLE to IFAS-MLE for additional capacity; extend with denitrifying sand filters with external COD (methanol) dosing to achieve lower TN.

Alternative Solutions

- Modify/extend ASP-MLE to IFAS-Bardenpho 4-Stage for additional capacity and to achieve lower TN
- Retain ASP-MLE and incorporate long sea outfall. The MWH report, in its recommendations, states –
  - "Of the four main options taken forward, the LSO option currently offers the highest degree of certainty that implementation would be feasible to free up the required level of development capacity around Chichester. The solution carries the highest whole life cost of all of the four scenarios considered, but developing at Tangmere and Lavant are both constrained by the uncertainty with regards to the EA's future policy on no deterioration of Phosphorus."

  This suggests this option has significant merit, notwithstanding the capital cost of the scheme. Transfer to Tangmere could be considered as a sub-option.

3.3.17 However, it is noted that Apuldram WwTW already treats to a quality of 3-4 mg/l TON. Information from Chichester Harbour Conservancy indicates that it may not be possible to further reduce nitrate concentrations at economic cost.

Optimum Solution Justification

- The identified solution offers an improved 'buildability' in terms of retrofit of the IFAS technology and addition of the denitrifying sand filters.

3.4 Bosham WwTW: Broadbridge Potential Growth Area

Summary – Bosham WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						50-500
DWF (m^3/d)						
2.5 per household	1,221	890	972	1109	1248	1359
5 per household			1054	1328	1606	1828

Coastal waters (nitrate)	**Current**	**Percentage of total contribution to receiving waters (EA data)**	**Predicted**
No deterioration	Moderate	<1%	Not significant
Loading assessment (N kg\d)	16.5		25 (51% increase)

Exceed sewer network capacity?[1]	
EA recorded pollution incidents	No reports
Third party information	Reports of sewer flooding

Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**
Nitrate (mg-N/l)	10	8.9	Not calculated	Y
Phosphate (mg-P/l)	N\A	N/A	N/A	N/A
Ammonia (mg/l)	N\A	0.1	N/A	N/A
BOD (mg/l)	50	3.0	N/A	N/A

Mitigation (preferred option)

- Extend Biofilter (nitrifying) and denitrifying sand filters with additional capacity; enhance denitrification with additional external COD (methanol) dosing to achieve lower TN

1. No projections are made of future sewer network capacity exceedance.

3.4.1 The potential growth area of Broadbridge is served by Bosham WwTW which discharges into the WFD water body of Chichester Harbour.

Upstream impacts

3.4.2 Apuldram WwTW discharges into the same WFD water body as Bosham WwTW, i.e. Chichester Harbour. This creates the potential for cumulative and in combination impacts, particularly in relation to the constraints faced by Apuldram WwTW.

No deterioration – preventing class deterioration or 10% within class

3.4.3 No modelled assessment of class deterioration, or deterioration against a threshold of 10% was made for growth areas served by WwTWs that discharge into coastal waters.

Getting to Good Status (or 2027 objective)

3.4.4 Chichester Harbour is designated as a heavily modified water body. The current WFD overall water body classification for Chichester Harbour is Moderate Status, with an objective to achieve Good Status by 2027. Chichester Harbour has Moderate Ecological Status and Moderate Status for physico-chemical quality elements, with objectives to achieve Good Status for both by 2027.

Nitrate loading assessment

3.4.5 Bosham WWTW was reviewed for the Habitats directive and consequently improvements recently came on line, so it is too early to early to record an environmental improvement. Bosham WWTW has a new nitrogen permit with a maximum concentration limit of 10 mg/l which was reviewed for growth in 2009. An increase in nitrogen load due to increasing flow up to the permitted flow limit will be accounted for in the concentration limit. As such the nitrogen permit has built in headroom for a small amount of growth, there will not be deterioration until headroom is used and the permit load is reached.

3.4.6 Assessment of nitrate loading from Bosham WwTW indicated that discharges could increase by 8.4 kg/d by 2036 from the current loading of 16.5 kg/d, representing a 50.7% increase.

Indicative permit calculations

3.4.7 No new indicative permit limits were calculated. However, it is noted that should it be determined that mitigation is required for nitrogen discharges to Chichester Harbour, a tighter permit may be required.

Sewer network capacity

3.4.8 Data from SWS indicate no storm tank overflows in 2016-2017. There have been complaints from the public about sewer flooding in this area, although the cause of these issues is not confirmed. Sewer network capacity could be a constraint to growth, but further investigation is required to confirm this.

Habitats Assessment

3.4.9 Chichester Harbour is part of the Solent Maritime SAC and the Chichester and Langstone Harbours SPA and Ramsar site. The area also includes the Chichester Harbour SSSI which is currently classed by Natural England as being mostly in unfavourable recovering condition (82%, although 15% is at favourable condition. There is a threat on the recovery of the majority of the Harbour due to the potential water quality changes from growth and the uncertainty around efficacy of existing measures to tackle diffuse pollution. The remainder of the units within the site are considered to be unfavourable with no change or unfavourable and declining condition.

3.4.10 In October 2007, the RoC for Chichester and Langstone Harbours Natura 2000 sites highlighted the need to reduce the nitrate discharged into water bodies. A major target was to reduce growth of algal weed from 2.5 kg/m^2 to an acceptable value of 0.5 kg/m^2 across large areas of the harbours. Discharge permits for Apuldram, Thornham and Bosham WWTW were reduced from 15 mg/l to 10 mg/l or less.

3.4.11 The area currently receives discharges from the Apuldram WwTW, Bosham WwTW and Thornham WwTW directly.

3.4.12 Environment Agency source apportionment modelling indicates that Bosham WwTW contributes less than 1% of the total nitrate loading to the Harbour, at waterbody scale, although it is noted that further work will be required as part of an HRA to assess potential impacts at feature scale. The predicted increase in nitrogen loading by 2036 of 8 kg/d from this works represents a small but measurable proportion of nitrogen loading to the whole of Chichester Harbour and may represent considerably more to individual harbour arms. Mitigation may be required against the increase in nitrate loading into Chichester harbour once consented flow is exceeded.

3.4.13 Bosham WwTW discharges into the Longmore Point unit of Chichester Harbour and is a littoral sediment environment. Currently the condition of this unit is unfavourable and recovering, however, there is a condition threat risk for this unit therefore mitigation measures should be implemented.

3.4.14 The potential mitigation solutions should be carried out in combination with other ongoing measures, which include Catchment Sensitive Farming measures, which could potentially reduce nitrogen and phosphate loads from agriculture to the designated area by approximately 12 – 16% maximum (initial estimates based on an study by ADAS commissioned by NE which has not yet been published which looked at the wider Solent in Hampshire and the Isle of Wight (not Chichester Harbour). Conservative estimates indicate that actual improvements would likely be less than this). Catchment management could provide headroom for increases caused by potential future housing growth, subject to the overarching objective of achieving or maintaining favourable condition at designated sites, although the confidence for this is low. It is not likely the catchment improvements will work in time to provide sufficient headroom in all catchments and the timescale for improvements could be at least 20-30 years, so putting it beyond the scope of the Local Plan if used alone, though as an integrated measures it may be very useful. Other methods of reducing nitrogen include demand management and reduced water usage to ensure that the planned works are nitrogen neutral or a long sea outfall to discharge the treated effluent offshore away from the harbour (this may be required in the long term to deal with the current condition and pressures).

Mitigation

3.4.15 Further discussion of mitigation and treatment options is provided in Section 4.

Optimum Solution

- Extend Biofilter (nitrifying) and denitrifying sand filters with additional capacity; enhance denitrification with additional external COD (methanol) dosing to achieve lower TN

Alternative Solution

- Extend Biofilter (nitrifying) with IFAS (nitrifying) and denitrifying sand filters for additional capacity; enhance denitrification with additional external COD (methanol) dosing to achieve lower TN (IFAS technology has lower footprint).

Optimum Solution Justification

- The identified solution offers an improved ‘buildability’ in terms of extension of the biofilter technology and addition of the denitrifying sand filters. The biofilter based solution also offers consistent site technology and lower operating costs.

3.5 Kirdford WwTW: Kirdford Potential Growth Area

Summary – Kirdford WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						50-250
DWF (m^3/d)						
2.5 per household	165	99	115	142	170	193
5 per household			131	185	242	287
Downstream water quality						
Phosphate	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	Y	Y	Y
BOD	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Ammonia	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	Y	Y
Exceed sewer network capacity?[1]						
EA recorded pollution incidents	No reports					
Third party information	No evidence of significant issues					
Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**		
Nitrate (mg-N/l)	N/A	12.8	N/A	N/A		
Phosphate (mg-P/l)	N/A	4.1	2.9	Y		
Ammonia (mg/l)	10	1.2	N/A	N/A		
BOD (mg/l)	25	6.9	N/A	N/A		
Mitigation (preferred option) • Extend Biofilter (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction.						

1. No projections are made of future sewer network capacity exceedance.

3.5.1 The potential growth area of Kirdford is served by Kirdford WwTW which discharges into the WFD water body of The River Kird, which flows into the Upper Arun SSSI.

Upstream impacts

3.5.2 Kirdford WwTW is 11.8 km downstream of the headwaters of the River Kird, with Northchapel WwTW located approximately 6 km upstream. There is no data on future housing growth for the upstream WwTW, but it is a relatively small works (140 m^3/d DWF) and so upstream impacts are not expected unless very significant growth is planned.

3.5.3 The Environment Agency's online Catchment Data Explorer indicates that the water body classification for 2016 was Poor Status. In order to achieve the objective of Good Status by 2027 there need to be upstream improvements. However, the Environment Agency also states that it will be disproportionately expensive to achieve this target.

No deterioration – preventing class deterioration

3.5.4 Modelling results across all time periods indicates that WFD class for each determinand will remain the same as the baseline 2015 classification at the downstream sample point (Figure 3.1). Therefore it is predicted that there will be no deterioration in WFD class from projected growth scenarios.

No deterioration – limiting in class deterioration to below the 10% threshold

3.5.5 The modelling indicated that at no point would BOD levels deteriorate more than 10% from the 2015 baseline (Figure 3.1).

3.5.6 For ammonia, there was an estimated 14% deterioration from baseline for the 2030 projection and an 18% deterioration by 2036. However, as ammonia remains within High Status and tighter permits to prevent this would require upstream improvement actions new tighter permit limits have not been calculated for this WwTW.

3.5.7 The modelled results for phosphate indicate that there will be a greater than 10% deterioration in water quality at the downstream sample point, F0003059. By 2025 a 12% deterioration was calculated, by 2030 a 21% deterioration and by 2036 a 26% deterioration. Therefore consideration will need to be given to permit limits for phosphate at the WwTW, to ensure this deterioration is mitigated. This is considered further in Section 4.

Getting to Good (or 2027 objective)

3.5.8 Baseline data for this study indicates that phosphate has been assessed as being at Moderate Status at F0003059 (Figure 3.2). For the purpose of this study, based on Environment Agency guidance, it has been assumed that a permitted concentration of 0.25 mg/l is the tightest possible standard that could be put on WwTWs[13]. However, the new tighter permit levels for technically feasible solutions are yet to be confirmed by Ofwat.

Downstream impacts beyond main water body

3.5.9 Based on the model, water quality at the end of reach was predicted to be at Good Status for ammonia and BOD, but at Poor status for phosphate. Wisborough Green WwTW is situated 6.6 km downstream of the Kirdford WwTW and as such may have a cumulative effect on phosphate loading at the end of the reach of the River Kird.

Indicative permit calculations

3.5.10 As no deterioration of WFD class has been predicted for any of the determinands calculation of new indicative permit limits was not required for this condition.

3.5.11 Indicative permit limits were calculated for phosphate with the objective of preventing deterioration in excess of 10%. The modelling indicated that a consent limit of 2.91 mg/l phosphate (or, in practice, 3 mg/l) is required. A high level review indicates that technical solutions exist which would allow achievement of the required consent limit for phosphate (Section 4).

Sewer network capacity

3.5.12 There are no known issues with sewer network capacity.

Habitats Assessment

3.5.13 No assessment of nitrate loading to designated downstream sites was carried out.

Mitigation

3.5.14 Further discussion of mitigation and treatment options is provided in Section 4.

[13] PR14 phosphorus technology trials and the Phosphorus Task and Finish Group. Paper presented to WLB Board Meeting Technical section July 2017

Optimum Solution

- Extend Biofilter (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction.

  Note that this solution will invoke an iron ELV, which may become the limiting parameter, possibly requiring additional treatment such as tertiary solids sand filtration (contingent of the iron ELV applied by the Environment Agency).

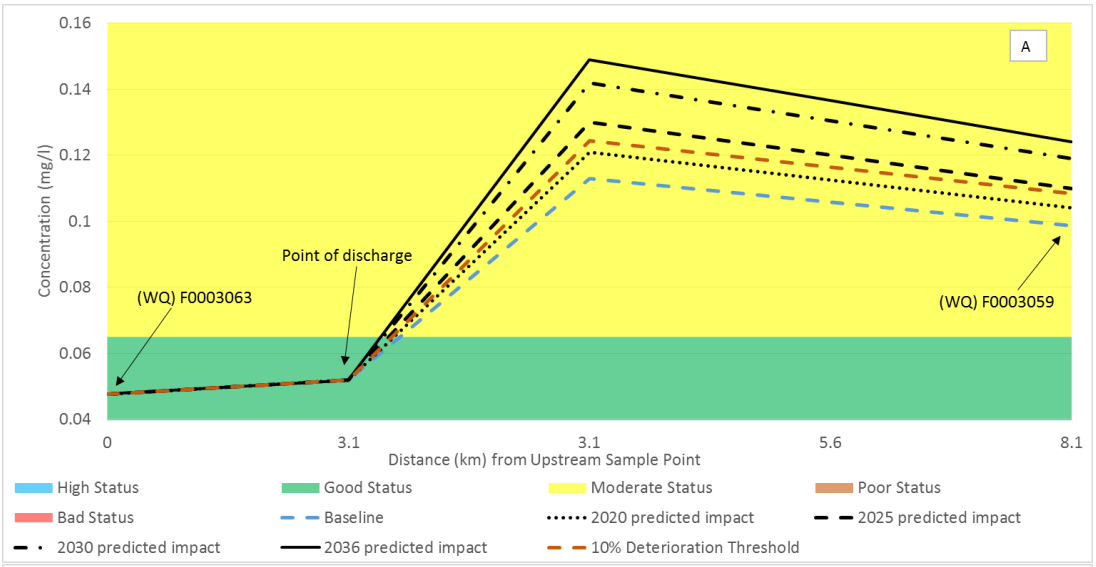
Alternative Solution

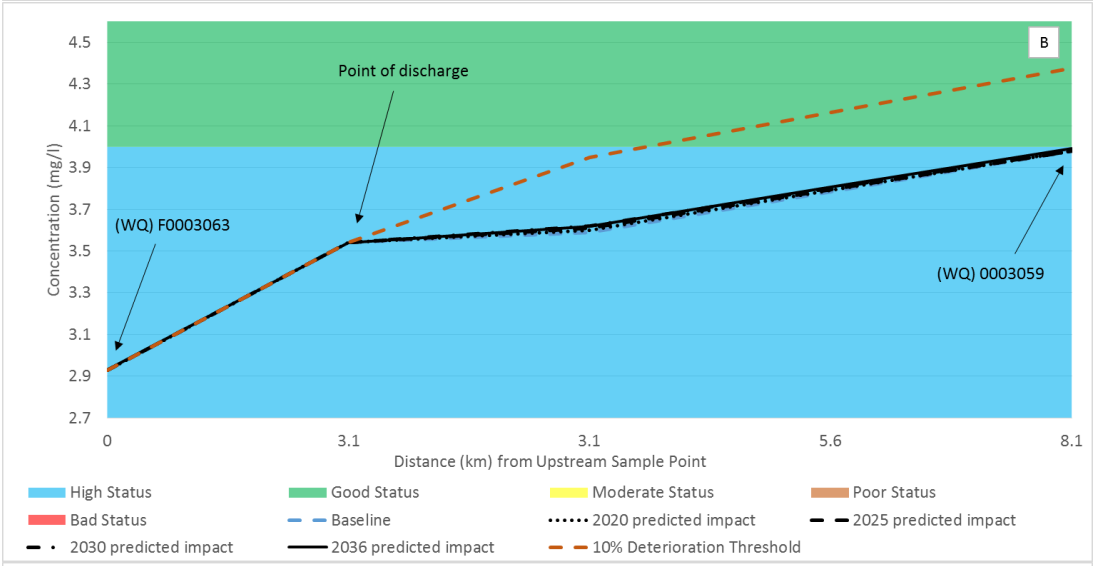
- Extend Biofilter (nitrifying) with IFAS (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction (IFAS technology has lower footprint)
- Rebuild with IFAS (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction (IFAS technology has lower footprint).

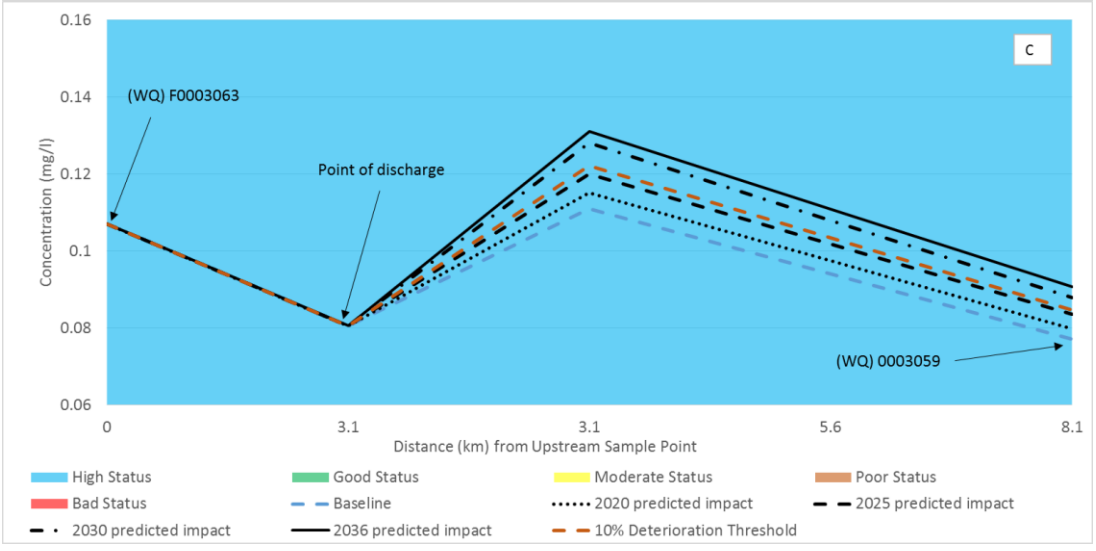
Optimum Solution Justification

- The identified solution offers an improved 'buildability' in terms of extension of the biofilter technology and retrofit of chemical phosphorus technology. The biofilter based solution also offers consistent site technology and lower operating costs.

Figure 3.1 Modelled changes in concentrations (in mg/l), of (A) phosphate (Average), (B) BOD (90%ile) and (C) Ammonia (90%ile) down the River Kird from the upstream sample point (WQ) F0003063 to downstream sample point (WQ) F0003059 of Kirdford WwTW, due to potential growth.







3.6 Loxwood WwTW: Loxwood Potential Growth Area

Summary – Loxwood WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						50-250
DWF (m^3/d)						
2.5 per household	767	719	752	806	862	907
5 per household			784	893	1004	1094
Downstream water quality						
Phosphate	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
BOD	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Ammonia	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Exceed sewer network capacity?[1]						
EA recorded pollution incidents	No reports					
Third party information	No evidence of significant issues					
Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**		
Nitrate (mg-N/l)	N\A	13.0	N/A	N/A		
Phosphate (mg-P/l)	N\A	0.3	N/A	N/A		
Ammonia (mg/l)	8	0.6	N/A	N/A		
BOD (mg/l)	20	5.2	N/A	N/A		
Mitigation (preferred option) • N/A						

1. No projections are made of future sewer network capacity exceedance.

3.6.1 The potential growth area of Loxwood is served by Loxwood WwTW which discharges into the Loxwood Chidding WFD water body, which is a priority river restoration habitat.

Upstream impacts

3.6.2 Loxwood WwTW is located on the main River Loxwood Chidding. Chiddingfold WwTW and Grayswood WwTW are further upstream of Loxwood but do not form part of this study and no housing growth numbers have been provided for these works[14]. No assessments could be undertaken of the potential impacts of housing growth on discharges from these works, and therefore it has been assumed that no upstream constraints are expected to impact on the potential growth areas served by Loxwood WwTW[15].

[14] Additionally they both had schemes under improvement schemes under PR19 reducing P loading to the river that relieve downstream pressure.
[15] This should be reviewed as the local plan progresses.

No deterioration – preventing class deterioration

3.6.3 Modelling of the impacts of housing growth on phosphate, ammonia and BOD concentrations downstream of Loxwood WwTW indicated that there will be no changes in WFD class from Poor or High Status (Figure 3.3).

No deterioration – limiting in class deterioration to below the 10% threshold

3.6.4 Modelling predicts that although there will be some deterioration downstream of Loxwood WwTW it will be less than the 10% threshold. This indicates that water quality should not be a constraint to future housing.

Getting to Good (or 2027 objective)

3.6.5 When using the 2015 baseline and potential growth predictions, ammonia and BOD remained at High Status downstream of Loxwood WwTW. As such, no further assessments were undertaken, although it should be noted that continued High Status is dependent upon Loxwood WwTW continuing to produce treated effluent to the same quality as noted in Appendix A.

3.6.6 Baseline data for this study indicate that phosphate concentrations have been assessed as Poor Status immediately downstream of the WwTW and at Good Status upstream of the discharge, indicating that the WwTW is currently causing a WFD failure prior to potential housing growth. However, potential future housing growth is not predicted to make a significant change to this. It has been assumed, based on Environment Agency guidance, that a permitted concentration of 0.25 mg/l is the tightest achievable limit that could be put on WwTWs. However, the new tighter permit level for technically feasible solutions is yet to be confirmed by Ofwat.

3.6.7 As all deterioration from potential future housing growth has been assessed as not significant (e.g. below 10%), the situation from the current baseline has not significantly changed and therefore potential housing growth is not predicted to alter the water body ability to reach GES. As such no new permits were calculated.

Downstream impacts beyond main water body

3.6.8 As no significant deterioration is predicted at the downstream sample point no impacts are expected in the next downstream water body, and therefore no further assessments were undertaken.

Indicative permit calculations

3.6.9 As no deterioration of WFD class or in excess of the 10% threshold has been identified for any of the determinands no new indicative permit limits were calculated.

Sewer network capacity

3.6.10 Data from SWS indicate relatively frequent storm tank discharges during the winter months which would indicate that sewer network capacity is likely to be a constraint to growth.

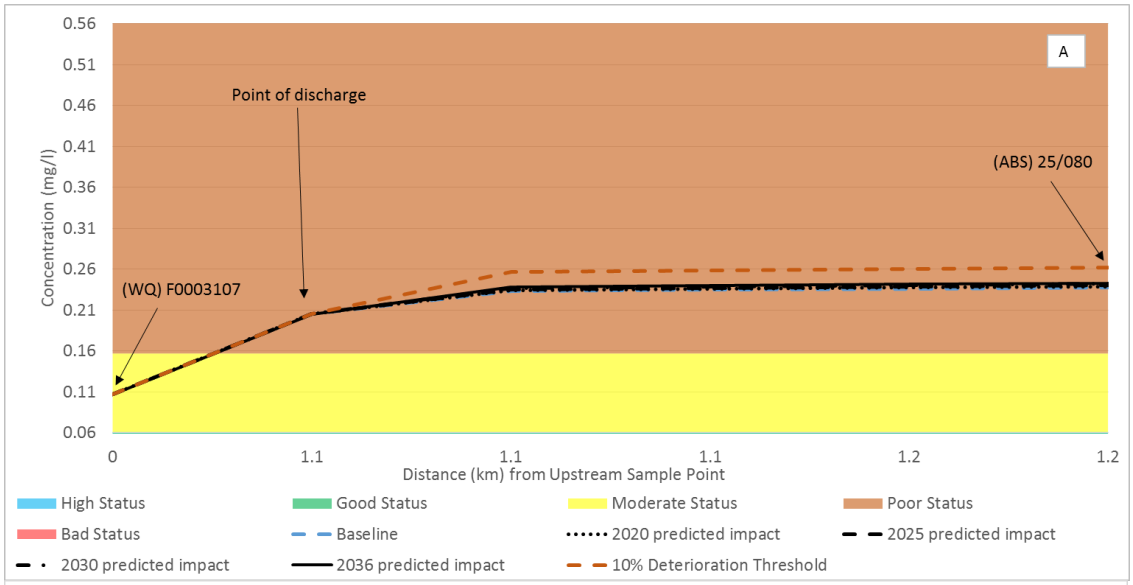
Habitats Assessment

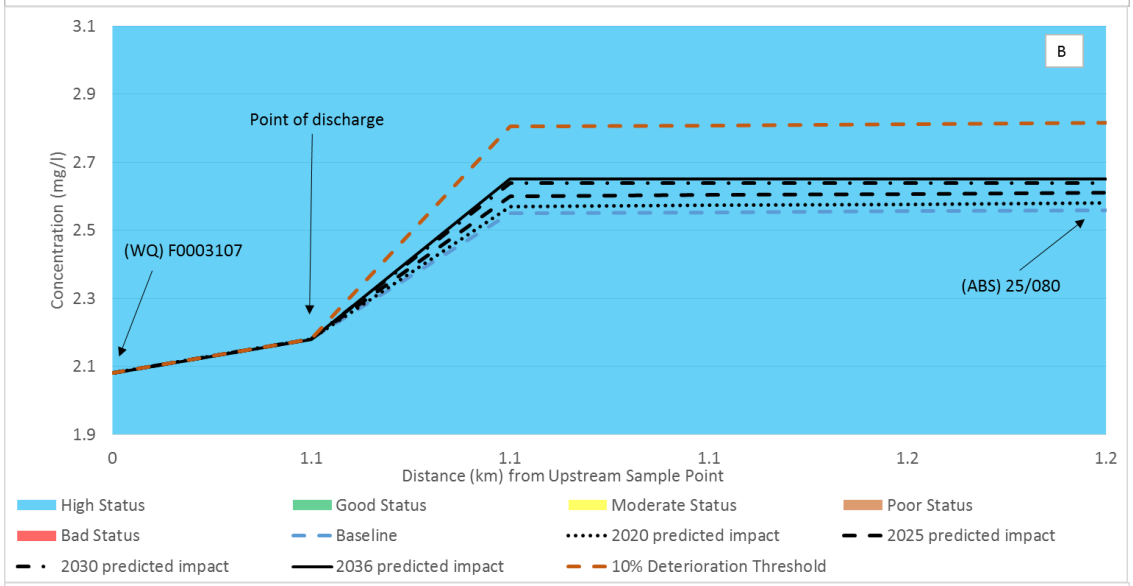
3.6.11 No assessment of nutrient loadings to designated downstream sites was carried out.

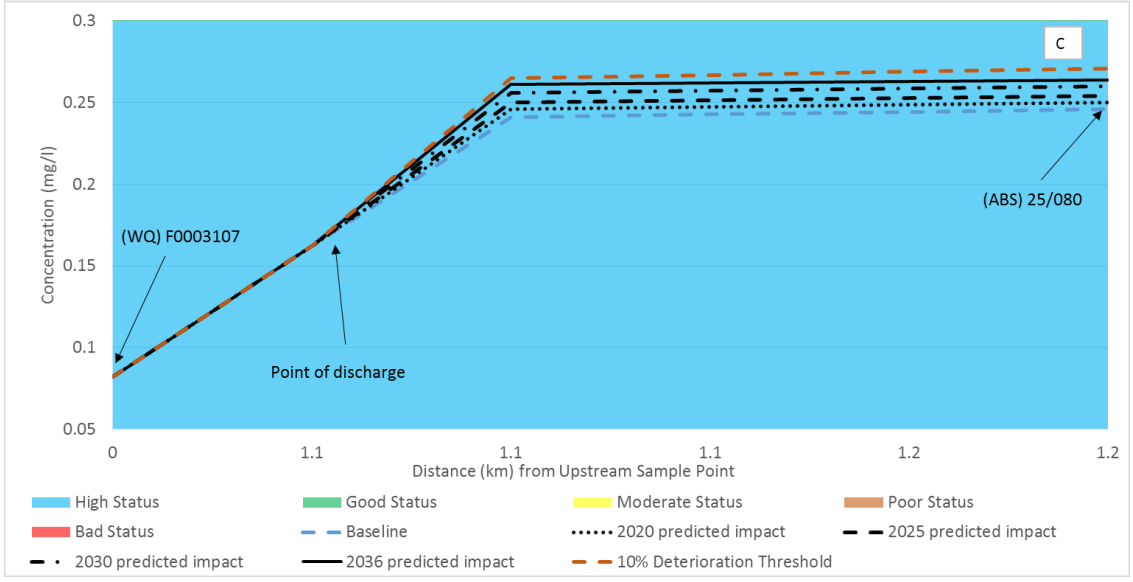
Mitigation

3.6.12 No mitigation has been identified as being required.

Figure 3.2 Modelled changes in concentrations (in mg/l), of (A) Phosphate (Average), (B) BOD (90%ile) and (C) Ammonia (90%ile) down Loxwood Chidding from the upstream sample point (WQ) F0003107 to the downstream sample point (ABS) 25/080 of Loxwood WwTW, due to potential growth







3.7 Pagham WwTW: Hunston and North Mundham Potential Growth Areas

Summary – Pagham WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						100-500
DWF (m^3/d)						
2.5 per household	2,309	1,854	1914	2024	2106	2173
5 per household			2029	2194	2359	2492
Downstream water quality						
Phosphate	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	Y	Y
BOD	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Ammonia	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N

Coastal waters (nitrate)	**Current**	**Percentage of total contribution to receiving waters (EA data)**	**Predicted**
No deterioration	Moderate	6%	Not significant
Loading assessment (N kg\d)	32.7		44.5 (36% increase)

Exceed sewer network capacity?[1]				
EA recorded pollution incidents	No reports			
Third party information	No evidence of significant issues			
Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**
Nitrate (mg-N/l)	N/A	18.6	N/A	N/A
Phosphate (mg-P/l)	N/A	4.3	2	Y
Ammonia (mg/l)	5	0.9	N/A	N/A
BOD (mg/l)	15	4.3	N/A	N/A

Mitigation (preferred option)

- Extend Biofilter (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction.

1. No projections are made of future sewer network capacity exceedance.

3.7.1 The potential growth areas of Hunston and North Mundham are served by Pagham WwTW which discharges into the WFD water body Pagham Rife and the downstream coastal water body of Pagham Harbour.

Upstream impacts

3.7.2 There are no major WwTWs upstream of Pagham WwTW and there are no predicted impacts from growth areas upstream of Pagham WwTW. Pagham WwTW also serves parts of Arun district and any future development in these areas would also need to be considered.

No deterioration – preventing class deterioration

3.7.3 Modelling of the impacts of potential housing growth on ammonia and BOD concentrations showed that there would be no deterioration in WFD class from the modelled baseline of Good for ammonia, High for BOD and Poor for phosphate.

No deterioration – preventing class deterioration or 10% within class

3.7.4 Modelling of the impacts of potential housing growth on ammonia and BOD concentrations downstream of Pagham WwTW indicated that there will be less than 10% deterioration by 2036 (9% and 6% respectively). As such no new permits are expected to be required.

3.7.5 Modelling indicated that phosphate concentrations could deteriorate more than 10% by 2030 (up to 13%). Therefore a permit will be required.

Getting to Good (or 2027 objective)

3.7.6 Pagham Rife is designated as a heavily modified water body. The current WFD overall water body classification for Pagham Rife is Moderate Status, with no objective to improve by 2027. Pagham Rife has Moderate Ecological Status and Moderate Status for physico-chemical quality elements, with an objective to achieve Good Status by 2027. Current classifications show that measures are required now to get the water body to Good.

3.7.7 Pagham Harbour is designated as a heavily modified water body. The current WFD overall water body classification for Pagham Harbour is Moderate Status, with no objective to improve by 2027. Pagham Harbour has Moderate Ecological Status with Poor Status for biological quality elements but Good Status for physico-chemical quality elements. This indicates that it is not the physico-chemical quality of Pagham Harbour which is preventing the water body from achieving Good Ecological Status as such no new permits have been assessed as part of this study.

Indicative permit calculations

3.7.8 Indicative permit limits were calculated for phosphate with the objective of preventing deterioration in excess of 10%. The modelling indicated that a consent limit of 2 mg/l phosphate is required. A high level review indicates that technical solutions exist which would allow achievement of the required consent limit for phosphate (Section 4).

Sewer network capacity

3.7.9 Data from SWS indicate relatively frequent storm tank overflows in 2016-2017. There have been complaints from the public about sewer flooding in this area, although the cause of these issues is not confirmed. Sewer network capacity could be a constraint to growth, but further investigation is required to confirm this.

Habitats Assessment

3.7.10 The Pagham WwTW discharges to the WFD water body Pagham Rife (GB107041012880), which is a SSSI, SPA, Ramsar site and MCZ and subject to coastal water standards under the Nitrates Directive.

3.7.11 After potential housing growth there would be an estimated 12 kg/d increase in nitrate loading from Pagham WwTW. The current contribution to the nitrate loading in Pagham Harbour which is attributable to Pagham WwTW is estimated at 6% (Environment Agency data). However, as the works does not discharge directly into Pagham Harbour, based on a similar situation to Chichester Harbour, the relative contribution is potentially low (although further more detailed modelling would be required to confirm this).

3.7.12 Due to the current favourable condition of Pagham Harbour SSSI and SPA (which is under review) and the low risk of eutrophication and the fact that this study is based on a worst case scenario for factors such as occupancy rates (i.e. double the national average), it is judged the mitigation measures are not required to reduce DIN levels. However, measures such as Catchment Sensitive Farming, demand management and reduced water usage should be pursued in order to work towards reducing levels of N released to the water environment.

Mitigation

3.7.13 Further discussion of mitigation and treatment options is provided in Section 4.

Optimum Solution

- Extend Biofilter (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction.

  Note that this solution will invoke an iron ELV, which may become the limiting parameter, possibly requiring additional treatment such as tertiary solids sand filtration (contingent of the iron ELV applied by the Environment Agency).

Alternative Solution

- Extend Biofilter (nitrifying) with IFAS (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction (IFAS technology has lower footprint)
- Rebuild with IFAS (nitrifying) for additional capacity; incorporate ferric (iron) dosing for chemical phosphorus to achieve TP reduction (IFAS technology has lower footprint).

Optimum Solution Justification

- The identified solution offers an improved ‘buildability’ in terms of extension of the biofilter technology and retrofit of chemical phosphorus technology. The biofilter based solution also offers consistent site technology and lower operating costs.

3.8 Sidlesham WwTW: East Wittering / Bracklesham, Selsey and Birdham Potential Growth Areas

Summary – Sidlesham WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						600-1000
DWF (m^3/d)						
2.5 per household	5,800	4,211	4411	4714	5018	5261
5 per household			4610	5217	5824	6310
Downstream water quality						
Phosphate	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
BOD	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Ammonia	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N

Coastal waters (nitrate)	**Current**	**Percentage of total contribution to receiving waters (EA data)**	**Predicted**
No deterioration	Moderate	19%	Not significant
Loading assessment (N kg\d)	115		140 (22% increase)

Exceed sewer network capacity?[1]	
EA recorded pollution incidents	No reports
Third party information	No evidence of significant issues

Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**
Nitrate (mg-N/l)	15.0	12.0	N/A	N/A
Phosphate (mg-P/l)	1	0.5	N/A	N/A
Ammonia (mg/l)	N/A	0.1	N/A	N/A
BOD (mg/l)	30	3.5	N/A	N/A

Mitigation (preferred option)

- N\A

1. No projections are made of future sewer network capacity exceedance.

3.8.1 The potential growth areas of East Wittering / Bracklesham, Selsey and Birdham are all served by Sidlesham WwTW which discharges into the WFD water body Broad Rife.

Upstream impacts

3.8.2 Sidlesham WwTW is located on the main river Broad Rife. No WwTW has been identified upstream of Sidlesham WwTW and there are no upstream constraints expected to impact on the potential growth areas served by Sidlesham WwTW.

No deterioration – preventing class deterioration

3.8.3 At (WQ) F0003357 no deterioration of WFD class has been identified for any of the determinands downstream of Sidlesham WwTW due to potential housing growth (Figure 3.3). As clearly shown in Figure 3.4, the discharge appears to provide dilution to upstream poor quality water. As such, no

further assessments were undertaken, although it should be noted that to prevent deterioration of status Sidlesham WwTW should continue to produce treated effluent to the same quality as noted in Appendix A.

No deterioration – limiting in class deterioration to below the 10% threshold

3.8.4 The model results for all determinands indicate that by 2036 deterioration will not exceed the Environment Agency's aspirational 10% threshold at the downstream sample point (WQ) F0003357. Therefore no further assessment of discharge permit levels has been carried out.

Getting to Good (or 2027 objective)

3.8.5 The modelling has predicted that potential future housing growth will not have a significant impact on downstream water quality. As such potential future housing growth is not predicted to impact on the water body's ability to reach GES and achieve its WFD objectives.

Downstream impacts beyond main water body

3.8.6 As no significant deterioration is predicted downstream of the WwTW no impacts are expected in the next downstream water body and no further assessments were undertaken.

3.8.7 Broad Rife discharges into Pagham Harbour, and therefore nitrate loading needs to be considered, and is discussed below.

Nitrate loading assessment

3.8.8 The Sidlesham WwTW discharges to Broad Rife. This water body is upstream of Pagham Harbour, which is a SSSI, SPA, Ramsar site and MCZ, a WFD water body and subject to coastal water standards under the Nitrates Directive. Assessment of nitrate loading from Sidlesham WwTW indicated that discharges could increase by 25.1 kg/d by 2036 from the current loading of 114.7 kg/d, representing a 22% increase. The Pagham Harbour water body currently has Good Status under WFD for dissolved inorganic nitrogen, with an objective to remain at Good Status by 2027.

Indicative permit calculations

3.8.9 As no deterioration of WFD class or in excess of the Environment Agency's aspirational 10% threshold have been identified for any of the determinands no new indicative permit limits were calculated (in relation to the freshwater receiving waterbody).

Sewer network capacity

3.8.10 Data from SWS indicate relatively frequent storm tank overflows in 2016-2017. There have been complaints from the public about sewer flooding in this area, although the cause of these issues is not confirmed. Sewer network capacity could be a constraint to growth, but further investigation is required to confirm this.

Habitats Assessment

3.8.11 Sidlesham WwTW discharges into Broad Rife, which discharges into Pagham Harbour, which is designated as an SSSI and an SPA, Ramsar site and MCZ.

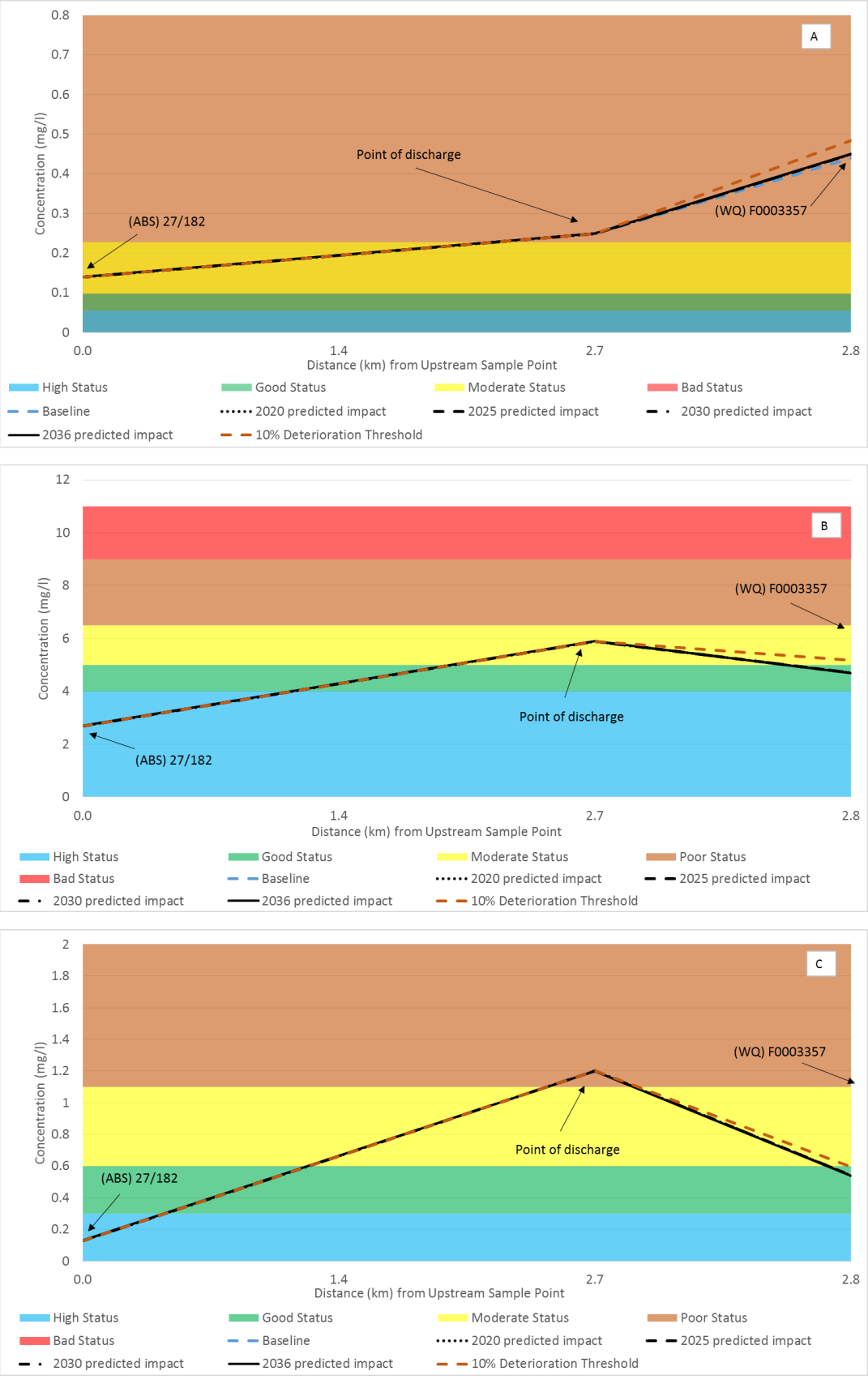
3.8.12 After potential housing growth there would be an estimated 25 kg/d increase in nitrate loading from Sidlesham WwTW. The current contribution to the nitrate loading in Pagham Harbour which is attributable to the works is estimated at 19% (Environment Agency data). However, as the works does not discharge directly into Pagham Harbour, based on a similar situation to Chichester Harbour, their relative contribution is potentially low (although further more detailed modelling would be required to confirm this).

3.8.13 Due to the current favourable condition of Pagham Harbour SSSI and SPA (which is under review) and the low risk of eutrophication and the fact that this study is based on a worst case scenario for factors such as occupancy rates (i.e. double the national average), it is judged the mitigation measures are not required to reduce DIN levels. However, measures such as Catchment Sensitive Farming, demand management and reduced water usage should be pursued in order to work towards reducing levels of N released to the water environment.

Mitigation

3.8.14 No mitigation has been identified as being required, as discussed above.

Figure 3.3 Modelled changes in concentrations (in mg/l), of (A) Phosphates (Average), (B) BOD (90%ile) and (C) Ammonia (90%ile) down Broad Rife from the upstream sample point (ABS) 27/182 to downstream sample point (WQ) F0003357 of Sidlesham WwTW, due to potential growth



3.9 Tangmere WwTW: East of Chichester / Shopwhyke Area, Southeast of Chichester (south of the A259), Oving, Tangmere, Boxgrove, Westhampnett Potential Growth Areas

Summary – Tangmere WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						2100-3000
DWF (m^3/d)						
2.5 per household	3,000	1,232	1,594	1,947	2,573	3026
5 per household			1,955	2,661	3,913	4819
Downstream water quality						
Phosphate	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	Y	Y
BOD	WFD class deterioration?		N	N	N	N
	>10% deterioration?		Y	Y	Y	Y
Ammonia	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Exceed sewer network capacity?[1]						
EA recorded pollution incidents	No reports					
Third party information	No evidence of significant issues					
Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**		
Nitrate (mg-N/l)	N/A	24.4	N/A	N/A		
Phosphate (mg-P/l)	2.6	5.0[2]	0.5	Y		
Ammonia (mg/l)	1.5	0.1	N/A	N/A		
BOD (mg/l)	7	3.4	3[3]	Y		

Mitigation (preferred option)

- Rebuild with nitrifying activated sludge MBR for additional capacity and achieve extremely low BOD; incorporate ferric (iron) dosing for chemical phosphorus reduction to achieve very low TP.

1. No projections are made of future sewer network capacity exceedance.
2. Value based on data from before the new consent was implemented. Therefore value set to 2.6 for modelling.
3. Potential consent requirement only.

3.9.1 The potential growth areas of East of Chichester / Shopwhyke Area, Southeast of Chichester (south of the A259), Oving, Tangmere, Boxgrove Westhampnett are all served by Tangmere WwTW which discharges into the Aldingbourne Rife WFD water body.

3.9.2 Tangmere WwTW has undergone recent upgrades which have been used as the baseline for this modelling.

Upstream impacts

3.9.3 Tangmere WwTW is located on the water body Aldingbourne Rife with no other WwTWs identified upstream. As such upstream influences are not expected to impact on the potential growth areas served by Tangmere WwTW. There is a small section at the top of Aldingbourne Rife of priority river habitat.

No deterioration – preventing class deterioration

3.9.4 No deterioration of WFD class has been identified for any of the determinands downstream of the WwTW due to potential housing growth for the period of the Local Plan (Figure 3.5). The modelling results, based on the new consent, indicate that phosphate will remain at Bad Status (based on modelled results) downstream of the WwTWs, whilst BOD and ammonia will remain at High Status.

3.9.5 The discrepancy in classifications of phosphate at the waterbody level and the stretch level (i.e. immediately downstream) of the WwTW was reviewed. The difference is down to the fact that water bodies are classed based on overall water body condition whilst this study looked at stretches immediately downstream of the WwTW, where conditions could be at a lower status.

No deterioration – limiting in class deterioration to below the 10% threshold

3.9.6 The modelling results indicate that there will be water quality deterioration downstream of Tangmere WwTW which will exceed the Environment Agency's aspirational 10% threshold for phosphate and BOD. There is a predicted deterioration of 13% for the 2030 potential housing growth projection and a 16% deterioration for the 2036 potential housing growth projection for phosphate. For BOD, there is a modelled deterioration of 17%, 30%, 45% and 53% for the 2020, 2025, 2030 and 2036 potential housing growth projections respectively.

Getting to Good (or 2027 objective)

3.9.7 When using the 2015 baseline and potential growth predictions, there was no deterioration in WFD class for all determinands and no further assessments were undertaken, although it should be noted that continued compliance with these classes is dependent upon Tangmere WwTW continuing to produce treated effluent to the same quality as noted in Appendix A.

3.9.8 Based on Environment Agency guidance (see 3.4.8), it has been assumed that a permitted concentration of 0.25 mg/l is the technically achievable limit that could be put on WwTWs. Based on mitigation to reverse deterioration future potential housing growth is not predicted to impact on the waterbody's ability to achieve its WFD objectives, although further modelling may be required in the future to confirm.

Downstream impacts beyond main water body

3.9.9 As no significant deterioration is predicted by the sample point downstream of the WwTW no impacts are expected in the next downstream water body, and no further assessments were undertaken.

Indicative permit calculations

3.9.10 No predicted deterioration of WFD class has been identified for any of the determinands, and on this basis there is no requirement to calculate new indicative permit limits.

3.9.11 Indicative permit limits were calculated for phosphate to prevent predicted deterioration of greater than 10%. The modelling indicates that consents of 0.5 mg/l for phosphate would be required. A high level review indicates that this limit is technologically feasible to achieve. This is further discussed in sections 3.12 and 5.

3.9.12 The Environment Agency has agreed a future permit, following the upgrade to the works that includes a BOD standard of 7 mg/l. Development within the permit would not therefore cause a problem. If there is a need to increase headroom then the BOD standard would need to be revisited.

Sewer network capacity

3.9.13 Data from SWS indicate that although historically there have been relatively frequent storm tank discharges, a recent extension to the works has provided additional capacity and discharges have been infrequent since January 2016. Sewer network capacity should not be a constraint to growth.

Habitats Assessment

3.9.14 No assessment of nutrient loadings to designated downstream sites was carried out.

Mitigation

3.9.15 Further discussion of mitigation and treatment options is provided in Section 4.

3.9.16 Although the Environment Agency have indicated that a tighter BOD permit is not required, in order to look at all options to support potential future housing growth it has been considered.

Optimum Solution

- Rebuild with nitrifying activated sludge MBR for additional capacity and achieve extremely low BOD; incorporate ferric (iron) dosing for chemical phosphorus reduction to achieve very low TP.

  Note that this solution will invoke an iron ELV. However, the membrane separation process will ensure compliance even with a very low ELV value.

Alternative Solution

- Rebuild with granular activated sludge (e.g. Nereda) and tertiary ultrafiltration for additional capacity and achieve extremely low BOD; incorporate ferric (iron) dosing for chemical phosphorus reduction to achieve very low TP.
- Rebuild with assisted-settlement activated sludge (e.g. BioMag) and tertiary ultrafiltration for additional capacity and achieve extremely low BOD; incorporate ferric (iron) dosing for chemical phosphorus reduction to achieve very low TP.
- Extend Biofilter (nitrifying) and incorporate tertiary ultrafiltration for additional capacity, and achieve extremely low BOD; incorporate ferric (iron) dosing for chemical phosphorus reduction to achieve very low TP.

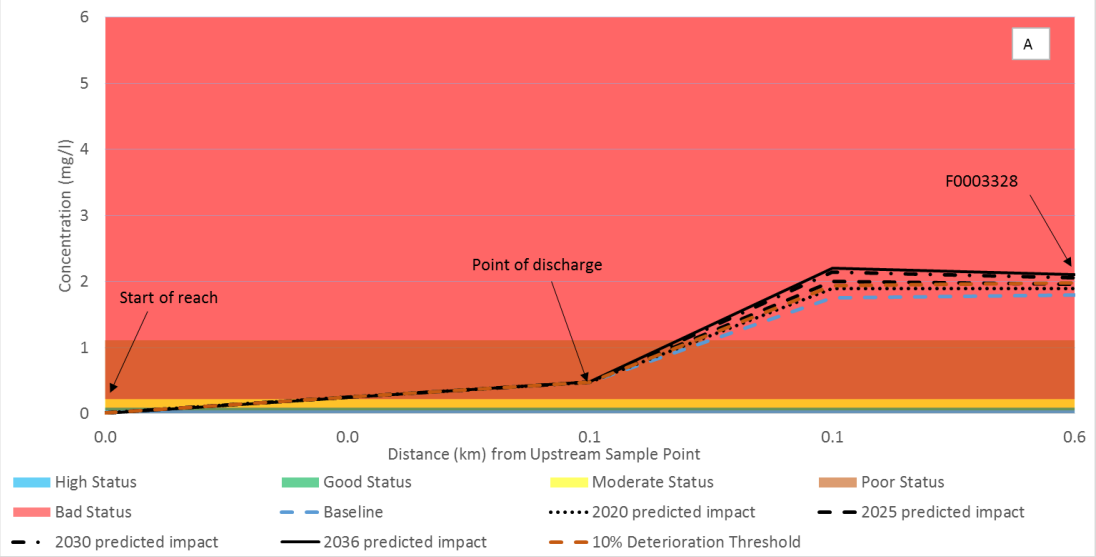
Optimum Solution Justification

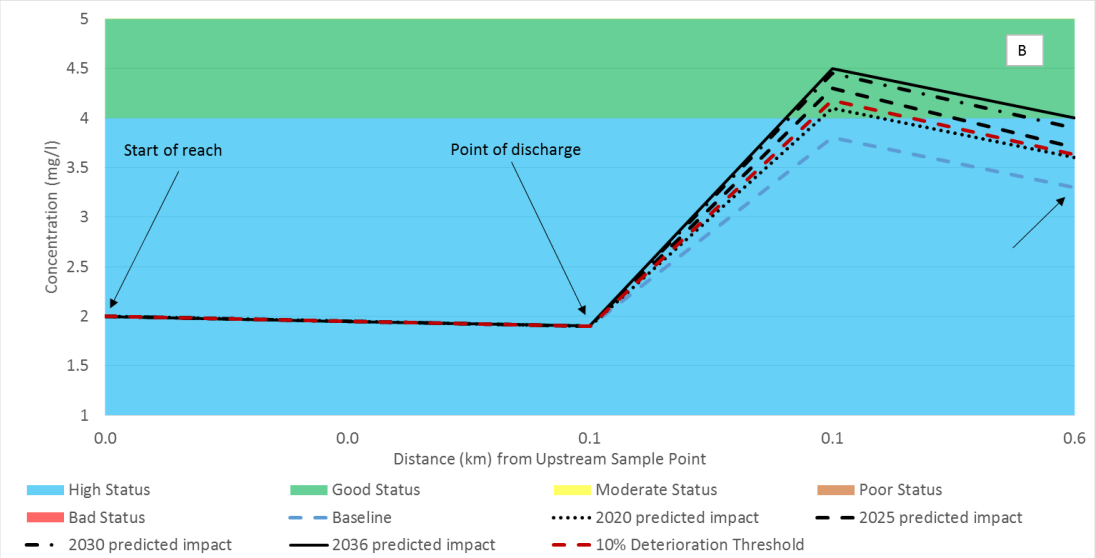
- The identified solution is based on the requirement to achieve an extremely low BOD ELV, which requires use of a membrane based process. A proprietary MBR system will offer the minimum commercial procurement risk.

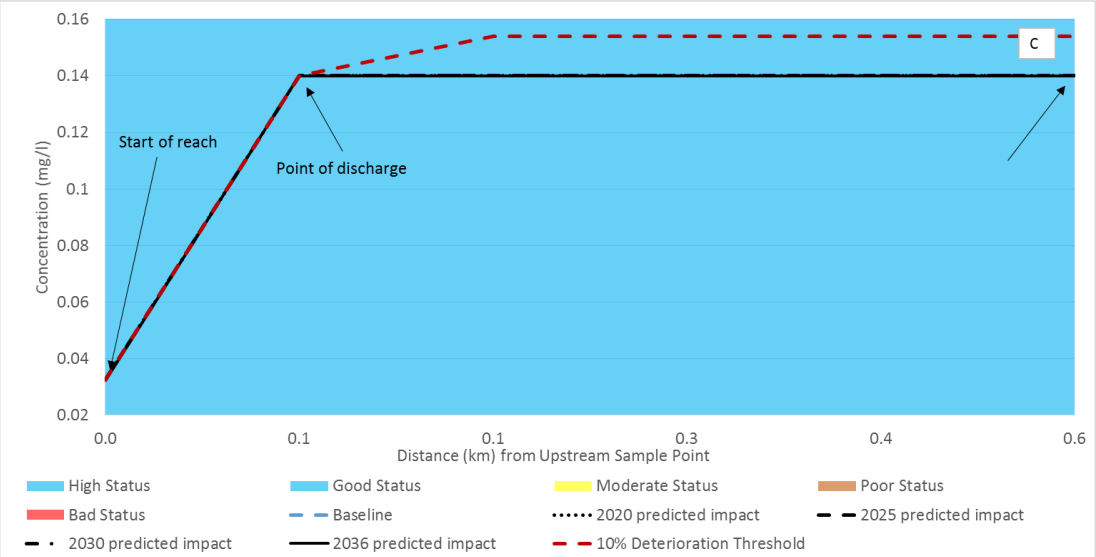
3.9.17 Notes

- BOD ELV 3 mg/l (lower tier) is extremely tight and may not be operationally achievable even with membrane separation technology. Achieving such low BOD concentrations can be considered as innovative/pioneering with many uncertainties attached to it.
- Potentially, the optimum solution could be enhanced to reduce TN rendering it suitable as a source for potable water production – requiring further treatment before introduction into the supply network: this may then avoid discharge to the environment but will likely be a high cost potable water supply. Again, this can be considered as innovative/pioneering with many uncertainties attached to it.

Figure 3.4 Modelled changes in concentrations (in mg/l), of (A) Phosphate (Average), (B) BOD (90%ile) and (C) Ammonia (90%ile) down Aldingbourne Rife from the modelled SIMCAT head of reach to downstream sample point (ABS) 10/41/541301, due to potential growth at Tangmere WwTW







3.10 Thornham WwTW: Southbourne and Hambrook / Nutbourne Potential Growth Areas

Summary – Thornham WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						1000-1500
DWF (m^3/d)						
2.5 per household	6,565	6,580	6765	7012	7261	7460
5 per household			6950	7445	7941	8340

Coastal waters (nitrate)	**Current**	**Percentage of total contribution to receiving waters (EA data)**	**Predicted**
No deterioration	Moderate	3%	Not significant
Loading assessment (N kg\d)	86		91.5 (8% increase)

Exceed sewer network capacity?[1]	
EA recorded pollution incidents	No reports
Third party information	No evidence of significant issues

Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**
Nitrate (mg-N/l)	10.0	8.0	N/A	N/A
Phosphate (mg-P/l)	N/A	N/A	N/A	N/A
Ammonia (mg/l)	N/A	0.6	N/A	N/A
BOD (mg/l)	64	8.7	N/A	N/A

Mitigation (preferred option)

- Modify/extend activated sludge (nitrifying) with IFAS for additional capacity and extend denitrifying sand filters with additional capacity; and enhance denitrification to achieve lower TN.

1. No projections are made of future sewer network capacity exceedance.

3.10.1 The potential growth areas of Southbourne and Hambrook / Nutbourne are served by Thornham WwTW which discharges into the WFD water body of Chichester Harbour.

3.10.2 Additional growth areas within Havant also have the potential to feed into Thornham WwTW. For the purpose of this study the cumulative potential housing growth predictions for Chichester and Havant have been used for Thornham WwTW to assess the overall impact.

Upstream impacts

3.10.3 There are no major WwTWs upstream of Thornham WwTW and as such there are no predicted impacts from upstream growth areas.

No deterioration – preventing class deterioration or 10% within class

3.10.4 No assessment of class deterioration, or deterioration against a threshold of 10% was made for potential growth areas served by WwTWs that discharge into coastal waters.

Getting to Good (or 2027 objective)

3.10.5 Chichester Harbour is designated as a heavily modified water body. The current WFD overall water body classification for Chichester Harbour is Moderate Status, with an objective to achieve

Good Status by 2027. Chichester Harbour is at Moderate Ecological Status and Moderate Status for physico-chemical quality elements, with objectives to achieve Good Status for both by 2027.

Nitrate loading assessment

3.10.6 Thornham WWTW was reviewed for UWWTD and Habitats directive and consequently improvements recently came on line, so it is too early to record an environmental improvement. Thornham WWTW has a new nitrogen permit with a maximum concentration limit of 10 mg/l which was reviewed for growth in 2009. An increase in nitrogen load due to increasing flow up to the permitted flow limit will be accounted for in the concentration limit. As such the nitrogen permit has built in headroom for a small amount of growth, there will be not be deterioration until headroom is used and the permit load is reached.

3.10.7 Assessment of nitrate loading from Thornham WwTW indicated that discharges could increase by 5.5 kg/d by 2036 from the current loading of 86 kg/d, representing an 8.3% increase. EA evidence indicates this is not a significant contributor (8% of 3%) of nitrate to the WFD waterbody.

Indicative permit calculations

3.10.8 No new indicative permit limits were calculated. However, it is noted that should it be determined that mitigation is required for nitrogen discharges to Chichester Harbour, a tighter permit may be required.

Sewer network capacity

3.10.9 Data from SWS indicate relatively frequent storm tank overflows in 2016-2017. There have been complaints from the public about sewer flooding in this area, although the cause of these issues is not confirmed. Sewer network capacity could be a constraint to growth, but further investigation is required to confirm this.

Habitats Assessment

3.10.10 Thornham WwTW contributes to the nitrate loading to Chichester Harbour. Chichester Harbour is part of the Solent Maritime SAC and the Chichester and Langstone Harbours SPA and Ramsar site. The area also includes the Chichester Harbour SSSI which is currently classed by Natural England as being mostly in unfavourable recovering condition (82%, although 15% is at favourable condition. There is a threat on the recovery of the majority of the Harbour due to the potential water quality changes from growth and the uncertainty around efficacy of existing measures to tackle diffuse pollution. The remainder of the units within the site are considered to be unfavourable with no change or unfavourable and declining condition.

3.10.11 In October 2007, the RoC for Chichester and Langstone Harbours Natura 2000 sites highlighted the need to reduce the nitrate discharged into water bodies. A major target was to reduce growth of algal weed from 2.5 kg/m^2 to an acceptable value of 0.5 kg/m^2 across large areas of the harbours. Discharge permits for Apuldram, Thornham and Bosham WWTW were reduced from 15 mg/l to 10 mg/l or less.

3.10.12 Environment Agency source apportionment modelling indicates that Thornham WwTW contributes about 3% of the total nitrate loading to the Harbour, at waterbody scale, although it is noted that further work will be required as part of an HRA to assess potential impacts at feature scale. The predicted increase in nitrogen loading by 2036 of 5.5 kg/d from this works represents a small but measurable proportion of nitrogen to the whole of Chichester Harbour.

3.10.13 Thornham WwTW discharges to Eames Farm which is a Neutral Grassland unit and is a transitional land feature to saltmarsh. It is currently designated as in favourable condition, yet is identified as having a high condition threat risk, as such mitigation measures must be considered. The adjacent intertidal unit is unfavourable recovering.

3.10.14 The potential mitigation solutions should be carried out in combination with other ongoing measures, which include Catchment Sensitive Farming measures, which could potentially reduce nitrogen and phosphate loads from agriculture to the designated area by approximately 12 – 16% maximum (initial estimates based on an study by ADAS commissioned by NE which has not yet been published which looked at the wider Solent in Hampshire and the Isle of Wight (not Chichester Harbour). Conservative estimates indicate that actual improvements would likely be less than this). Catchment management could provide headroom for increases caused by potential future housing growth, subject to the overarching objective of achieving or maintaining favourable condition at designated sites,, although the confidence for this is low. It is not likely the catchment improvements will work in time to provide sufficient headroom in all catchments and the timescale for improvements could be at least 20-30 years, so putting it beyond the scope of the Local Plan if used alone, though as an integrated measures it may be very useful. Other methods of reducing nitrogen include demand management and reduced water usage to ensure that the planned works are nitrogen neutral or a long sea outfall to discharge the treated effluent offshore away from the harbour (this may be required in the long term to deal with the current condition and pressures).

Mitigation

3.10.15 Further discussion of mitigation and treatment options is provided in Section 4.

Optimum Solution

- Modify/extend activated sludge (nitrifying) with IFAS for additional capacity and extend denitrifying sand filters with additional capacity; and enhance denitrification to achieve lower TN.

Alternative Solution

- Extend activated sludge (nitrifying) denitrifying sand filters with additional capacity; enhance denitrification with additional external COD (methanol) dosing to achieve lower TN.

Optimum Solution Justification

- The identified solution offers an improved ‘buildability’ in terms of retrofit of the IFAS technology and addition of the denitrifying sand filters.

3.11 Wisborough Green WwTW: Wisborough Green Potential Growth Area

Summary – Wisborough Green WwTW

			Projected			
	Consent	**Current**	**2020**	**2025**	**2030**	**2035**
Projected population growth						50-250
DWF (m^3/d)						
2.5 per household	324	215	231	258	286	309
5 per household			247	301	358	403
Downstream water quality						
Phosphate	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
BOD	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Ammonia	WFD class deterioration?		N	N	N	N
	>10% deterioration?		N	N	N	N
Exceed sewer network capacity?[1]						
EA recorded pollution incidents	No reports					
Third party information	No evidence of significant issues					
Effluent quality	**Current consent**	**Current performance**	**Required limit**	**Technically feasible?**		
Nitrate (mg-N/l)	N/A	26.6	N/A	N/A		
Phosphate (mg-P/l)	N/A	1.0	N/A	N/A		
Ammonia (mg/l)	3	0.3	N/A	N/A		
BOD (mg/l)	15	4.5	N/A	N/A		
Mitigation (preferred option) • N/A						

1. No projections are made of future sewer network capacity exceedance.

3.11.1 The potential growth area of Wisborough Green is served by Wisborough Green WwTW which discharges into the WFD water body of the River Kird which is upstream of the Upper Arun SSSI.

Upstream impacts

3.11.2 Wisborough Green WwTW is located on the River Kird downstream of Kirdford WwTW and its associated potential growth areas. The modelling predicts that the upstream influences from Kirdford WwTW could cause a significant deterioration in upstream water quality before the watercourse reaches Wisborough Green WwTW (i.e. greater than 10% deterioration).

3.11.3 The Environment Agency's online Catchment Data Explorer indicated that the water body classification for 2016 was Poor Status. In order to achieve the objective of Good Status by 2027 there need to be upstream improvements. However, the Environment Agency also states that it will be disproportionately expensive to achieve this target.

No deterioration – preventing class deterioration

3.11.4 No deterioration of WFD class has been predicted for any determinands downstream of the WwTW during the life of the Local Plan (Figure 3.6). The results indicate that phosphate will remain at Poor Status downstream of the WwTWs, whilst BOD and ammonia will remain at Good Status.

No deterioration – limiting in class deterioration to below the 10% threshold

3.11.5 The modelling indicates that although there will be some deterioration downstream of Wisborough Green WwTW, it will be less than the Environment Agency's aspirational 10% threshold. This indicates that water quality should not be a constraint to future housing development.

Getting to Good (or 2027 objective)

3.11.6 When using the 2015 baseline and growth predictions, ammonia and BOD remained at Good Status downstream of Wisborough Green WwTW. As such no further assessments were undertaken, although it should be noted that continued Good Status is dependent upon Kirdford WwTW continuing to produce treated effluent to the same quality as noted in Appendix A.

3.11.7 The baseline modelled results indicate that phosphate would be at Poor Status at downstream monitoring point (WQ) F0003056. It has been assumed that, based on Environment Agency guidance (see 3.4.8), a permitted concentration of 0.25 mg/l is the tightest possible standard that could be put on WwTWs. However, the new tighter permit level for technically feasible solutions is yet to be confirmed by Ofwat. Potential future housing growth is not predicted to impact on the waterbody's ability to achieve its WFD objectives but further modelling is required to confirm this since recent upgrades have not produced the expected improvement.

3.11.8 Upgrades would be required at Wisborough WwTW and Kirdford WwTW to improve discharge quality, although potential future housing growth is not expected to impact on the achievement of WFD objectives.

Downstream impacts beyond main water body

3.11.9 As no significant deterioration is predicted downstream of the WwTW no impacts are expected in the downstream water body and no further assessments were undertaken.

Indicative permit calculations

3.11.10 As no deterioration of WFD class has been identified for any of the determinands and all deterioration was predicted to be less than 10% no new indicative permit limits were calculated.

Sewer Network capacity

3.11.11 There are no known issues with sewer network capacity.

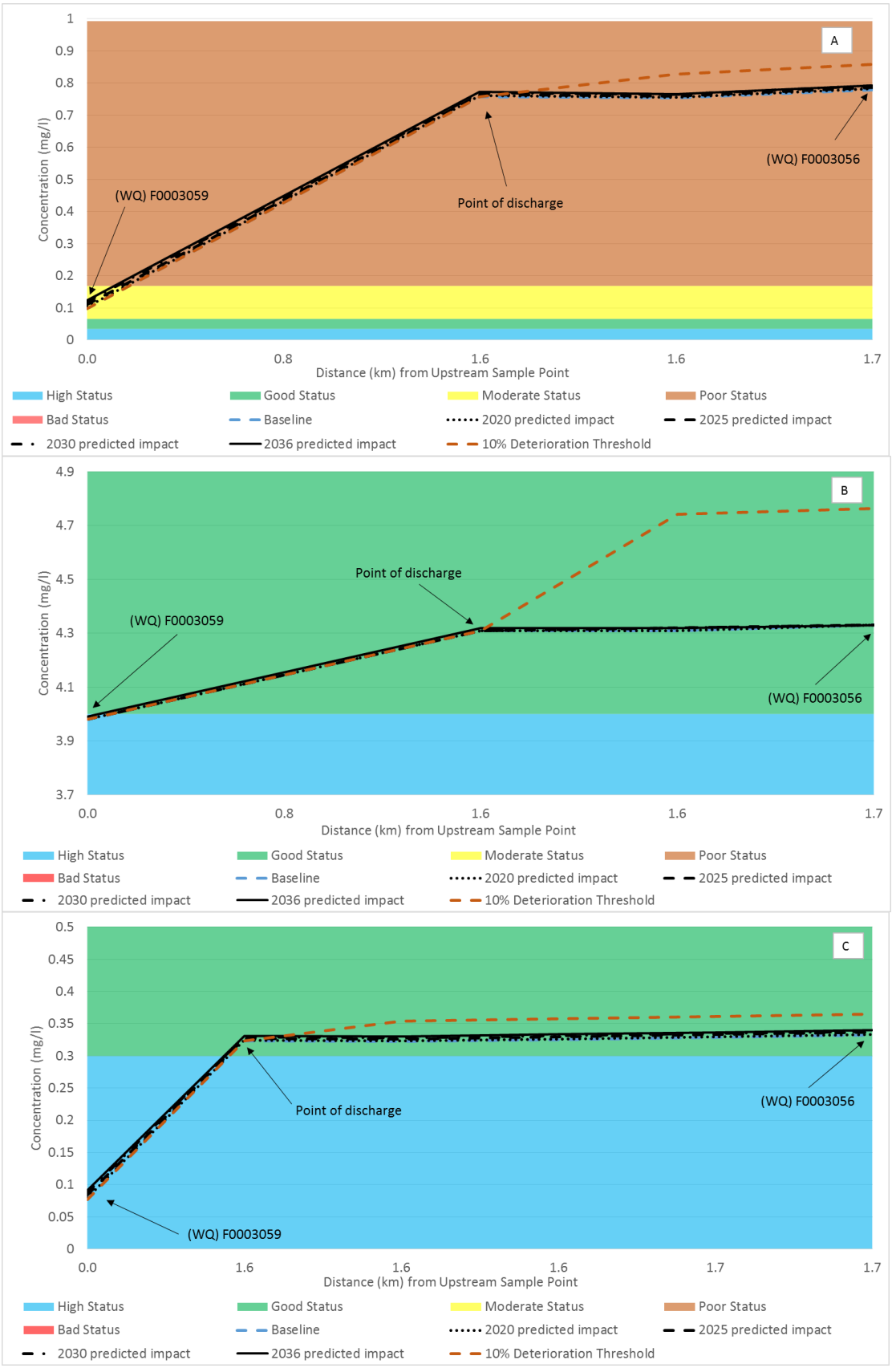
Habitats Assessment

3.11.12 No assessment of nutrient loadings to designated downstream sites was carried out.

Mitigation

3.11.13 No mitigation has been identified as being required.

Figure 3.5 Modelled changes in concentrations (in mg/l), of (A) Phosphate (Average), (B) BOD (90%ile) and (C) Ammonia (90%ile) down the River Kird from the upstream sample point (WQ) F0003059 to the downstream sample point (WQ) F0003056, due to potential growth.



3.12 Cumulative impacts

3.12.1 Cumulative impacts are possible where two or more WwTW drain into the same water body, or downstream water body. This is particularly visible where several WwTW are located within, or can impact on, a single catchment. A review of the results for the individual WwTWs in relation to the WFD catchments has identified three areas where there is potential for cumulative impacts.

Arun Upper

3.12.2 There are three WwTWs directly related to the Arun Upper catchment that could potentially have a cumulative impact on WFD compliance, including:

- Loxwood WwTW;
- Kirdford WwTW; and
- Wisborough Green WwTW.

All of these WwTW are within the Arun Upper catchment, however Loxwood is not on the same river as Kirdford and Wisborough Green WwTWs. These WwTW are located on the river Kird and as such there is potential for cumulative impacts to occur. The nitrogen loading from Kirdford WwTW is predicted to increase from baseline conditions by 75% by 2036 and that from Wisborough Green is predicted to increase by 44%, equating to a total increase of about 8 kg-N/day from both works combined. Although this does not directly correlate to nitrate concentrations, it does indicate an increased risk to the Arun Upper catchment, and measures will be required to reduce the future potential loading of nitrate. Modelling suggests that there will be no significant increase in phosphate concentrations downstream of either Kirdford (based on implementation of the mitigation highlighted in Section 4) or Wisborough Green WwTW.

Chichester Harbour

3.12.3 There are three WwTWs which discharge into Chichester Harbour, and may have the potential for cumulative impact on WFD compliance, including:

- Apuldram (Chichester) WwTW;
- Bosham WwTW; and
- Thornham WwTW.

The total projected increase in nitrogen loading from the three works combined is approximately 20 kg-N/day. Although this does not directly correlate to nitrate concentrations, and represents only a small proportion of the total nitrogen loading to the harbour, it does indicate an increased risk to Chichester Harbour and measures may be required to reduce the future potential loading of nitrate.

Pagham Harbour

3.12.4 There are two WwTWs which discharge into streams which discharge into Pagham Harbour, with the potential for a cumulative impact on WFD compliance of the water body including:

- Pagham WwTW; and
- Sidlesham WwTW.

The total projected increase in nitrogen loading from the two works combined is approximately 37 kg-N/day. Although this does not directly correlate to nitrate concentrations, it does indicate a combined risk to Pagham Harbour and measures may be required to reduce the future potential loading of nitrate.

3.13 Summary

3.13.1 Table 3.4 presents a summary of the results of the modelling work. Potential growth areas in which housing growth is predicted to cause deterioration in WFD class or in excess of the 10% threshold are shown.

Table 3.4 Summary of outcomes of modelling

WwTW	Receiving water body	Deterioration (WFD class)	Deterioration (10% threshold)
Apuldram (Chichester)	Chichester Harbour GB580705210000	n/a	n/a
Bosham	Chichester Harbour GB580705210000	n/a	n/a
Kirdford	Kird GB107041012300	N	Y
Loxwood	Loxwood Stream GB107041017970	N	N
Pagham	Pagham Rife GB107041012880	N	Y
Sidlesham	Broad Rife GB107041006580	N	N
Tangmere	Aldingbourne Rife GB107041011980	N	Y
Thornham	Chichester Harbour GB580705210000	n/a	n/a
Wisborough Green	Kird GB107041012300	N	N

N/A = not assessed, N = no deterioration, Y= risk of deterioration

4. Mitigation

This section provides an overview of the mitigation that could be implemented for the WwTWs and their associated sewer networks

4.1 Overview

4.1.1 The study has indicated that various measures are required to mitigate the impacts on water quality from future housing growth, and to support development. These are required either to prevent deterioration against WFD objectives and aspirational objectives (i.e. 10% deterioration) or to reduce nitrate or phosphate loading which could potentially affect a designated area. Mitigation measures could range from site based upgrades to improvement the level of effluent treatment or to catchment measures to reduce nitrate levels from non WwTW sources in the catchment, or policy measures, for example, requiring that housing development is “nitrate neutral”. Where possible, an indication of lead in times for delivery of measures was also highlighted to help ensure that all measures could be put in place in time to support future housing growth.

4.1.2 Based on the outcomes of this study and the original 2010 strategic review[16] an initial strategic overview of potential options were undertaken. This was done in order to provide a high level assessment of potential mitigation that could be further researched or delivered to support future housing growth. Options which were not considered further were screened out. Details of the options reviewed are presented in Table 4.1.

4.1.3 The optimal identified mitigation measures at each individual works are reported in Section 3, where applicable. This section provides an overview of treatment options and summary of the results.

[16] Chichester District Council, 2010 Strategic Growth Study Wastewater Treatment Options for Chichester District. 17th August 2010

Table 4.1 Potential treatment mitigation options to support housing growth

Option	Description	Potential WwTWs	Justification for being scoped out of this study
Reduce Existing Connections to Wastewater System	This could include creating new WwTWs to take flows from very large contributors of effluent to the public sewer networks or pockets of areas (e.g. industrial estates or distinct urban areas).	All	This would require creating new small scale WwTWs. So although the option would reduce pressure on the larger works it would still lead to an overall increase in loading of pollutants to surface waters but would also involve increasing the risk of incidents by having more smaller WwTWs discharging effluent that would need regulating but might be too small and privately owned to be considered within the OfWAT water company business cycles.
Separate surface water drainage from foul sewer network	This would involve separating surface water drainage from foul sewer network in networks that exist now (all new networks have to be separated). This would produce the greatest benefits in urban areas (e.g. Chichester) where the high impact on the networks is seen.	All	This is unlikely to be plausible on a large scale. Within urban areas where old combined sewers are located large scale engineering works might be required to create a whole new surface water or sewer network. This would also not deliver improvements within the timeframe of the local plan. Additionally the costs would potentially be prohibitive and there might not be possible to fit a new network in some locations.
Introduce water efficiency measures (including Grey Water usage)	This would involve implementing water efficiency measures (e.g. reduced water usage in showers and toilets or grey water usage) in current urban areas. The reduce water usage would reduce the volumetric loading to the sewer network and WwTWs and therefore create headroom capacity for future housing.	All but a focus on Chichester and other areas with current sewer network issues	Measures are generally being implemented by water companies already. Additionally the scale of improvement would be dependent upon the scale of uptake and longevity of the public keeping measures in place. As such it could not be appropriately quantified for this study and would have a low level of confidence in its ability to support future housing growth.
Effluent reuse to reduce volume of water discharged*	This would involve redirecting treated effluent to a water treatment facility in order to create potable water. This would potential require treating the effluent to a higher quality and building associated infrastructure e.g. pipes or a new WTW	All	This could represent a good alternative to water supply in the region. However, for the purpose of this study it was not deemed viable due to the delivery time, costs, and uncertainties around the current round of water resource planning being undertaken by water companies.
Discharge to ground	This would involve changing a surface water discharge to groundwater. This would reduce the loading to surface waters of pollutants and thereby help with the WFD status and designated areas.	All	This was scoped out as it would be unlikely to get consent from the EA due to the Groundwater Daughter Directive and the WFD and the potential risks to groundwater particularly from nitrate.
Change discharge location (not including long sea outfalls)	This would include building new discharge pipes from the current WwTWs and discharging to a new river or catchment in order to help protect downstream quality in the target river.	All	Although a viable option that could be implemented at some of the works, due to the locations of the WwTWs it is unlikely that new discharge points would be located that would remove the problem from designated sites (e.g. coastal areas)

Option	Description	Potential WwTWs	Justification for being scoped out of this study
Catchment management including reductions from - agriculture; private discharges; landfill leachate; intercepting indirect atmospheric deposition; and industrial discharges.	This would include targeting all sources of N or P into a catchment upstream of a WwTW.	All	For phosphate in some catchments these sources do not represent a large enough source combined to mitigate against future housing growth. Additionally the cost and issues with regulatory regimes mean that the delivery and success of this measure would have a very low level of confidence.

Note: Although these options are scoped out of this study they should still be considered in the future as they could potentially deliver the level of improvements required.

4.2 WwTWs and water quality

4.2.1 Measures to improve WwTWs and water quality in effluent were primarily based on site level requirements although catchment management was considered for issues highlighted for nitrate.

Ammonia and BOD

4.2.2 Although Kirdford WwTW was predicted to have >10% deterioration for ammonia by 2030, ammonia remained at High Status. As such mitigation of deterioration of ammonia by considering consent limits was not required for Kirdford WwTW.

4.2.3 Tangmere WwTW was predicted to require new permit limits for BOD, to prevent the predicted >10% deterioration. However, further work by the Environment Agency and Southern Water has resulted in a new permit including a BOD limit of 7 mg/l being determined. Any future development within this revised permit should not, therefore, result in any deterioration.

Phosphate

4.2.4 Kirdford WwTW was predicted to require new permit limits for phosphate by 2025, to prevent the predicted >10% deterioration. The modelling indicated that a consent limit of 3 mg/l would be required.

4.2.5 Tangmere WwTW was predicted to require new permit limits for phosphates, to prevent the predicted >10% deterioration. The modelling indicated that a consent limit of 0.5 mg/l would be required.

4.2.6 Pagham WwTW was predicted to require new permit limits for phosphates, to prevent the predicted >10% deterioration. The modelling indicated that a consent limit of 2 mg/l would be required.

4.2.7 These potential standards are technically feasible to achieve. As such deterioration of phosphates concentrations can be avoided and future housing growth supported.

Treatment options

4.2.8 The conventional technologies for phosphate removal in sewage treatment in the UK are commonly based around the addition of iron salts to the final effluent. This binds with the phosphates to produce a flocculent which is allowed to settle out before the effluent is discharged. Other treatment methods for removal of phosphate from effluent include biological treatment (either in activated sludge or the final effluent). Current guidance indicates that onsite treatment methods can be put in place to ensure a WwTW produces an effluent quality of 0.25 mg/l or less (based on national Environment Agency guidance). It was previously 0.5 mg/l. It is therefore feasible to deliver the reductions required to support future housing growth and prevent deterioration.

Lead in time for construction and installation of any infrastructure

4.2.9 The lead in time for construction/installation of any infrastructure is dependent on a number of factors including the size of the existing works and the complexity of the solution and of its installation on site (especially in the case of limited land availability). The scale of indicative permits identified as potentially required in order to allow future growth can be achieved through current technology (i.e. iron salt dosing or upcoming technology such as polymer treatment) and only a short lead in time is expected to be required. However, this would need to be confirmed with Southern Water as part of their next round of business planning (2020-2025).

Catchment options

4.2.10 As well as treatment of the final effluent by water companies, WwTWs phosphate concentrations can also be reduced by targeting other catchment sources which include:

- Runoff from agricultural land;
- Private discharges;
- Industrial discharges; and
- Effluent reuse.

4.2.11 Reduction of other sources can be undertaken through catchment measures such as agri-environment schemes, permit standards on industrial and private discharges and changing the discharge location. A combination of these measures at the catchment level can bring about the level of reductions required to support housing growth. Additionally they can form part of an integrated set of options e.g. effluent reuse can provide a supply of drinking water and also reduce the amount of effluent discharged to a river and therefore provide water quality improvements. However, although these are all technically feasible measures, the level of reductions possible and the timeline and certainty for improvements are much more variable than for end of pipe solutions at WwTWs.

Nitrate

4.2.12 Apuldram, Bosham and Thornham WwTWs have been identified as requiring integrated mitigation strategies, in order to prevent future housing development causing increased DIN levels in designated areas.

Treatment options

4.2.13 The conventional technologies for nitrate removal in sewage treatment in the UK are based around biological denitrification (which involves the biological reduction of nitrate into nitric oxide, nitrous oxide and mainly nitrogen gas). The process happens in the absence of dissolved oxygen which leads some heterotrophic bacteria to use nitrate as a terminal electron acceptor thereby reducing nitrate to nitrogen gas. It requires nitrate, a carbon source (sometimes external, in which case typically methanol), the right bacteria and absence of dissolved oxygen. Biological denitrification is an integral part of biological nitrogen removal, which involves both nitrification (ammonia conversion into nitrate) and denitrification.

4.2.14 These conventional biological denitrification technologies in the UK include activated sludge plants (ASP) configured to achieve biological nitrogen removal (i.e. both nitrification and denitrification).

4.2.15 Alternatives to biological nitrogen removal are generally less cost effective and so are used less often in general and in particular in the UK. They include:

- Air stripping of ammonia with pH adjustment (high pH);
- Breakpoint chlorination of ammonia directly into nitrogen gas;
- Ion exchange; and

- Membrane separation such as nanofiltration (NF) or reverse osmosis (RO) to remove dissolved nitrogen compounds (as well as particle-bound nitrogen).

Lead in time for construction and installation of any infrastructure

4.2.16 Lead in times and issues for nitrate removal are similar to those for phosphate, and like those of phosphate will be site specific due to site constraints.

Catchment options

4.2.17 As well as treatment of the final effluent at water company WwTWs nitrate concentrations can also be reduced by targeting other catchment sources which include:

- Agriculture;
- Private discharges;
- Landfill leachate;
- Indirect atmospheric deposition;
- Industrial discharges; and
- Effluent reuse.

4.2.18 Reduction of other sources can be undertaken through catchment measures such as agri-environment schemes, prevention of livestock entering rivers, reductions in fertiliser use, increased use of buffer strips and other rural SuDs, permit standards on industrial and private discharges and changing the discharge location. A combination of these measures at the catchment level can bring about the level of reductions required to support housing growth. Additionally they can form part of an integrated set of options e.g. effluent reuse can not only provide a supply of drinking water but could also reduce the amount of effluent discharged to a river and therefore provide water quality improvements. However, although these are all technically feasible measures the level of reductions possible and the timeline and certainty for improvements are much more variable than for end of pipe solutions at WwTW.

4.2.19 One known problem with catchment level solutions for nitrate is the lead in time for seeing reductions in nitrate in raw water due to the time of travel through groundwater, which can be of the order of decades. This can lead to uncertainty in the effectiveness of measures and therefore whether the measure is appropriate to support future housing growth. As such it should be noted that although catchment measures for nitrate are recommended, they are done so for the lifetime of the houses themselves rather than limited to the lifetime of the Local Plan. Recovery times for groundwater can be long, potentially up to 40 years (SDNP Authority, 2014[17]), so over the lifetime of the Local Plan (up to 2036) some reductions in nitrate would be expected but they would be relatively small (circa 10%). Additionally further study may be required to clarify what the true sources of nitrate into coastal waters are, as well as the actual levels of reduction required to protect saltmarshes, seagrass beds and other coastal features affected by water quality.

WwTW Capacity

4.2.20 It is expected that capacity upgrades and/or improvements are likely to be needed for all of the WwTWs considered in this report at some stage in the Plan period in order to accommodate the increase in sewage from future housing development. Tangmere WwTW currently provides the most capacity for growth and an upgrade would only be required at the later stages. This is based on the worst case scenario of a household occupancy of 5 people per household. However, even when basing the housing occupancy on the national average of 2.5 people, capacity upgrades would still be required.

[17] South Downs National Park Authority - 2014, South Downs Collaborative Nitrate Modelling - Nitrate Modelling Report. prepared by Amec Foster Wheeler pp 138

4.2.21 A capacity upgrade to a WwTW generally requires a physical increase to the WwTW size although it can be achieved by changes to management practices at the WwTW. The scale of the upgrade can have significant implications on lead in times for when the WwTW would be fully operational. Table 4.2 shows the general lead in times used when planning for these such upgrades.

Table 4.2 Lead in times for options to increase capacity at WwTWs

Interventions	Lead in times
0 – 10% increase : Review consent	N/A
10%-20% increase: Reduce Infiltration and/or water use reduction measures.	1 – 2 yrs
20%-30% increase: Consider transfer of flows to an adjacent WwTW which has capacity	1 – 3 yrs
Greater than 30% increase: Consider upgrade of small works	2 – 5 yrs
Greater than 30% increase: Consider upgrade of large works	5 -10 yrs.

4.2.22 Where it is not feasible to increase the capacity of the works alternative measures should be considered such as redirecting flow away from a WwTW to one with available capacity.

4.2.23 An additional range of measures are generally considered by Southern Water. These include:

- Accommodation at existing catchment WwTW, with minor investment (new permit conditions achievable with existing plant/process);
- Accommodating at existing catchment, with capital expenditure (provide more treatment capacity);
- Transferring flows from development to adjacent catchment where headroom exists or investment requirements are lower than at catchment WwTW;
- Transferring flows from development and closure of catchment WwTW with transfer of flows, where costs stack up and acceptable to the environment;
- New WwTW to serve large development locations (typically last resort);
- Create capacity by removal of surface water from catchment.

Sewer Capacity

4.2.24 Capacity issues with the sewer networks should be resolved in line, or in line with any upgrades to WwTWs. Potential measures include:

- Reduce infiltration to sewer networks
  - This would include either repairing the current sewer network to prevent groundwater egress or sealing of selected manhole covers located in areas prone to surface water flooding (based on EA maps). This should be prioritised where networks are known to be at risk (i.e. Southbourne, Bosham, Birdham, East Wittering, Chichester and Ifold) and can then be expanded based on SW and EA evidence.
  - Infiltration (and excessive storm overflow) is also a known issue at Apuldram (as noted in Section 3.3) and an Infiltration Reduction Plan is now in place.

Preferred/Alternative solutions

4.2.25 Following the potential options noted above a range of options were reviewed based on the needs of the assessments and meeting the relevant objectives.

Treatment Techniques Review

4.2.26 This section critically reviews the applicability of identified potential treatment techniques.

Effluent reuse to reduce volume of water discharged

4.2.27 The MWH report concludes on this option;

- "Conclusion: The lack of confidence in relatively continuous demand for final effluent and low likelihood it will be acceptable for use anyway means that this option is unlikely to be a suitable solution ……."

4.2.28 The Amec Foster Wheeler Process Team agrees with the MWH conclusion, although it is noted that the acceptability of this option should be regularly reviewed.

Upgrade BAT at WwTW – nutrient stripping

4.2.29 Nutrient stripping, specifically phosphorus reduction, is a process that is typically applied to concentrated streams such as anaerobic sludge digester discharges used for sludge processing. As such, these types of process are not applied to main treatment processes at sewage treatment works. Further, the treated stream will contain relatively high phosphorus concentrations, far in excess required to meet site emission limit values (ELVs). This technique is not appropriate as a main process treatment.

Air stripping of ammonia with pH adjustment (high pH)

4.2.30 Air stripping of ammoniacal-nitrogen could be applied to a concentrated waste stream such as anaerobic sludge digester discharges used for sludge processing. As such, this type of process is not applied to main treatment processes at sewage treatment works. Further, the treated stream will contain relatively high ammoniacal-nitrogen concentrations, far in excess required to meet site emission limit values (ELVs). This technique is not appropriate as a main process treatment. Additionally, the process generates a concentrated waste stream, which requires further treatment and disposal. Whilst this may generate a potential recovered nitrogen stream the costs will be prohibitively expensive.

Breakpoint chlorination of ammonia directly into nitrogen gas

4.2.31 Ammoniacal-nitrogen oxidation using powerful chlorine-based oxidants has a number of practical barriers to successful implementation. The chlorine demand for treated final effluent will be very high due to the residual organic contamination. This increases cost, capital, operating and whole-life. More significantly, there is the very real risk of generating halogenated-organics increasing risk to the environment and human health. Dechlorination, through sulphur compound dosing, may need to be applied to ensure that residual chlorine is not discharged to the environment. Lastly, the handling of large quantities of chlorine based chemicals is a health and safety risk from a number of perspectives. The Amec Foster Wheeler Process Team believes this technique to be inappropriate for the proposed duty.

Ion exchange

4.2.32 The MWH report concludes that this technique is not a commercially viable option for a number of reasons. The Amec Foster Wheeler Process Team agrees with the MWH conclusion. Indeed, the technique may not be technically feasible since residual organic contamination in the treated effluent may foul the exchange medium reducing its removal effectiveness. Further, even if the

technique could remove ammoniacal-nitrogen to low concentrations, the process generates a concentrated waste stream, which requires further treatment and disposal. Whilst this may generate a potential recovered nitrogen stream the costs will be prohibitively expensive. It is believed that this process has not been proven at the commercial scale, certainly not in the UK.

Membrane separation such as nanofiltration (NF) or reverse osmosis (RO) to remove dissolved nitrogen compounds (as well as particle-bound nitrogen

4.2.33 The MWH report concludes on this approach;

- "Ultrafiltration and reverse osmosis would be prohibitively expense in the context of this scheme, both in terms of capital and operational expenditure and in general terms. Effluent re-use is only considered commercial feasibility in resource zones where there is a considerable deficit in water supply over future years. It is not clear whether this is the case in the Chichester district. Portsmouth Water do not currently have a water deficit issue but the Environment Agency may take a wider view as the Southern Water resources zone further to the east is water resources constrained. Indeed the Environment Agency are particularly keen to establish effluent reuse in the south-east of England (where feasible) as a water resources solution."

4.2.34 A membrane technology approach would have to be aligned with a water recovery/reuse scheme as described by MWH, which is unlikely to be in place at the specified locations. Additionally, the process will generate a relatively large volume of concentrated ammoniacal-nitrogen, say about 5 – 15 % of the main process, which requires further treatment and disposal. Export of such volumes from even a relatively small site will require a large number of road tanker movements. The Amec Foster Wheeler Process Team agrees with the MWH conclusion.

5. Action plan

5.1 Water quality

5.1.1 During the lifetime of the Local Plan measures will need to be put in place at each WwTW and their associated catchments and sewer networks in order to tackle current and future water quality issues to support future housing growth. Measures include:

- Upgrades to reduce phosphate concentrations
- Upgrades to increase physical capacity
- Upgrades and catchment measures to reduce nitrate concentrations
- Upgrades to sewer networks.

5.1.2 Each set of improvements required, whether at catchment or WwTW scale, have a lead in time for any construction work or for observing the improvements.

5.1.3 The action plan shown in Table 5.1 shows the upgrades and various mitigation measures.

5.2 Risk to delivery

5.2.1 A high level risk assessment was undertaken to identify the likelihood that the options identified to support growth might not be delivered within the lifetime of the plan. The risk assessment took into account for the methods of the assessment, factors such as looking at a worst case scenario and sensitivity analysis. The risks were assigned based on the likelihood of funding against the potential for an action to be delivered within the lifespan of the Local Plan. Figure 5.1 Shows the matrix used to assess the risks and the results are shown in Table 5.1.

Figure 5.1 Risk matrix for the potential delivery of measures to support future housing growth

		Funding		
Delivery		Set funding streams and processes in place (e.g. water companies NEP)	Potential funding streams	No confirmed funding stream or uncertainty
	Mitigation and improvements can be delivered within the local plan timescale	LOW	LOW	MEDIUM
	Unlikely that the mitigation and\or improvements can be delivered within the local plan timescale	LOW	MEDIUM	HIGH
	Unlikely that the mitigation and\or improvements can be delivered within the local plan timescale	MEDIUM	HIGH	HIGH

Treatment upgrades to WwTWs

5.2.2 Treatment upgrades to WwTWs have a very prescribed and set methodology for implementation (i.e. 5 year water company business planning cycles). This involves water companies working with the Environment Agency and Ofwat to set out their plans for any upgrades for a five year period (e.g. 2020-2025). Within this framework it is possible to highlight any upgrades required to support

housing growth and ensure compliance with the WFD. Schemes are funded based on customer acceptance.

5.2.3 Based on the indicative permits that were calculated and when they would have to be implemented, it has been assessed that there is a low risk that the measures would not be delivered in time to support future housing growth. The exception is the BOD improvements highlighted for Tangmere WwTW, as these have been assessed as being required more immediately.

Capacity upgrades to WwTWs or sewer networks

5.2.4 As with treatment upgrades to WwTWs the planning and funding for these types of measures happens in line with the 5 year water company business planning cycles, and the risk of non-delivery is thus low.

5.2.5 The data provided by Southern Water indicate that most of the WwTW are likely to require upgrades during the lifetime of the Local Plan. Upgrades could be implemented in the next business cycle.

5.2.6 It is known that sewer capacity and storm overflows are issues at Apuldram WwTW and there is anecdotal evidence of issues at other WwTWs. It is recommended that more detailed surveys are undertaken once specific development sites are identified. Additionally water companies could use their Water Resource Management Plans to implement measures such as water efficiency at the earliest opportunity. These can be undertaken when required and as such have no risk assigned.

Catchment management

5.2.7 Based on the scale of improvements that are likely from catchment management measures (e.g. up to 10-20% maximum reductions in nitrate from agriculture) it has been assessed that there is a high risk that the measures either would not be delivered in time to support future housing growth or that the lag time for improvements would mean no improvements in water quality would occur during the lifetime of the plan. As such, catchment management should be pursued, but to help support future housing growth rather than relied upon for primary delivery.

Table 5.1 Summary of timescales for required improvements to WwTW to ensure compliance with objectives along with risks of failing

WwTW	Main WFD Catchment	Relevant downstream catchment and Designated area	Indicative required permit	Catchment solutions[1]	By 2020 (End AMP 6)	By 2025 (End AMP 7)	By 2030 (End AMP 8)[2]
Apuldram (Chichester)	Chichester Harbour	Chichester Harbour SSSI; Solent Maritime SAC; Solent and Chichester and Langstone Harbours SPA	Nitrogen permit may be required	Recommended for nitrate (high) Water efficiency measures	Sewer network upgrade (medium)		nitrate (low)
Bosham	Chichester Harbour	Chichester Harbour SSSI; Solent Maritime SAC; Solent and Chichester and Langstone Harbours SPA	Nitrogen permit may be required	Recommended for nitrate (high) Water efficiency measures		WwTW capacity upgrade (medium)	nitrate (low)
Kirdford	River Kird	Arun (u/s of Pallingham)	Phosphate 3mg/l	Recommended for phosphate (high) Water efficiency measures		WwTW capacity upgrade (medium) phosphate (low)	
Loxwood	Loxwood Chidding	Arun (u/s of Pallingham)	N/A	Water efficiency measures		WwTW capacity upgrade (medium)	
Pagham	Pagham Rife	Pagham Harbour SSSI & SPA	Phosphate 2mg/l	Water efficiency measures	Phosphate	Phosphate (low)	WwTW capacity upgrade (medium)
Sidlesham	Broad Rife	Pagham Harbour SSSI & SPA	N/A	Water efficiency measures		WwTW capacity upgrade (medium)	
Tangmere	Aldingbourne Rife	Sussex TraCs	Phosphate 0.5mg/l	Water efficiency measures	BOD[3]		WwTW capacity upgrade (low) phosphate (low)
Thornham	Chichester Harbour	Chichester Harbour SSSI; Solent Maritime SAC; Solent and Chichester and Langstone Harbours SPA	Nitrogen permit may be required	Recommended for nitrate (high) Water efficiency measures		WwTW capacity upgrade (medium)	nitrate (low)
Wisborough Green	River Kird	Arun (u/s of Pallingham)	N/A	Water efficiency measures			WwTW capacity upgrade (medium)

1 Due to the nature of catchment solutions it is recommended that they commence as soon as possible to ensure achieving the required levels of reduction.
2 Schemes needed by 2036 have been put against 2030 in order to ensure they are in place before the end of the Local Plans
3 Noted although EA indicate it should not be required based on recent work they have undertaken

6. Conclusions

6.1.1 A Water Quality Assessment has been undertaken to assess the potential impact of housing growth and associated increases in effluent discharge in a number of potential growth areas in the emerging Chichester Local Plan.

6.1.2 The Local Plan will plan for housing growth to 2035.

6.1.3 The potential growth areas are served by nine WwTWs. Modelling of freshwaters and assessments of coastal waters was carried out to predict the potential impact of increased discharge volumes from the WwTWs on water quality in receiving WFD river waterbodies. Additionally high level assessments were carried out using EA evidence against impacts of potential housing growth on WwTWs discharging to coastal waters.

6.1.4 The additional phosphate discharge from Kirdford WwTW and Pagham WwTW are predicted to cause a deterioration in downstream water quality in excess of the aspirational 10% target set by the Environment Agency. Mitigation is likely to be required to prevent this deterioration.

6.1.5 The WwTWs at Apuldram, Bosham and Thornham discharge into Chichester Harbour. The projected increase in nitrate discharge from these works may require mitigation to prevent damage to this designated site beyond the issues already noted through the WFD and habitats assessments undertaken by the EA and NE. Further investigation is also required into potential impacts of increased effluent discharges on Pagham Harbour.

6.1.6 The assessments indicate that all the WwTWs might need to consider upgrades to provide increased volumetric capacity. Additionally the sewer networks related to Chichester and Loxwood WwTWs will need upgrading and the rest investigating as growth occurs in order to ensure that there is sufficient capacity in the networks to reduce the volume and frequency of any storm related spills.

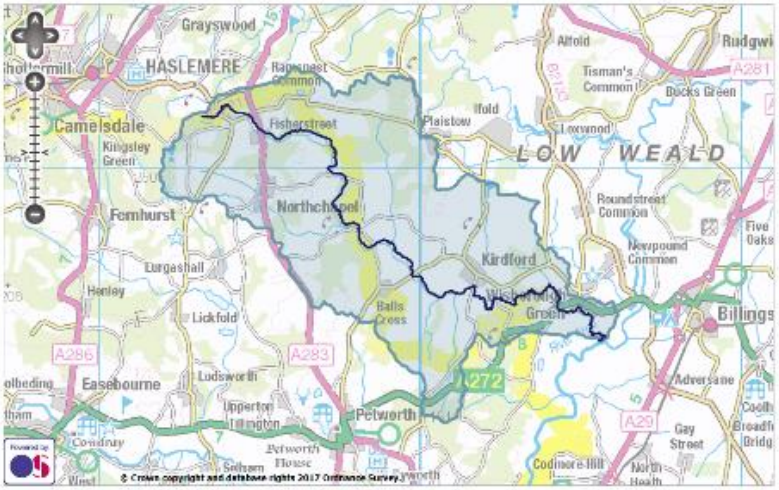
6.1.7 Based on the impacts predicted from future housing growth traditional end of pipe solutions (e.g. improved treatment at the WwTW) provide the most low risk solutions for ensuring that future growth can be supported. However, wider options such as water efficiency measures (to reduce the volume of effluent) and catchment solutions (to reduce other sources of phosphates and nitrate) should be pursued as well, despite the higher risk that they will not deliver the level of improvements required within the necessary timescale. The required upgrades for capacity have been assessed as a medium risk due to them being required now. However, as the WwTWs are currently operating with this constraint so long as any potential upgrades are identified in detail and delivered in the next water company business cycle future housing growth will not be limited.

Appendix A
Input data and modelling outputs (Excel workbook)

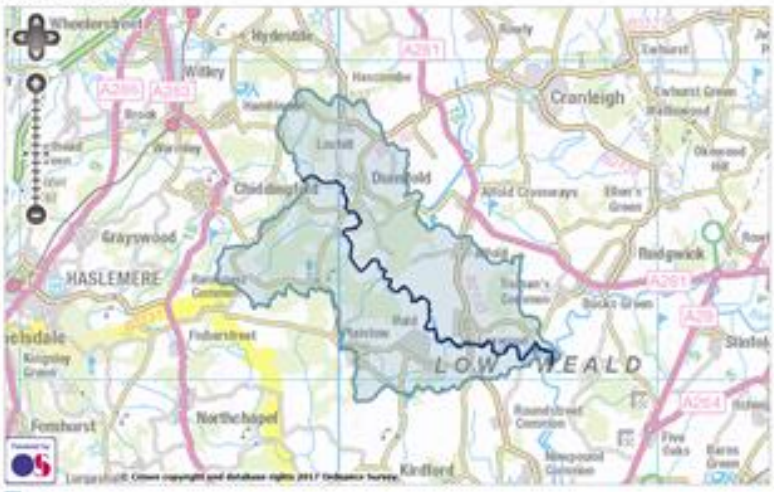
Appendix B WFD waterbody maps

CHICHESTER HARBOUR

Kird



Loxwood Stream



Pagham Rife

Aldingbourne Rife

Maps taken from the Environment Agency's Catchment Data Explorer website

Appendix C Designated Site Data

Appendix C
Site Data

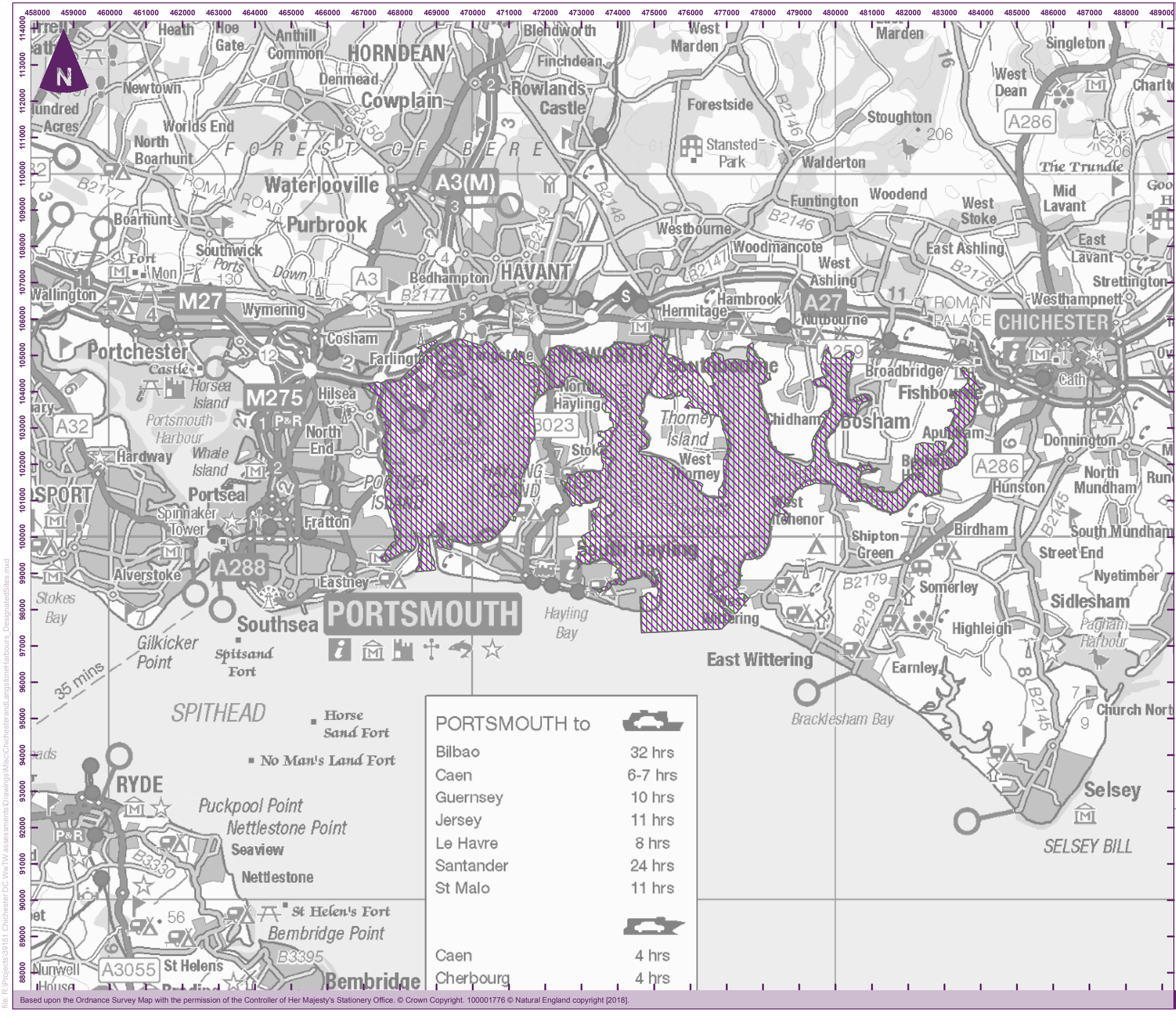
1.2 Chichester Harbour sites

The data included for the Chichester Harbour sites (Chichester Harbour SSSI; Chichester and Langstone Harbours SPA; Chichester and Langstone Harbours Ramsar; Solent Maritime SAC) are as follows:

Table 1.2 Included data for the Chichester Harbour sites

Data	SSSI	SPA	Ramsar	SAC
Site map	✓	✓	✓	✓
Citation / Criteria	✓	✓	✓	✓
Conservation Objectives	**	✓	As for SPA	✓
Condition Tables	✓	As for SSSI*		
Condition Assessment	✓	As for SSSI*		

* Site- and feature-specific condition assessment data are not available for the SPA, Ramsar and SAC; the SSSI condition assessment data are applied across the sites when considering feature and site conservation status. However, these data should be applied mindfully as (a) the interest features of the sites will not all be the same, and some features will not be covered by the SSSI data; and (b) the site boundaries and extents will not necessarily be coincident.
** Formal conservation objectives are published for the European sites only, although the broad objectives are applicable to the SSSI also.



Key

Chichester and Langstone Harbours Special Protection Area (England) © Natural England

Chichester and Langstone Harbours Ramsar (England) © Natural England

0 1 2 3 4 5 km

Scale at A3: 1:100,000

39151 Chichester DC WwTW assessments

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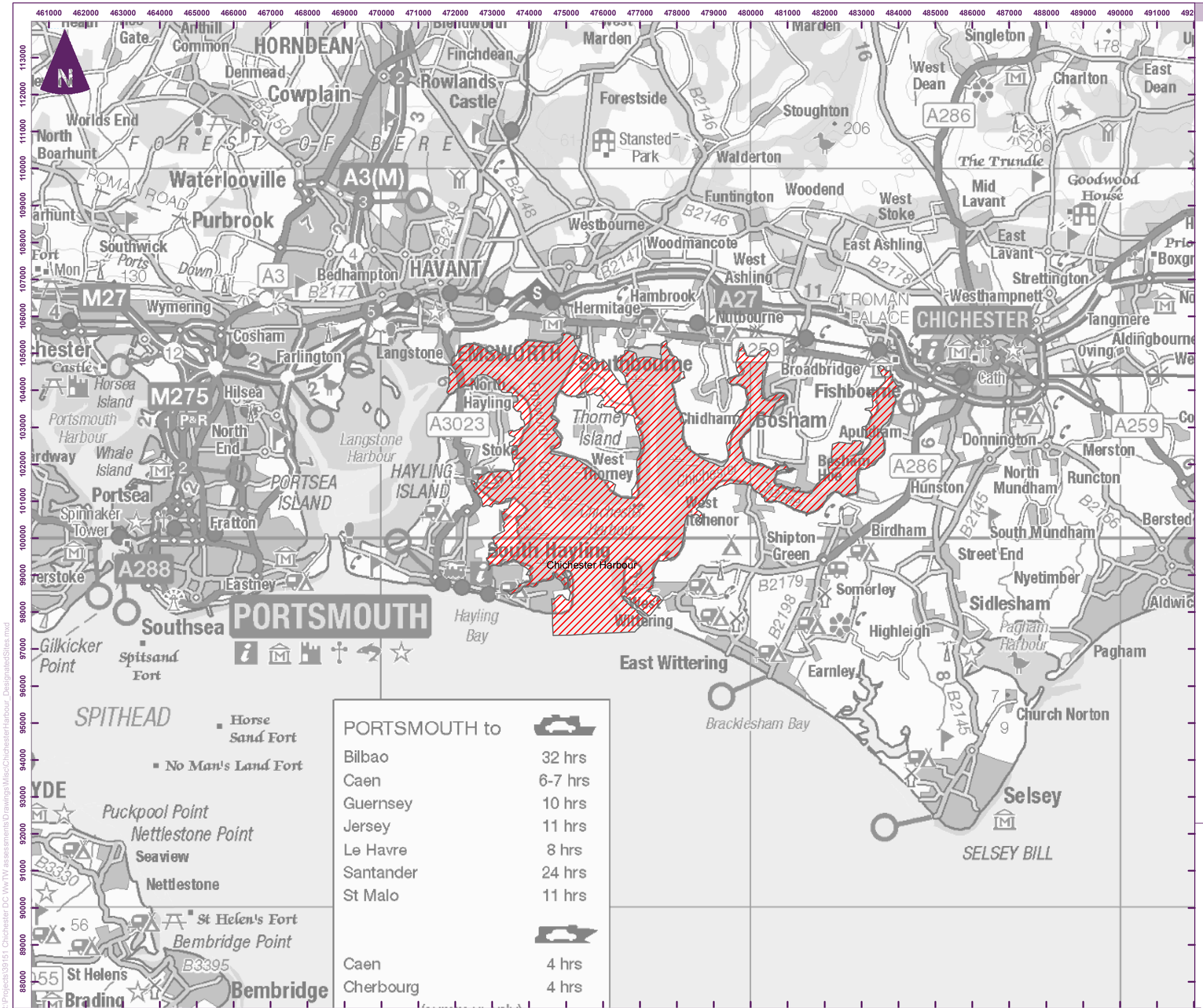
Chichester and Langstone Harbours Designated Sites



PORTSMOUTH to	
Bilbao	32 hrs
Caen	6-7 hrs
Guernsey	10 hrs
Jersey	11 hrs
Le Havre	8 hrs
Santander	24 hrs
St Malo	11 hrs
Caen	4 hrs
Cherbourg	4 hrs

Key

Chichester Harbour Site of Special Scientific Interest (SSSI) © Natural England

0 1 2 3 4 5 km

Scale at A3: 1:100,000

39151 Chichester DC WwTW assessments

amec foster wheeler

Chichester Harbour Designated Sites

February 2018 ChichesterHarbour_DesignatedSites.mxd whilh

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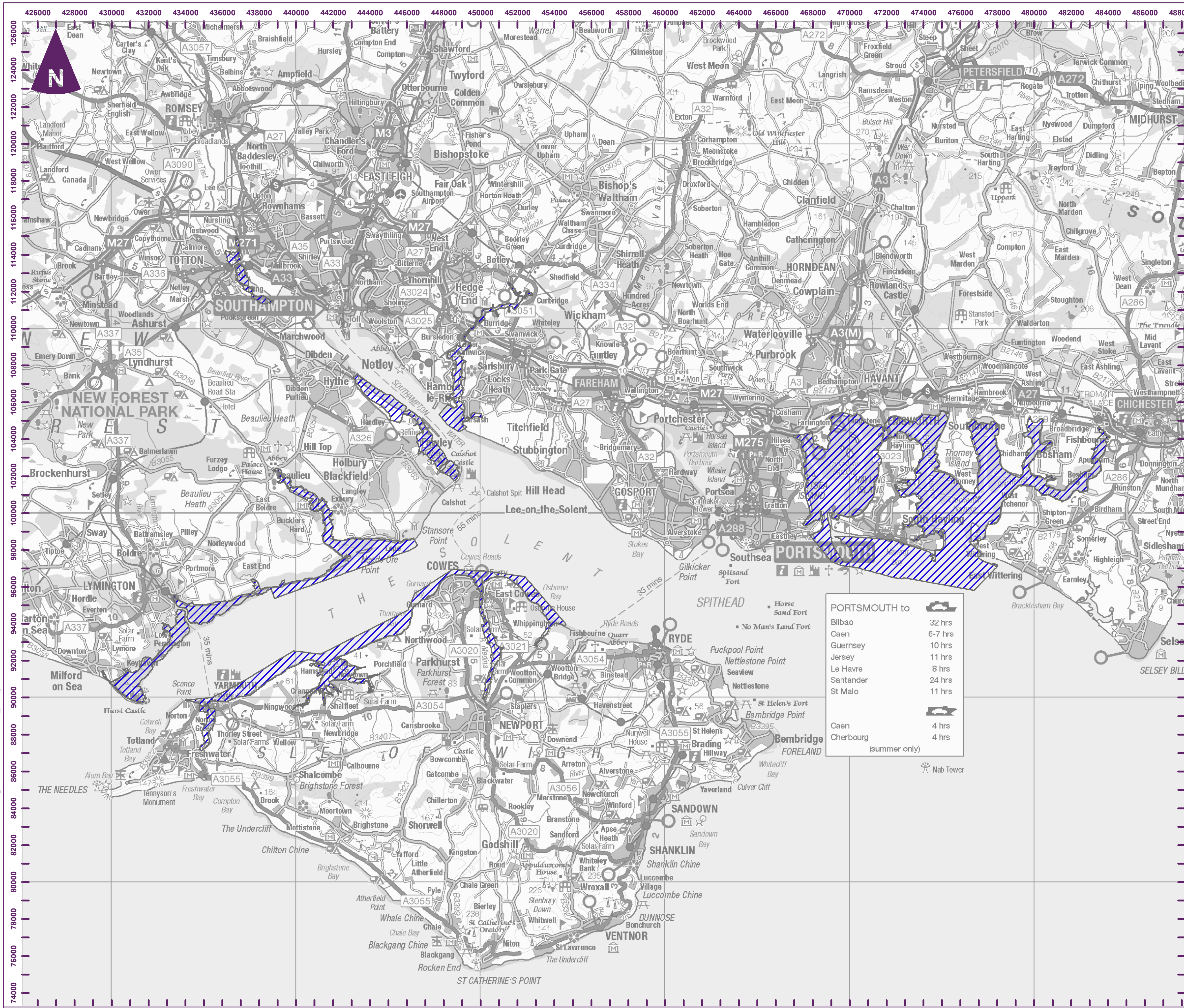

Key

Solent Maritime Special Area of Conservation (England) © Natural England

0 2 4 6 8 10 km

Scale at A3: 1:200,000

39151 Chichester DC WwTW assessments

amec foster wheeler

Solent Maritime Designated Sites

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COUNTY: WEST SUSSEX/HAMPSHIRE SITE NAME: CHICHESTER HARBOUR

DISTRICT: CHICHESTER/HAVANT

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981.

Local Planning Authority: CHICHESTER DISTRICT COUNCIL; HAVANT BOROUGH COUNCIL

National Grid Ref: SU 760 000 Area: 2657 ha 6566.7 acres W Sussex
3695 ha 9130.3 acres Total

Ordnance Survey Sheet 1:50,000:197 1:10,000: SU 70 NW,NE,SW,SE, SU 80 NW, SW,SE, SZ 79 NW,NE, SZ 89 NW

Date Notified (Under 1949 Act): 1970 Date of Last Revision: 1980

Date Notified (Under 1981 Act): 1984 (Hants) 1985 (W Sussex)

Other Information: This site lies within the South Coast Plain. It includes Nutbourne Marshes Local Nature Reserve. The site is listed in 'A Nature Conservation Review' and is a Geological Conservation Review site.

Reasons for Notification:

Chichester Harbour is a large estuarine basin in which at low water extensive mud and sandflats are exposed, drained by channels which unite to make a common exit to the sea. The site is of particular significance for wintering wildfowl and waders and also breeding birds both within the Harbour and in the surrounding permanent pasture fields and woodlands. There is a wide range of habitats which have important plant communities.

The intertidal area is fragmented in the upper reaches of the harbour by intruding tongues of land giving a very long and varied coastline. The harbour exhibits a wide range of intertidal and associated terrestrial habitats and with the neighbouring Langstone and Portsmouth Harbours is unusual in providing a large volume of sheltered saline water fed by a few streams of only low volume. The extensive intertidal mudflats are the feeding grounds, at the relevant times of year for internationally important numbers of ringed plover, grey plover, redshank, black-tailed godwit, dunlin, sanderling, curlew and greenshank (the latter two in autumn particularly). Bar-tailed godwit numbers are of European importance. Amongst the wildfowl, shelduck, teal and dark-bellied brent goose numbers are of international importance with 5% of the world population of the latter. The unimproved permanent pasture behind the sea wall provides alternative feeding sites for the geese and major high tide wader roosts. Some of this pasture is floristically rich being a red fescue *Festuca rubra* sward with scarce species such as green-winged orchid *Orchis morio* and adder's tongue fern *Ophioglossum vulgatum*.

The lower saltmarsh habitat fringing the mud flats is dominated by cord grass *Spartina anglica* and in most places the upper saltmarsh is rather restricted by the sea wall but there are some pure stands of sea purslane *Halimione portulacoides* while in some areas there is also sea lavender *Limonium vulgare*, sea aster *Aster tripolium* and other saltmarsh species.

Shingle occurs as spits and islands and most are rather unstable permitting little vegetation to become established. This habitat forms the main breeding grounds in the harbour for ringed plover, blackheaded gull and three species of terns. The extensive sand dunes at East Head are dominated by marram grass *Ammophila arenaria* although the degree of ground cover varies from 90% to 10% on the more recently established dunes.

At the head of Fishbourne Channel saltmarsh grades through a reed *Phragmites australis* bed into fresh marsh

influenced by a chalk spring. Most of the other fresh marshes behind the sea wall are small but at Thorney Deeps reclaimed saltmarsh has given way to extensive fresh water marsh vegetation influenced by salt water intrusion; here the reed is fringed by extensive areas of rushes *Juncus* species and invasive willow *Salix* scrub. A number of small ponds occur one of which contains the rare annual beard grass *Polypogon monspeliensis*. Significant blocks of scrub, mainly hawthorn *Crataegus monogyna* and blackthorn *Prunus spinosa* occur which are important for breeding and roosting birds. Hedgerows of oak *Quercus robur* are common and in some places the oak roots are strongly influenced by salt water. Semi-natural broadleaved woodland associated with the Harbour is important for breeding birds and supports two heronries. Oak is the major tree species usually with hazel *Corylus avellana* coppice, as at Old Park Wood, although Tournerbury Wood has well spaced oaks with the occasional beech *Fagus sylvatica*, holly *Ilex aquifolium* and yew *Taxus baccata* with a fairly dense ground flora of bramble *Rubus fruticosus* and bracken *Pteridium aquilinum*.

Notable invertebrates include the long-winged conehead *Conocephalus discolor* and the moths, starwort shark *Cucullia asteris*, the sand dart *Agrotis ripae*, shore wainscot *Mythimna litoralis* and lunar hornet *Sphecia bemeciformis*.

Geology and Physiography

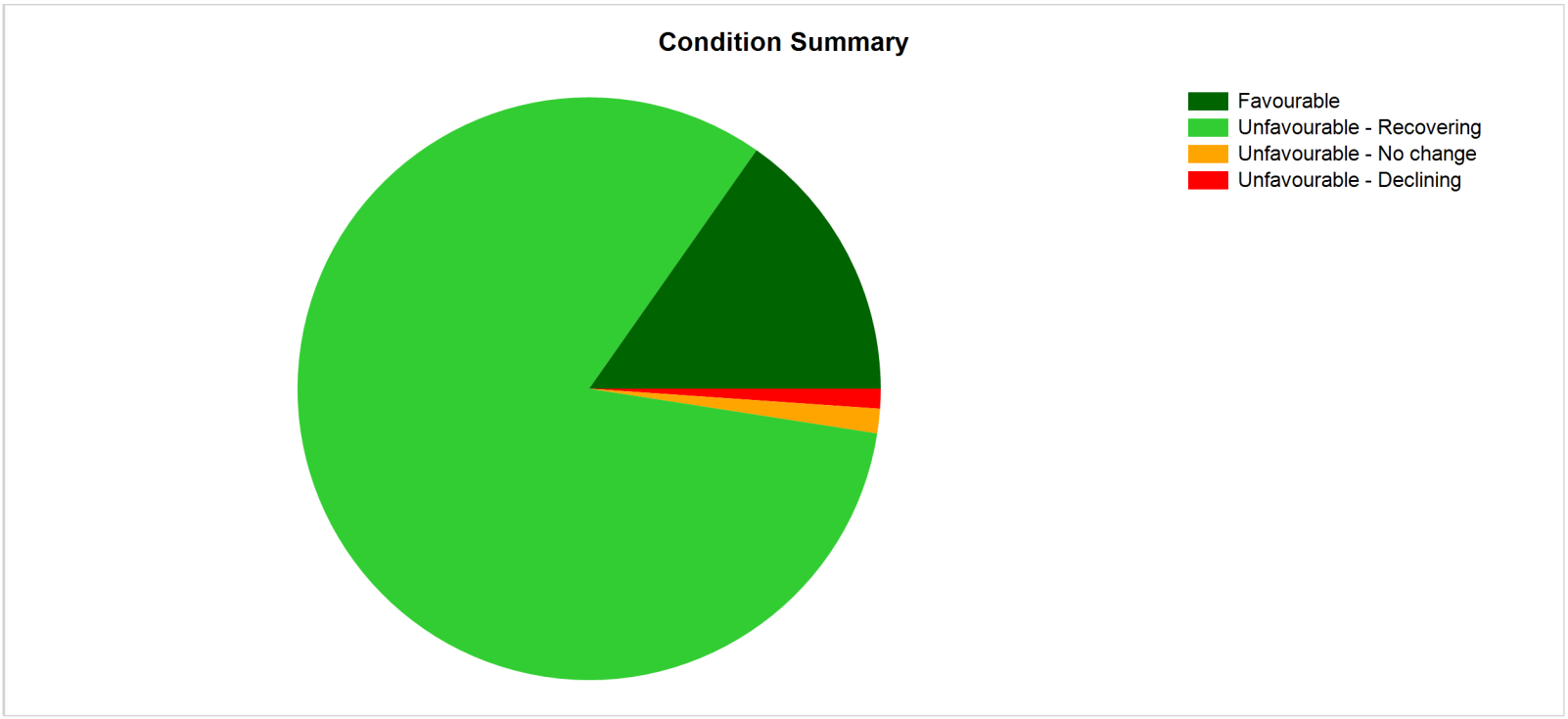
East of Langstone, at SU 725053, a low cliff line at high water mark exhibits a complex of Brickearth and Coombe Rock deposits and at East Head, SZ 769991 there is a sizeable sand dune and shingle system both of which are of geomorphological importance.

Site: Chichester Harbour SSSI

Report generated on: 01 Feb 2018

	Sites	Units	Units Assessed
Total number	1	43	43
Total area (ha)	3,733.53	3,733.53	3,733.53

	% meeting area of favourable or unfavourable recovering	Favourable	Unfavourable - Recovering	Unfavourable - No change	Unfavourable - Declining	Partially destroyed	Destroyed	Not Assessed
Area (ha)	3,641.82	569.79	3,072.03	50.86	40.85			
Percentage	97.54%	15.26%	82.28%	1.36%	1.09%	0.00%	0.00%	0.00%


Condition Summary
Favourable
Unfavourable - Recovering
Unfavourable - No change
Unfavourable - Declining

Report generated on: 01 Feb 2018

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
DWARF SHRUB HEATH - Lowland	KRISTOFFER HEWITT	001	1016975	17.2912	0.00	13/01/2009	Favourable	The site supports a mosaic of dune heath, areas of acid grassland, dense and scattered patches of gorse and bramble scrub, and a permanent pond within the centre of the site, surrounded by hard and soft rush. A fringe of marram grass occurs around the seaward edge of the unit adjacent to the shingle, which over a very short distance grades into the dune heath inland.The heath is dominated by ling with some bell heather, and supports a good variety of species including herbs such as sheep?s sorrel and heath bedstraw, bryophytes such as Rhytidiadelphus squarrosus, Pseudoscleropodium purum and Dicranum scoparium, and a good cover of lichens (Cladonia spp). The heath is managed by Hampshire County Council, involving grazing by ponies and Highland cattle maintaining the grass ward on average at 5 ? 10 cm height, and some gorse and bramble clearance. The site is also subject to rabbit grazing, which is not considered to be having a significant adverse impact on the site	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	002	1016980	147.3011	0.00	29/11/2010	Unfavourable - Recovering	This is a large area of intertidal mud with extensive areas of pioneer salt marsh. The habitats are affected significantly by sea level rise and 'coastal squeeze' as much of the unit is backed by hard sea defences so that the habitats are unable to retreat landward as levels rise. This means that the extent of habitat exposed at low tide will be declining and the area of salt marsh is likely to be diminishing. Changes in water level may also be having adverse impacts on the distribution and extent of biotopes associated with the intertidal sediments. The issue is being addressed through the creation of compensatory habitat and coastal re-alignment at Medmerry. Birds numbers, as with elsewhere in the wider Solent, are declining for reasons which are unclear. This aspect is under investigation.	
BROADLEAVED, MIXED AND YEW WOODLAND - Lowland	KRISTOFFER HEWITT	003	1016959	17.1147	0.00	09/07/2010	Favourable	The northern part of the unit supports deciduous semi-natural ancient woodland, dominated by oak with occasional yew, silver birch and holly and hawthorn in the understorey. Good levels of regeneration of these trees were noted with all three age classes being present. Bluebell, bramble and nettles were present in the groundflora.The woodland in the remaining southern part of the unit supports similar woodland along with pine plantations. Occasional Rhododendron, some of them large, were noted across the unit, which should be removed. Sycamore was noted within the woodland but this is considered to be within acceptable levels, although should continue to be monitored. A pheasant pen is also present in the southwestern part of the unit.The eastern part of the unit is occupied by a residential building and remnants of an old brickworks. The southern boundary of the unit supports small areas of fringing saltmarsh vegetation and mudflats, and saline lagoons are also present.Given there appears to be no apparent decline in extent of the notified woodland, and that the woodland continues to be appropriately managed, the unit is still considered to be favourable, although the Rhododendron will require management in the near future.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	004	1016962	48.785	0.00	10/01/2017	Unfavourable - Recovering	This is an area of grazing marsh, supporting habitat for over wintering birds. Cover of scrub and bare ground less than 5% of the area. Average sward height around 10cm, with a mosaic of heights. Yorkshire fog, dominant, with frequent common bent, and occasional crested dog's tail, sweet vernal grass and meadow barley. Frequent red clover. Meadow buttercup. Common bird's –foot- trefoil occasional. Negative species – common ragwort and creeping thistle rare.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	005	1016986	169.2144	0.00	29/11/2010	Unfavourable - Recovering	This is a large area of mainly intertidal mud with areas of pioneer salt marsh. The habitats are affected significantly by sea level rise and 'coastal squeeze' as much of the unit is backed by hard sea defences so that the habitats are unable to retreat landward as levels rise. This means that the extent of habitat exposed at low tide will be declining and the area of salt marsh is likely to be diminishing. Changes in water level may also be having adverse impacts on the distribution and extent of biotopes associated with the intertidal sediments. The issue is being addressed through the creation of compensatory habitat and coastal re-alignment at Medmerry. Birds numbers, as with elsewhere in the wider Solent, are declining for reasons which are unclear. This aspect is under investigation.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	006	1016963	20.9525	0.00	29/03/2017	Unfavourable - No change	Nutrient source trends, and efficacy of measures across the Solent are subject to ongoing analysis through the Judicial Review consent order implementation and other programmes	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	007	1017002	8.4217	0.00	19/01/2017	Unfavourable - Recovering	Gutner Point pioneer saltmarsh, with frequent common saltmarsh-grass in places, and occasional glasswort spp. Common cord-grass dominant. Low-mid zone frequent glasswort and dwarf seaweeds, with frequent sea purslane, sea, plantain. Sea heath rare. Upper salt marsh transition, with red rescue, sea couch, common sea-lavender, sea wormwood spp, sea thrift, and occasional sea aster. Sea wall along a stretch of this area. Algae present in small thin patches. Sward height variable. No evidence of vehicle damage, bare substrate, or creek realignment.The algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management. Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	008	1016987	267.5454	0.00	29/11/2010	Unfavourable - Recovering	This is a large area of mainly intertidal mud with small areas of pioneer salt marsh. The habitats are affected significantly by sea level rise and 'coastal squeeze' as much of the unit is backed by hard sea defences so that the habitats are unable to retreat landward as levels rise. This means that the extent of habitat exposed at low tide will be declining and the area of salt marsh is likely to be diminishing. Changes in water level may also be having adverse impacts on the distribution and extent of biotopes associated with the intertidal sediments. The issue is being addressed through the creation of compensatory habitat and coastal re-alignment at Medmerry. Birds numbers, as with elsewhere in the wider Solent, are declining for reasons which are unclear. This aspect is being investigated.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	009	1016964	29.903	0.00	29/03/2017	Unfavourable - No change	Nutrient source trends, and efficacy of measures across the Solent are subject to ongoing analysis through the Judicial Review consent order implementation and other programmes	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	010	1016988	65.7649	0.00	19/01/2017	Unfavourable - Recovering	Range of pioneer, low-mid and upper saltmarsh communities, variation of zonations. Common cord-grass rare, with dominant glasswort species. Common saltmarsh-grass, frequent with occasional greater sea-spurrey, sea arrowgrass, annual sea-blite, sea aster. Sea-purslane dominant. Transition to upper saltmarsh with saltmarsh rush, shruby sea-blite, red fescue. Sea wall preventing roll back across some stretches, and presence of bike tracks in one area. Evidence of artificial drainage channel. Thin cover of algae on mudflats- less than 10% of the unit. The algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management. Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	011	1016989	260.8892	0.00	19/01/2017	Unfavourable - Recovering	Unit 11 is predominantly made up of intertidal mudflat with small remnant areas of saltmarsh along the foreshore between the villages of Langstone and Emsworth. Very little saltmarsh was observed during our assessment, and what was present was largely a Spartina anglica dominated pioneer sward.There were several inaccessible areas of what appeared to be Spartina-dominated saltmarsh further towards the tidal channel, which we were unable to assess in full, but through examination using binoculars it appears that these were again Spartina-dominated areas of pioneer marsh. The best area of remnant saltmarsh was a very small area of slightly higher marsh around Coniger Point. Here, the sward was made up of annual sea-blite, Salicornia spp., lesser sea spurrey, sea aster, sea purslane and golden samphire. Higher towards the shore at Coniger Point, the sward was a transitional upper saltmarsh habitat dominated by sea couch, atriplex spp. and sea beet. The algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management. Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	012	1016991	119.1558	0.00	23/01/2017	Unfavourable - Recovering	Desk based assessment: Using EA data: (saltmarsh extent community monitoring to 2013) Spartina dominated, pioneer, with two isolated pockets of Saltmarsh. Less than 5% algal cover The algal weed and diffuse pollution impacts are being addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management. Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	013	1016965	155.6735	0.00	23/01/2017	Favourable	Predominately grazing marsh, on the eastern fringes transitions to saltmarsh, with occasional cord grass, glasswort spp/ saltmarsh grass/sea couch frequent, sward 20cm. Central area -red fescue, sea couch, undergrazed, with pockets of scrub, sward height 50-60cm, bft, spiney rest harrow, dropwort, knapweed occasional. Rest of the unit mixture of well grazed, and undergrazed with sward height up to 100cm . Requires increased grazing to ensure in target condition – requires sward height – mosaic of between 5cm and 20 cm over 75% of the area to support a wide range of overwintering bird species. Unit is in agri-environment scheme, with continued monitoring to ensure grazing is managed appropriately to deliver the optimal supporting habitat for overwintering birds.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	014	1016967	13.2727	0.00	12/09/2008	Favourable	The grassland here under CSM is notified as supporting habitat for breediong and wintering birds. The structure is OK and cattle were on parts of the site; some parts appeared undergrazed at the time of the visit in late August; these will presumably be grazed at a lter date but this should be monitored.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	015	1016981	572.0334	0.00	23/01/2017	Unfavourable - Recovering	This is an area of saltmarsh with vegetated shingle fringing the southern end. There is a good range of mid-transitions from SM, occasional cord grass, glasswort spp/ saltmarsh grass/sea couch frequent, sward 20cmlower, and pioneer saltmarsh communities, with abundant sea-purslane, glasswort species and frequent common sea-lavender. Although common cord grass (Spartina anglica) present in most stops, it was only dominant in the occasional stop. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed.The vegetated shingle strandline species –occasional sea sandwort, sea mayweed and sea rocket, with abundant orache species. The species indicative of perennial vegetation of stony banks were less frequent. Little evidence of disturbance from vehicles, etc. Overall meeting the objectives for this habitat.The habitats are affected significantly by sea level rise and 'coastal squeeze' as much of the unit is backed by hard sea defences so that the habitats are unable to retreat landward as levels rise. The issue is being addressed through the creation of compensatory habitat and coastal re-alignment at Medmerry.Presence of algae frequent. The excessive algal weed and diffuse pollution impacts are being addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management.	
BROADLEAVED, MIXED AND YEW WOODLAND -	KRISTOFFER HEWITT	016	1016977	7.4756	0.00	04/09/2008	Favourable	This unit is site fabric and helps to support the breeding bird assemblage. Comment by Amy Francis 04/09/08.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	017	1016992	211.0291	0.00	04/09/2014	Unfavourable - Recovering	This unit has high % of Spartina. Although there are species of 3 main saltmarsh communities, not meeting targets for frequencies of species. Spartina within the harbour has historically been frequent and in some locations dominant. Provided that there is no evidence of further expansion/dominance into existing saltmarsh communities, consider meeting objectives. There is no evidence of bare substrate from man made activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. Algae abundant in more than 50% of stops, mainly in the north of the unit (upper reaches of Prinsted Channel) .The excessive algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	018	1016968	9.5233	0.00	16/07/2013	Unfavourable - Recovering	This unit is now in Countryside Stewardship, and will be grazed with cattle, which will begin to address the main reason for the unfavourable status, lack of grazing, which has led to the majority of the site being dominated with tall, rank grasses which is unsuitable for the majority of overwintering bird species	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	019	1017003	4.0362	0.00	04/09/2008	Favourable	This unit is site fabric and helps to support the breeding bird assemblage. Comment by Amy Francis 04/09/08.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	020	1016982	386.5215	0.00	23/01/2017	Unfavourable - Recovering	Range of pioneer, low-mid and upper saltmarsh communities, variation of zonations. Pioneer dominated by common cord-grass, with occasional and glasswort species, sea aster rare. Common saltmarsh-grass dominant low-mid saltmarsh community, with transition community of sea couch, common sea lavender, greater sea- spurrey and sea kale, orache species. No obvious signs of pollution, bare substrate. The majority of this unit has a sea wall boundary. This is may be removed if managed realignment scheme goes ahead. The excessive algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required to address storm overflow management. . Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025	
BROADLEAVED, MIXED AND YEW WOODLAND - Lowland	KRISTOFFER HEWITT	021	1016960	1.3469	0.00	27/08/2008	Favourable	Woodland at SU7834002450 and SU7857002250 assessed against the site?s conservation objectives dated November 2007.Small area of non-intervention woodland on the shore of the estuary. The 2 main sections are linked by a narrow strip of oaks and hawthorn which fringe the shore. These 2 small areas of woodland are in favourable condition. Ground layer of bracken, grassland, bramble and ivy. Canopy oak dominated with some hawthorn scrub. Some open areas and lots of dead wood.Comment by Amy Francis 29/08/08.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	022	1016993	131.7106	0.00	03/09/2014	Unfavourable - Recovering	The areas throughout the unit are dominated by Spartina, but there are frequent areas of low-to mid saltmarsh communities, with occasional pioneer and mid-high communities present. Algae present throughout, % cover low in some areas (less than 5%) and in 3 stops coverage of 60% or more. This meets the targets set for algal coverage (25-75%) overall. The algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required in addressing storm overflow management. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	023	1016994	104.4732	0.00	03/09/2014	Unfavourable - Recovering	Upper reaches of Bosham channel, into the harbour dominated by algae, rest of unit absent or rare. The upper reaches are dominated by cord grass , but there are frequent areas of low-to mid saltmarsh communities, with occasional pioneer and mid-high communities present in the mid and southern areas of the unit. %). There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. The excessive algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required in addressing storm overflow management.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	024	1016995	87.0592	0.00	19/10/2010	Unfavourable - Recovering	This unit includes extensive intertidal habitat. Part is backed by low level flood defenses but the majority is not affected by 'coastal squeeze'. There is concern about raised nutrient levels which is resulting in excessive algal growth in places. This is being addressed through improvements to sewage treatment works and better control of diffuse pollution. Bird numbers, as with elsewhere in the wider Solent, are declining for reasons which are unclear. However, this part of the harbour experiences lower levels of human disturbance than elsewhere in the wider Solent and is regarded as an important feeding and roosting area.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	025	1016973	1.9702	0.00	28/01/2010	Favourable	The grassland has not undergone any loss in area, and is botanically rich in species. A running species list provided by the landowner and observing the grassland at the time of survey found constant species such as crested dog?s-tail, common knapweed and occasional or rare species such as fescues, meadow vetchling, black medick, bird?s-foot trefoil, creeping cinquefoil, meadow and bulbous buttercup and rarer species such as adder?s-tongue fern, pepper saxifrage, twayblade and green-winged orchid (the orchids occasionally appear in impressive stands from year to year). The high spring tide mark is apparent approximately 30m from the shoreline, and the botanical composition of the grassland becomes more coastal towards the shore, including species such as sea couch grass, sea beet, thrift, sea plantain, wild carrot, sea-lavender and sea purslane. The site is currently in good management, involving mowing once or twice each summer with the cuttings removed, usually in June/ July. Bare ground and litter levels are satisfactory. At the time of survey, sward height was on average 5cm. A number of negative indicator species were seen such as greater plantain and creeping/ spear thistle, but they occur at satisfactory cover, below 5%. The unit is not subject to heavily invasive species, and scrub levels are maintained at below 5%	
BROADLEAVED, MIXED AND YEW WOODLAND - Lowland	KRISTOFFER HEWITT	026	1016961	40.8469	0.00	28/05/2013	Unfavourable - Declining	Structure: Although there is some structural diversity, with mainly hazel understorey, this is being limited through lack of coppicing, with seedlings such as ash being limited by light and also deer browsing. Overall not meeting the objectives, when assessing the site as a whole. The network of rides have been opened up and widened, so cover of permanent open space is good, but the majority of ride edges lack structure and variation. Not meeting objectives on temporary open space through lack of coppicing. There are a number of age classes of trees present, so the site is meeting its objectives for this criteria. There are a number of mature oaks scattered across the wood and some would benefit from surrounding trees being haloed. Regeneration potential: Although seedlings are present their growth is being limited by shade and possibly deer browsing, number of seedlings showed evidence of deer browsing (approx 30 Roe deer known to frequent the site). Composition : predominately oak hazel, with some ash and birch. There is a block of sycamore in the north eastern area of the site (refer to previous assessments), this is now spreading to other areas of the wood, and is frequent in south eastern compartment, with little or no ground flora in this section. There is Rhododendron poticum in the south of the site (refer to previous assessments). This is continuing to spread (area approximately 50m x 10m). Not meeting objectives on composition ? the sycamore is not being contained within the existing block and the R.poticum is spreading. Ground flora, dominated by ivy with grasses frequent, locally frequent bluebells occasional orchids (early purple) and marsh thistle in wetter areas. Many of the rides have been re-seeded with perennial rye grass in the last few years.	FORESTRY - FORESTRY AND WOODLAND MANAGEMENT,

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	027	1016996	51.3959	0.00	01/09/2014	Unfavourable - Recovering	The upper reaches of the unit are dominated by Spartina, but in the mid-to lower sections there are a range of low to upper saltmarsh communities, with occasional pioneer communities where the spartina is present in lower frequencies. Algae in one stretch dominant, over the rest of the unit frequent or occasional cover. There is little evidence of pollution, with the occasional algae covering small areas of the habitat. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. Coastal squeeze and extent- meeting targets due to compensatory habitat at Medmerry.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	028	1017004	5.4059	0.00	04/09/2008	Favourable	Favourable 'site fabric' - Healthy looking area of upper saltmarsh grading into grassland dominated by sea couch. Comment by Amy Francis 04/09/08.	
FEN, MARSH AND SWAMP - Lowland	KRISTOFFER HEWITT	029	1017001	6.4553	0.00	23/01/2017	Unfavourable - Recovering	Area of reedbed, dominated by common reed. Requires a programme of infrequent rotational cutting to ensure optimal habitat for range for invertebrates for wish the site is notified. Majority of the reedbed is in agri-environment, and rotational cutting has been introduced. The northern area comprises fen habitat, which in the past has supported populations of Desmoulin's whorl snail. Recent surveys suggest that the snail may not now be present. Review of the designated site status for this species to be reviewed. Fen vegetation management required	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	030	1016997	33.1731	0.00	23/01/2017	Unfavourable - Recovering	Significant areas of saltmarsh/mudflats covered with algae, Apuldram outfall discharging into this unit. Upper reaches dominated by Spartina, mid to lower channel have appropriate communities, but low frequencies of appropriate species for this community. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The excessive algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required in addressing storm overflow management. Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	031	1016998	49.3458	0.00	01/09/2014	Unfavourable - Recovering	This unit has frequent Cord Grass (Spartina anglica) . Spartina within the harbour has historically been frequent and in some locations dominant. Provided that there is no evidence of further expansion/dominance into existing saltmarsh communities, consider meeting objectives. There is a range of upper/mid/low saltmarsh communities present, with transition to reedbed in the southern areas of the channel. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. Algae frequent, but not dominant in 50% of stops..The excessive algal weed and diffuse pollution impacts are starting to be addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Further work is required in addressing storm overflow management.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	032	1016999	174.7361	0.00	04/09/2014	Unfavourable - Recovering	This unit has high % of Spartina. Little other pioneer zone present. Mid-upper and mid-low communities present, with frequent sea-purslane, annual sea-blite, glasswort species, and common sea lavander. Spartina within the harbour has historically been frequent and in some locations dominant. Provided that there is no evidence of further expansion/dominance into existing saltmarsh communities, consider meeting objectives. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. Occasional algae present.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	033	1016969	2.2769	0.00	22/06/2009	Unfavourable - Recovering	This unit appears to be recovering well to salt marsh by a process of natural regeneration. Lower lying parts have a well-developed lower salt marsh community dominated by sea purslane with smaller amounts of samphire, common sea lavender, sea aster and seablite. There are also small patches of an upper salt marsh community with sea campion and buckshorn plantain. The surrounding higher ground is dominated by a tall sward of red fescue and sea couch.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	035	1016970	5.4698	0.00	28/01/2010	Favourable	The unit supports low-lying semi-improved grassland, and appears to still be grazed by cattle. The sward of little botanical interest with constant and occasional species including crested dog?s-tail, fescues and creeping bent, as well as creeping thistle and buttercup. The site includes patches of soft and hard rush, with a stand of reed-canary grass along the drains, as well as occasional patches of standing shallow water at time of survey. Scrub levels are below 5% and litter at time of survey was considered acceptable. The site provides a good mosaic of structure, and is considered suitable for supporting the wintering bird assemblage.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
LITTORAL SEDIMENT	KRISTOFFER HEWITT	036	1016984	112.8351	0.00	01/09/2014	Unfavourable - Recovering	This is an area of saltmarsh and vegetated shingle. Only occasional spartina, with a range of mid upper/mid-lower saltmarsh, with frequent sea-purslane, common sea lavender, greater sea-spurrey and glasswort species. Only occasional algae present. . There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed. Vegetated shingle, is formed of a narrow spit, with transition to saltmarsh. Terns have nested here in the past. Some evidence of recreational pressure, with a path through one section of the shingle. No negative indicator species such as ragwort, creeping thistle. Vegetated shingle species, low diversity with only abundant sea beat, with spear-leaved orache, with sea campion, sea mayweed and sea kale rare. No evidence of loss of habitat extent. Please note that this assessment was for both salt marsh and vegetated shingle on the unit. JF 050716	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	037	1016978	35.708	0.00	23/01/2017	Unfavourable - Recovering	Large area of spartina, with algae dominant or frequent over all the stops, bare ground frequent, no upper saltmarsh species, with lower frequencies of low-mid saltmarsh community species. The excessive algal weed and diffuse pollution impacts are being addressed through the South Downs and Harbours Clean Water Partnership Delivery Strategy and the Solent Diffuse Water Pollution Plan. There is also concern around point source pollution from sewerage treatment works. This is starting to be addressed through investment in sewerage treatment work infrastructure. Part of the eastern stretch now has the West Wittering flood defences in place, with mosaic of mudflat/saltmarsh habitat being created behind the defences. Loss of saltmarsh due to coastal squeeze across 'Hold the Line' frontages in the North Solent Shoreline Management Plan (SMP) are mitigated for via the Environment Agency's managed realignment at Medmerry This provides compensation for coastal squeeze on 'Hold the Line' frontages in the North Solent for the first Epoch of the SMP until 2025	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	038	1016979	3.6307	0.00	17/10/2008	Favourable	Unit is notified for the breeding and wintering birds it supports and remains favourable in this respect.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	039	1016971	26.2744	0.00	23/01/2017	Favourable	The majority of this is grassland which is supporting habitat for overwintering birds. This area and adjacent unit 40 support large populations of brent geese. The fields are well grazed, helping to maintain the short sward which is preferred by brent geese. There is a small area of transitional wetland habitat and scrub in the north west area of the unit.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	040	1016972	3.5176	0.00	23/01/2017	Favourable	An area of grassland which is supporting habitat for overwintering birds. This area and adjacent unit 39,supports large populations of brent geese. The unit is mown, helping to maintain the short sward which is preferred by brent geese.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Chichester Harbour SSSI - HAMPSHIRE, WEST SUSSEX (CHICHESTER, HAVANT)									
SUPRALITTORAL SEDIMENT	KRISTOFFER HEWITT	041	1016976	16.6766	0.00	10/01/2017	Unfavourable - Recovering	Much of the unit is comprised of sand dune system, with strandline, mobile, dune slack and fixed dunes which transitions into saltmarsh. Strandline along the western side of the dunes sparsely vegetated with rare spear-leaved orache and sea rocket. The northern section of the site has embryonic dunes with strandline community –with occasional sea rocket, prickly saltwort, annual seablite, marram grass and frequent sand couch. Vegetated shingle is evolving into embryonic dunes.Mobile dunes: vegetation composition indicative of the species community, with marram grass dominant and occasional sand couch. Negative indicator species rare, with occasional bramble, elder.The centre of the site is composed of a mosaic of communities ranging from dune slack to semi-fixed communities. The area is dominated by sea rush (Juncus maritimus), as well as distant sedge (Carex distans), saltmarsh rush (Juncus gerardii) and yorkshire-fog (Holcus lanatus) Nationally scarce divided sedge (Carex divisa), present here, and nationally scarce sea heath Frankenia laevis) present in the strandline community. The centre of the site indicates continued development of dune slack and fixed dune communities. This is a dynamic system, and the overall extent and species communities and composition is being maintained. Some evidence of high visitor numbers, particularly along the strandline. A programme of access management is in place.A plan is in place for the gradual removal of hard defences: the breastworks around the hinge, part of the adaptive management plan for this section at East Head. A recharge behind the hinge was undertaken in 2016 to facilitate a move towards allowing natural coastal processes to evolve.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	042	1017000	300.268	0.00	23/01/2017	Favourable	Large part of the section forms part of the outer harbour estuary, with no saltmarsh. The western section forms part of the sand dune system at East Head (please refer to unit 41 assessment). The outer estuary is important for helping to supply sediments to East Head spit and the surrounding sand dunes. The north east section transitions to mobile sand dunes: vegetation composition indicative of sand dune NVC community SD6, with marram grass dominant and occasional sand couch. Negative indicator species rare, with occasional bramble, elder.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	044	1025400	3.5412	0.00	01/09/2014	Favourable	This is a small area of developing saltmarsh, ponds and existing grassland. There is a range of salt marsh communities present – pioneer, mid and upper saltmarsh, and a range of species associated with these communities. Although cord grass – Spartina anglica is present, it is not at the expense of the other species that are beginning to colonise. There is little evidence of pollution, with the occasional algae covering small areas of the habitat. There is no evidence of bare substrate from manmade activities (trampling, vehicle use) or realignment of creeks. The height of the saltmarsh is on average around 20-25cm, which is acceptable as this area is not, nor has it traditionally been grazed.	
FEN, MARSH AND SWAMP - Lowland	KRISTOFFER HEWITT	045	1025606	3.5043	0.00	12/03/2009	Favourable	The grassland is notified for the breeding birds it supports and recent BBS data shows that the breeding birds are favourable at Chichester Harbour	

NATURA 2000 – STANDARD DATA FORM

Special Areas of Conservation under the EC Habitats Directive (includes candidate SACs, Sites of Community Importance and designated SACs).

Each Natura 2000 site in the United Kingdom has its own Standard Data Form containing site-specific information. The data form for this site has been generated from the Natura 2000 Database submitted to the European Commission on the following date:

22/12/2015

The information provided here, follows the officially agreed site information format for Natura 2000 sites, as set out in the Official Journal of the European Union recording the Commission Implementing Decision of 11 July 2011 (2011/484/EU).

The Standard Data Forms are generated automatically for all of the UK's Natura 2000 sites using the European Environment Agency's Natura 2000 software. The structure and format of these forms is exactly as produced by the EEA's Natura 2000 software (except for the addition of this coversheet and the end notes). The content matches exactly the data submitted to the European Commission.

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

Further technical documentation may be found here
http://bd.eionet.europa.eu/activities/Natura_2000/reference_portal

As part of the December 2015 submission, several sections of the UK's previously published Standard Data Forms have been updated. For details of the approach taken by the UK in this submission please refer to the following document:
http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

More general information on Special Areas of Conservation (SACs) in the United Kingdom is available from the SAC home page on the JNCC website. This webpage also provides links to Standard Data Forms for all SACs in the UK.

Date form generated by the Joint Nature Conservation Committee
25 January 2016.

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK0030059**

SITENAME **Solent Maritime**

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1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
B	UK0030059

1.3 Site name

Solent Maritime

1.4 First Compilation date	1.5 Update date
1998-10	2015-12

1.6 Respondent:

Name/Organisation: Joint Nature Conservation Committee

Address: Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY

Email:

Date site proposed as SCI:	1998-10
Date site confirmed as SCI:	2004-12
Date site designated as SAC:	2005-04
National legal reference of SAC designation:	Regulations 11 and 13-15 of the Conservation of Habitats and Species Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/490/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
-0.927777778	50.79638889

2.2 Area [ha]:

11243.12

2.3 Marine area [%]

91.9

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKJ3	Hampshire and Isle of Wight
UKJ2	Surrey, East and West Sussex
UKZZ	Extra-Regio

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.1 Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
1110			3597.8		M	C	C	C	C
1130			6633.44		G	A	B	B	B
1140			5059.4		G	A	C	B	C
1150	X		146.16		P	C	B	B	C
1210			112.43		P	C	A	B	C
1220			112.43		M	C	B	B	C
1310			123.67		P	B	B	B	C
1320									

			94.44		P	A	A	C	A
1330			2023.76		M	B	B	B	B
2120			112.43		M	C	B	B	C
2130	X		112.43		M	D			

- **PF:** for the habitat types that can have a non-priority as well as a priority form (6210, 7130, 9430) enter "X" in the column PF to indicate the priority form.
- **NP:** in case that a habitat type no longer exists in the site enter: x (optional)
- **Cover:** decimal values can be entered
- **Caves:** for habitat types 8310, 8330 (caves) enter the number of caves if estimated surface is not available.
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation)

3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
M	1355	Lutra lutra			p				P	DD	D			
M	1365	Phoca vitulina			p				P	DD	D			
I	1016	Vertigo moulinsiana			p				R	DD	B	B	B	C

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N02	59.0
N03	23.0
N16	0.5

N01	14.0
N05	3.0
N04	0.5
Total Habitat Cover	100

Other Site Characteristics

1 Terrestrial: Soil & Geology: shingle,sedimentary,sand,alluvium,mud,neutral,nutrient-rich,clay 2 Terrestrial: Geomorphology and landscape: island,lowland,coastal 3 Marine: Geology: sand,clay,sedimentary,gravel,mud,limestone/chalk,shingle,sandstone/mudstone 4 Marine: Geomorphology: open coast (including bay),estuary,enclosed coast (including embayment),shingle bar,subtidal sediments (including sandbank/mudbank),intertidal sediments (including sandflat/mudflat),islands,lagoon

4.2 Quality and importance

Sandbanks which are slightly covered by sea water all the time for which the area is considered to support a significant presence. Estuaries for which this is considered to be one of the best areas in the United Kingdom. Mudflats and sandflats not covered by seawater at low tide for which the area is considered to support a significant presence. Coastal lagoons for which the area is considered to support a significant presence. Annual vegetation of drift lines for which the area is considered to support a significant presence. which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 100 hectares. Perennial vegetation of stony banks for which the area is considered to support a significant presence. Salicornia and other annuals colonising mud and sand for which the area is considered to support a significant presence. Spartina swards (Spartinion maritimae) for which this is one of only two known outstanding localities in the United Kingdom. which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 100 hectares. Atlantic salt meadows (Glauco-Puccinellietalia maritimae) for which this is considered to be one of the best areas in the United Kingdom. Shifting dunes along the shoreline with Ammophila arenaria (?white dunes?) for which the area is considered to support a significant presence. Vertigo moulinsiana for which the area is considered to support a significant presence.

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts

Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	H02		B
H	M01		B
H	F02		I
H	M02		B
H	G01		I

Positive Impacts

Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	A04		I
H	A02		I
H	D05		I
H	A03		I
H	B02		I
H	D05		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,

T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions

i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): http://publications.naturalengland.org.uk/category/6490068894089216

http://publications.naturalengland.org.uk/category/3212324

http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK04	71.4	UK00	28.6	UK01	4.5

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

- [ ] Yes
- [ ] No, but in preparation
- [X] No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE NATURA 2000 STANDARD DATA FORMS

The codes in the table below are also explained in the official European Union guidelines for the Standard Data Form. The relevant page is shown in the table below.

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	Designated Special Protection Area	53
B	SAC (includes candidates Special Areas of Conservation, Sites of Community Importance and designated SAC)	53
C	SAC area the same as SPA. Note in the UK Natura 2000 submission this is only used for Gibraltar	53

3.1 Habitat representativity

CODE	DESCRIPTION	PAGE NO
A	Excellent	57
B	Good	57
C	Significant	57
D	Non-significant presence	57

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha□ rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	15%-100%	58
B	2%-15%	58
C	< 2%	58

3.1 Conservation status habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global grade habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	15%-100%	62
B	2%-15%	62
C	< 2%	62
D	Non-significant population	62

3.2 Conservation status species (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' Or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Assemblages types

CODE	DESCRIPTION	PAGE NO
WATR	Non breeding waterfowl assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code
BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

CODE	DESCRIPTION	PAGE NO
E03	Discharges	65
E04	Structures, buildings in the landscape	65
E06	Other urbanisation, industrial and similar activities	65
F01	Marine and Freshwater Aquaculture	65
F02	Fishing and harvesting aquatic ressources	65
F03	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)	65
F04	Taking / Removal of terrestrial plants, general	65
F05	Illegal taking/ removal of marine fauna	65
F06	Hunting, fishing or collecting activities not referred to above	65
G01	Outdoor sports and leisure activities, recreational activities	65
G02	Sport and leisure structures	65
G03	Interpretative centres	65
G04	Military use and civil unrest	65
G05	Other human intrusions and disturbances	65
H01	Pollution to surface waters (limnic & terrestrial, marine & brackish)	65
H02	Pollution to groundwater (point sources and diffuse sources)	65
H03	Marine water pollution	65
H04	Air pollution, air-borne pollutants	65
H05	Soil pollution and solid waste (excluding discharges)	65
H06	Excess energy	65
H07	Other forms of pollution	65
I01	Invasive non-native species	65
I02	Problematic native species	65
I03	Introduced genetic material, GMO	65
J01	Fire and fire suppression	65
J02	Human induced changes in hydraulic conditions	65
J03	Other ecosystem modifications	65
K01	Abiotic (slow) natural processes	65
K02	Biocenotic evolution, succession	65
K03	Interspecific faunal relations	65
K04	Interspecific floral relations	65
K05	Reduced fecundity/ genetic depression	65
L05	Collapse of terrain, landslide	65
L07	Storm, cyclone	65
L08	Inundation (natural processes)	65
L10	Other natural catastrophes	65
M01	Changes in abiotic conditions	65
M02	Changes in biotic conditions	65
U	Unknown threat or pressure	65
XO	Threats and pressures from outside the Member State	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK02	Marine Nature Reserve	67
UK04	Site of Special Scientific Interest (UK)	67

European Site Conservation Objectives for Solent Maritime Special Area of Conservation Site Code: UK0030059

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- **The extent and distribution of qualifying natural habitats and habitats of qualifying species**
- **The structure and function (including typical species) of qualifying natural habitats**
- **The structure and function of the habitats of qualifying species**
- **The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely**
- **The populations of qualifying species, and,**
- **The distribution of qualifying species within the site.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

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; Intertidal mudflats and sandflats

H1150. Coastal lagoons*

H1210. Annual vegetation of drift lines

H1220. Perennial vegetation of stony banks; Coastal shingle vegetation outside the reach of waves

H1310. *Salicornia* and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand

H1320. *Spartina* swards (*Spartinion maritimae*); Cord-grass swards

H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram

S1016*. Vertigo moulinsiana*; Desmoulin`s whorl snail

* denotes a priority natural habitat or species (supporting explanatory text on following page)

This is a European Marine Site

This site is a part of the Solent Maritime European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

*** Priority natural habitats or species**

Some of the natural habitats and species listed in the Habitats Directive and for which SACs have been selected are considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Directive and the Habitats Regulations. These priority natural habitats and species are denoted by an asterisk (*) in Annex I and II of the Directive. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Directive or the Habitats Regulations.

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive. They must be considered when a competent authority is required to make a 'Habitats Regulations Assessment', including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where available) will also provide a framework to inform the measures needed to conserve or restore the European Site and the prevention of deterioration or significant disturbance of its qualifying features as required by the provisions of Article 6(1) and 6(2) of the Directive.

These Conservation Objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving Favourable Conservation Status for that species or habitat type at a UK level. The term 'favourable conservation status' is defined in Article 1 of the Habitats Directive.

Publication date: 30 June 2014 – version 2. This document updates and replaces an earlier version dated 29 May 2012 to reflect Natural England's Strategic Standard on European Site Conservation Objectives 2014.

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:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

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

2. Date this sheet was completed/updated:

Designated: 28 October 1987

3. Country:

UK (England)

4. Name of the Ramsar site:

Chichester and Langstone Harbours

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):

50 48 23 N 00 55 12 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: Portsmouth

The site lies on the central south coast of mainland England, approximately 1 km east of Portsmouth.

Administrative region: Hampshire; West Sussex

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 5810.03

Min. -2
Max. 4
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.

Chichester and Langstone Harbours are large, sheltered estuarine basins comprising extensive mud and sand flats exposed at low tide. The site is of particular significance for over-wintering wildfowl and waders and also a wide range of coastal and transitional habitats supporting important plant and animal communities.

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, 5, 6

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

Two large estuarine basins linked by the channel which divides Hayling Island from the main Hampshire coastline. The site includes intertidal mudflats, saltmarsh, sand and shingle spits and sand dunes.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:
76480 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 spring/autumn:

Ringed plover , *Charadrius hiaticula*, Europe/Northwest Africa	853 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)
Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe	906 individuals, representing an average of 2.5% of the population (5 year peak mean 1998/9-2002/3)
Common redshank , *Tringa totanus totanus*,	2577 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

Dark-bellied brent goose, *Branta bernicla bernicla*,	12987 individuals, representing an average of 6% of the population (5 year peak mean 1998/9-2002/3)
Common shelduck , *Tadorna tadorna*, NW Europe	1468 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3)
Grey plover , *Pluvialis squatarola*, E Atlantic/W Africa -wintering	3043 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3)
Dunlin , *Calidris alpina alpina*, W Siberia/W Europe	33436 individuals, representing an average of 2.5% 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:

Little tern , *Sterna albifrons albifrons*, W Europe	130 apparently occupied nests, representing an average of 1.1% of the breeding population (Seabird 2000 Census)

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.
Details of bird species occuring 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	neutral, shingle, sand, mud, alluvium, nutrient-rich, sedimentary, clay, gravel
Geomorphology and landscape	lowland, coastal, floodplain, shingle bar, subtidal sediments (including sandbank/mudbank), intertidal sediments (including sandflat/mudflat), enclosed coast (including embayment), estuary, islands, lagoon, pools
Nutrient status	eutrophic, mesotrophic
pH	circumneutral
Salinity	brackish / mixosaline, saline / euhaline
Soil	mainly mineral
Water permanence	usually permanent
Summary of main climatic features	Annual averages (Bognor Regis, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/bognor_regis.html) Max. daily temperature: 13.7° C Min. daily temperature: 7.7° C Days of air frost: 24.0 Rainfall: 717.4 mm Hrs. of sunshine: 1902.9

General description of the Physical Features:

Chichester and Langstone Harbours are large, sheltered estuarine basins comprising extensive sand- and mud-flats exposed at low tide. The two harbours are joined by a stretch of water that separates Hayling Island from the mainland. Tidal channels drain the basin and penetrate far inland. The basin contains a wide range of coastal habitats.

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).

Chichester and Langstone Harbours are large, sheltered estuarine basins comprising extensive sand- and mud-flats exposed at low tide. The two harbours are joined by a stretch of water that separates Hayling Island from the mainland. Tidal channels drain the basin and penetrate far inland.

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, Maintenance of water quality (removal of nutrients)

19. Wetland types:

Marine/coastal wetland

Code	Name	% Area
G	Tidal flats	46
H	Salt marshes	21.4
Other	Other	14.3
F	Estuarine waters	14.1
B	Marine beds (e.g. sea grass beds)	1.7
Ts	Freshwater marshes / pools: seasonal / intermittent	0.9
E	Sand / shingle shores (including dune systems)	0.8
Tp	Freshwater marshes / pools: permanent	0.4
Sp	Saline / brackish marshes: permanent	0.3
W	Shrub-dominated wetlands	0.07
M	Rivers / streams / creeks: permanent	0.02
J	Coastal brackish / saline lagoons	0.01

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 site comprises two large, interconnected sheltered estuarine basins providing extensive intertidal mud and sand flats with eelgrass *Zostera* spp. beds, large areas of mixed saltmarsh and extensive cord-grass *Spartina* spp. swards in an advanced state of degeneration. Fringing habitats include shingle spits, saline, brackish and freshwater lagoons, coastal grazing marsh and deciduous woodland. The site supports important overwintering populations of migratory waterfowl.

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.

Polypogon monspeliensis, Zostera angustifolia, Zostera marina, Zostera noltei

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:

Mediterranean gull , *Larus melanocephalus*, Europe	47 apparently occupied nests, representing an average of 43.5% of the GB population (Seabird 2000 Census)
Black-headed gull , *Larus ridibundus*, N & C Europe	3180 apparently occupied nests, representing an average of 2.4% of the GB population (Seabird 2000 Census)

Common tern , *Sterna hirundo hirundo*, N & E Europe	127 apparently occupied nests, representing an average of 1.2% of the GB population (Seabird 2000 Census)
Species with peak counts in spring/autumn:	
Little egret , *Egretta garzetta*, West Mediterranean	224 individuals, representing an average of 13.5% of the GB population (5 year peak mean 1998/9-2002/3)
Eurasian oystercatcher , *Haematopus ostralegus ostralegus*, Europe & NW Africa -wintering	3403 individuals, representing an average of 1% of the GB population (5 year peak mean 1998/9-2002/3)
Whimbrel , *Numenius phaeopus*, Europe/Western Africa	192 individuals, representing an average of 6.4% of the GB population (5 year peak mean 1998/9-2002/3 - spring peak)
Eurasian curlew , *Numenius arquata arquata*, N. a. arquata Europe (breeding)	3108 individuals, representing an average of 2.1% of the GB population (5 year peak mean 1998/9-2002/3)
Spotted redshank , *Tringa erythropus*, Europe/W Africa	6 individuals, representing an average of 4.4% of the GB population (5 year peak mean 1998/9-2002/3)
Common greenshank , *Tringa nebularia*, Europe/W Africa	215 individuals, representing an average of 36% of the GB population (5 year peak mean 1998/9-2002/3)
Ruddy turnstone , *Arenaria interpres interpres*, NE Canada, Greenland/W Europe & NW Africa	569 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Species with peak counts in winter:	
Little grebe , *Tachybaptus ruficollis ruficollis*, Europe to E Urals, NW Africa	131 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)
Black-necked grebe , *Podiceps nigricollis nigricollis*, Europe, N Africa	14 individuals, representing an average of 11.6% of the GB population (5 year peak mean 1998/9-2002/3)
Great bittern , *Botaurus stellaris stellaris*, W Europe, NW Africa	1 individuals, representing an average of 1% of the GB population (5 year peak mean 1998/9-2002/3)
Eurasian teal , *Anas crecca*, NW Europe	2226 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Red-breasted merganser , *Mergus serrator*, NW & C Europe	306 individuals, representing an average of 3.1% of the GB population (5 year peak mean 1998/9-2002/3)
Water rail , *Rallus aquaticus*, Europe	12 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)
Bar-tailed godwit , *Limosa lapponica lapponica*, W Palearctic	1189 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9-2002/3)

Species Information

17 British Red Data Book species and 84 nationally scarce species have been recorded from Chichester and Langstone Harbours Ramsar site.

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
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation
Fisheries production
Livestock grazing
Non-consumptive recreation
Scientific research
Sport fishing
Sport hunting
Subsistence fishing
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	+	+

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	

Cutting of vegetation (small-scale/subsistence)		+
Fishing: commercial	+	+
Fishing: recreational/sport	+	+
Marine/saltwater aquaculture	+	
Gathering of shellfish	+	
Bait collection	+	
Arable agriculture (unspecified)		+
Permanent arable agriculture		+
Livestock watering hole/pond	+	
Permanent pastoral agriculture	+	
Hay meadows	+	+
Hunting: recreational/sport	+	+
Industry	+	+
Sewage treatment/disposal	+	+
Harbour/port	+	+
Flood control	+	+
Irrigation (incl. agricultural water supply)		+
Mineral exploration (excl. hydrocarbons)		+
Transport route	+	+
Domestic water supply		+
Urban development		+
Non-urbanised settlements	+	+
Military activities	+	+
Horticulture (incl. market gardening)		+

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?
Erosion	2		+		+
Eutrophication	1		+		+
Pollution – domestic sewage	1			+	

For category 2 factors only.
What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Erosion - Coastal Defence Strategies, regulation of private coastal defences, shoreline management plans are in place or are being developed.
Some larger-scale saltmarsh re-creation projects, beneficial usage of maintenance dredgings and managed realignment scheme to offset losses to coastal squeeze have been proposed. CHaMPs identify potential areas suitable for managed realignment.

Is the site subject to adverse ecological change? YES

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)	+	+
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	
Management agreement	+	+
Site management statement/plan implemented	+	
Area of Outstanding National Beauty (AONB)	+	+
Special Area of Conservation (SAC)	+	

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.
Bird Ringing by Solent Shorebirds Study Group.

Environment.
Coastal Sediment (SCOPAC)
Water Quality/Eutrophication (EA/Southern Water).
Various research and educational establishments carry out ongoing research into a number of different aspects of the environment.

Flora.
Spartina survey (EN project).

Completed.

Environment.
Extensive research and survey into:
Tidal regimes.
Proposed:
Intertidal Habitat Monitoring (EN/EA project).
Sediment movement.

Flora and Fauna.
The distribution of all major plant and animal groups/communities.

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.

Interpretation facilities and interpretative panels exist at strategic locations on the Harbour footpaths; all nature reserve areas are covered by warden and ranger services with an educational remit. An Education Officer is employed by the Chichester Harbour Conservancy to instruct both school parties and adults in the cultural and nature conservation aspects of the harbour.

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, including dog walking: all year.

Birdwatching: all year.

Angling and bait-digging: all year.

Swimming (in restricted areas) - mostly summer.

Sailing, windsurfing, canoeing, waterskiing.

Sept-Feb wildfowling.

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

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

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

Barne, JH, Robson, CF, Kaznowska, SS, Doody, JP & Davidson, NC (eds.) (1998) *Coasts and seas of the United Kingdom. Region 9 Southern England: Hayling Island to Lyme Regis*. Joint Nature Conservation Committee, Peterborough. (Coastal Directories Series.)

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Covey, R (1998) Chapter 7. Eastern Channel (Folkestone to Durlston Head) (MNCR Sector 7). In: *Benthic marine ecosystems of Great Britain and the north-east Atlantic*, ed. by K. Hiscock, 199-218. Joint Nature Conservation Committee, Peterborough. (Coasts and Seas of the United Kingdom. MNCR series)

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

Doody, JP, Johnston, C & Smith, B (1993) *Directory of the North Sea coastal margin*. Joint Nature Conservation Committee, Peterborough

Fowler, SL (1995) *Review of nature conservation features and information within the Solent & Isle of Wight Sensitive Marine Area*. Report to the Solent Forum Strategic Guidance Subgroup [Includes extensive bibliography]

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Musgrove, AJ, Langston, RHW, Baker, H & Ward, RM (eds.) (2003) *Estuarine waterbirds at low tide. The WeBS Low Tide Counts 1992–93 to 1998–99*. WSG/BTO/WWT/RSPB/JNCC, Thetford (International Wader Studies, No. 16)

Musgrove, AJ, Pollitt, MS, Hall, C, Hearn, RD, Holloway, SJ, Marshall, PE, Robinson, JA & Cranswick, PA (2001) *The Wetland Bird Survey 1999–2000: wildfowl and wader counts*. British Trust for Ornithology, Wildfowl and Wetlands Trust, Royal Society for the Protection of Birds & Joint Nature Conservation Committee, Slimbridge. www.wwt.org.uk/publications/default.asp?PubID=14

Ratcliffe, DA (ed.) (1977) *A Nature Conservation Review. The selection of biological sites of national importance to nature conservation in Britain*. Cambridge University Press (for the Natural Environment Research Council and the Nature Conservancy Council), Cambridge (2 vols.)

Sneddon, P & Randall, RE (1994) *Coastal vegetated shingle structures of Great Britain: Appendix 3. Shingle sites in England*. Joint Nature Conservation Committee, Peterborough

Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds.) (2001) *The UK SPA network: its scope and content*. Joint Nature Conservation Committee, Peterborough (3 vols.) www.jncc.gov.uk/UKSPA/default.htm

Tubbs, C (1991) The Solent: a changing wildlife heritage. Hampshire and Isle of Wight Wildlife Trust, RomseyTubbs, CR & Tubbs, JM (1980) Wader and shelduck feeding distribution in Langstone Harbour, Hampshire. *Bird Study*, **27**, 239-248

Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
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NATURA 2000 – STANDARD DATA FORM

Special Protection Areas under the EC Birds Directive.

Each Natura 2000 site in the United Kingdom has its own Standard Data Form containing site-specific information. The data form for this site has been generated from the Natura 2000 Database submitted to the European Commission on the following date:

22/12/2015

The information provided here, follows the officially agreed site information format for Natura 2000 sites, as set out in the Official Journal of the European Union recording the Commission Implementing Decision of 11 July 2011 (2011/484/EU).

The Standard Data Forms are generated automatically for all of the UK's Natura 2000 sites using the European Environment Agency's Natura 2000 software. The structure and format of these forms is exactly as produced by the EEA's Natura 2000 software (except for the addition of this coversheet and the end notes). The content matches exactly the data submitted to the European Commission.

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

Further technical documentation may be found here
http://bd.eionet.europa.eu/activities/Natura_2000/reference_portal

As part of the December 2015 submission, several sections of the UK's previously published Standard Data Forms have been updated. For details of the approach taken by the UK in this submission please refer to the following document:
http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

More general information on Special Protection Areas (SPAs) in the United Kingdom is available from the SPA home page on the JNCC website. This webpage also provides links to Standard Data Forms for all SPAs in the UK.

Date form generated by the Joint Nature Conservation Committee
25 January 2016.

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK9011011**

SITENAME **Chichester and Langstone Harbours**

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1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
A	UK9011011

1.3 Site name

Chichester and Langstone Harbours

1.4 First Compilation date	1.5 Update date
1987-10	2015-12

1.6 Respondent:

Name/Organisation: Joint Nature Conservation Committee

Address: Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY

Email:

1.7 Site indication and designation / classification dates

Date site classified as SPA:	1987-10
National legal reference of SPA designation	Regulations 12A and 13-15 of the Conservation Habitats and Species Regulations 2010, (http://www.legislation.gov.uk/uksi/2010/490/contents/made) as amended by The Conservation of Habitats and Species (Amendment) Regulations 2011 (http://www.legislation.gov.uk/uksi/2011/625/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
-0.92	50.80638889

2.2 Area [ha]:

5810.95

2.3 Marine area [%]

87.8

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKJ3	Hampshire and Isle of Wight
UKJ2	Surrey, East and West Sussex

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
B	A054	Anas acuta			w	330	330	i		G	C		C	
B	A056	Anas clypeata			w	100	100	i		G	C		C	
B	A052	Anas crecca			w	1824	1824	i		G	C		C	
B	A050	Anas penelope			w	2055	2055	i		G	C		C	
B	A169	Arenaria interpres			w	430	430	i		G	C		C	
B	A675	Branta bernicla bernicla			w	17119	17119	i		G	A		C	
B	A144	Calidris alba			w	236	236	i		G	C		C	
B	A672	Calidris alpina alpina			w	44294	44294	i		G	B		C	
B	A137	Charadrius hiaticula			w	846	846	i		G	B		C	

B	A157	Limosa lapponica			w	1692	1692	i		G	B		C	
B	A069	Mergus serrator			w	297	297	i		G	B		C	
B	A160	Numenius arquata			w	1861	1861	i		G	C		C	
B	A141	Pluvialis squatarola			w	3825	3825	i		G	B		C	
B	A195	Sterna albifrons			r	100	100	p		G	B		C	
B	A193	Sterna hirundo			r	33	33	p		G	C		C	
B	A191	Sterna sandvicensis			r	31	31	p		G	C		C	
B	A048	Tadorna tadorna			w	2410	2410	i		G	B		C	
B	A162	Tringa totanus			w	1788	1788	i		G	C		C	

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

3.3 Other important species of flora and fauna (optional)

Species					Population in the site				Motivation					
Group	CODE	Scientific Name	S	NP	Size		Unit	Cat.	Species Annex		Other categories			
					Min	Max		C|R|V|P	IV	V	A	B	C	D
B	WATR	Waterfowl assemblage			93230	93230	i						X	

- **Group:** A = Amphibians, B = Birds, F = Fish, Fu = Fungi, I = Invertebrates, L = Lichens, M = Mammals, P = Plants, R = Reptiles
- **CODE:** for Birds, Annex IV and V species the code as provided in the reference portal should be used in addition to the scientific name
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Unit:** i = individuals, p = pairs or other units according to the standard list of population units and codes in accordance with Article 12 and 17 reporting, (see reference portal)
- **Cat.:** Abundance categories: C = common, R = rare, V = very rare, P = present
- **Motivation categories: IV, V:** Annex Species (Habitats Directive), **A:** National Red List data; **B:** Endemics; **C:** International Conventions; **D:** other reasons

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N02	63.0
N23	0.2
N16	0.8
N10	1.7
N07	0.5
N14	11.7
N03	21.5
N06	0.4
N04	0.3
N08	0.1
Total Habitat Cover	100.2

Other Site Characteristics

1 Terrestrial: Soil & Geology: nutrient-rich,shingle,alluvium,sand,sedimentary,neutral,mud 2 Terrestrial: Geomorphology and landscape: coastal,lowland,floodplain 3 Marine: Geology: sand,clay,shingle,mud,sedimentary,gravel 4 Marine: Geomorphology: pools,lagoon,estuary,subtidal sediments (including sandbank/mudbank),enclosed coast (including embayment),islands,shingle bar,intertidal sediments (including sandflat/mudflat)

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC) During the breeding season the area regularly supports: Sterna albifrons (Eastern Atlantic - breeding) 4.2% of the GB breeding population 5 year mean, 1992-1996 Sterna hirundo (Northern/Eastern Europe - breeding) 0.3% of the GB breeding population 5 year mean, 1992-1996 Sterna sandvicensis (Western Europe/Western Africa) 0.2% of the GB breeding population 5 year mean, 1993-1997 Over winter the area regularly supports: Limosa lapponica (Western Palearctic - wintering) 3.2% 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: Anas acuta (North-western Europe) 1.2% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Anas clypeata (North-western/Central Europe) 1% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Anas crecca (North-western Europe) 0.5% of the population 5 year peak mean 1991/92-1995/96 Anas penelope (Western Siberia/North-western/North-eastern Europe) 0.7% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Arenaria interpres (Western Palearctic - wintering) 0.7% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Branta bernicla bernicla (Western Siberia/Western Europe) 5.7% of the population 5 year peak mean 1991/92-1995/96 Calidris alba (Eastern Atlantic/Western & Southern Africa - wintering) 0.2% of the population 5 year peak mean 1991/92-1995/96 Calidris alpina alpina (Northern Siberia/Europe/Western Africa) 3.2% of the population 5 year peak mean 1991/92-1995/96 Charadrius hiaticula (Europe/Northern Africa - wintering) 3% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Mergus serrator (North-western/Central Europe) 3% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Numenius arquata (Europe - breeding) 1.6% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Pluvialis squatarola (Eastern Atlantic - wintering) 2.3% of the population 5 year peak mean 1991/92-1995/96 Tadorna tadorna (North-western Europe) 3.3% of the population in Great Britain 5 year peak mean 1991/92-1995/96 Tringa totanus (Eastern Atlantic - wintering) 1% 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: 93230 waterfowl (5 year peak mean 1991/92-1995/96) Including: Branta bernicla bernicla , Tadorna tadorna , Anas penelope , Anas crecca , Anas acuta , Anas clypeata , Mergus serrator , Charadrius hiaticula , Pluvialis squatarola , Calidris alba , Calidris alpina alpina , Limosa lapponica , Numenius arquata , Tringa totanus , Arenaria interpres

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	H02		B
H	M01		B
H	M02		B
H	F02		I
H	G01		I

Positive Impacts			
Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	B02		I
H	D05		I
H	A02		I
H	A04		I

Rank: H = high, M = medium, L = low
Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,
T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions
i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

http://publications.naturalengland.org.uk/category/3212324
http://publications.naturalengland.org.uk/category/6490068894089216

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK04	100.0				

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

- [ ] Yes
- [ ] No, but in preparation
- [X] No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE NATURA 2000 STANDARD DATA FORMS

The codes in the table below are also explained in the official European Union guidelines for the Standard Data Form. The relevant page is shown in the table below.

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	Designated Special Protection Area	53
B	SAC (includes candidates Special Areas of Conservation, Sites of Community Importance and designated SAC)	53
C	SAC area the same as SPA. Note in the UK Natura 2000 submission this is only used for Gibraltar	53

3.1 Habitat representativity

CODE	DESCRIPTION	PAGE NO
A	Excellent	57
B	Good	57
C	Significant	57
D	Non-significant presence	57

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha□ rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	15%-100%	58
B	2%-15%	58
C	< 2%	58

3.1 Conservation status habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global grade habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	15%-100%	62
B	2%-15%	62
C	< 2%	62
D	Non-significant population	62

3.2 Conservation status species (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' Or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Assemblages types

CODE	DESCRIPTION	PAGE NO
WATR	Non breeding waterfowl assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code
BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

CODE	DESCRIPTION	PAGE NO
E03	Discharges	65
E04	Structures, buildings in the landscape	65
E06	Other urbanisation, industrial and similar activities	65
F01	Marine and Freshwater Aquaculture	65
F02	Fishing and harvesting aquatic ressources	65
F03	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)	65
F04	Taking / Removal of terrestrial plants, general	65
F05	Illegal taking/ removal of marine fauna	65
F06	Hunting, fishing or collecting activities not referred to above	65
G01	Outdoor sports and leisure activities, recreational activities	65
G02	Sport and leisure structures	65
G03	Interpretative centres	65
G04	Military use and civil unrest	65
G05	Other human intrusions and disturbances	65
H01	Pollution to surface waters (limnic & terrestrial, marine & brackish)	65
H02	Pollution to groundwater (point sources and diffuse sources)	65
H03	Marine water pollution	65
H04	Air pollution, air-borne pollutants	65
H05	Soil pollution and solid waste (excluding discharges)	65
H06	Excess energy	65
H07	Other forms of pollution	65
I01	Invasive non-native species	65
I02	Problematic native species	65
I03	Introduced genetic material, GMO	65
J01	Fire and fire suppression	65
J02	Human induced changes in hydraulic conditions	65
J03	Other ecosystem modifications	65
K01	Abiotic (slow) natural processes	65
K02	Biocenotic evolution, succession	65
K03	Interspecific faunal relations	65
K04	Interspecific floral relations	65
K05	Reduced fecundity/ genetic depression	65
L05	Collapse of terrain, landslide	65
L07	Storm, cyclone	65
L08	Inundation (natural processes)	65
L10	Other natural catastrophes	65
M01	Changes in abiotic conditions	65
M02	Changes in biotic conditions	65
U	Unknown threat or pressure	65
XO	Threats and pressures from outside the Member State	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK02	Marine Nature Reserve	67
UK04	Site of Special Scientific Interest (UK)	67

EC Directive 79/409 on the Conservation of Wild Birds: Special Protection Area

CHICHESTER AND LANGSTONE HARBOURS (HAMPSHIRE/WEST SUSSEX)

The site is internationally important because it regularly supports more than 10,000 wintering wildfowl (average 25,000) and also by regualrly supporting more than 20,000 wintering waders (average 77,000).

The site also supports internationally important numbers of the following species: grey plover Pluvualis squatarola (3.9% of the west European population), sanderling Caldris alba (3.1%), dunlin Caldris alpina (2.6% and over 20,000 birds), redshank Tringa totanus (1.4%), brent goose Branta bernicla (12%), shelduck Tadorna tadorna (4%), and teal Anas crecca (1%).

The site qualifies under Article 4.2 by supporting internationally important numbers of the migratory bird species listed above and nationally important wintering numbers of the following migratory bird species: ringed plover Charadrius hiaticula, curlew Numerius arquata, bar-tailed godwit Limosta lapponica, turnstone Arenaria interpres, wigeon Anas penelope, pintail Anas acuta, shoveler Anas clypeata and the red-breasted merganser Mergus serrator.

The site also qualifies under Article 4.1 because it provices a breeding site for three species of terns Sterna.

This citation / map relates to a site entered in the Register of European sites for Great Britain.
Register reference number UK 00 11 01
Date of registration 30 JAN 1996
Signed .....
on behalf of the Secretary of State for the Environment

European Site Conservation Objectives for Chichester and Langstone Harbours Special Protection Area Site Code: UK9011011

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- **The extent and distribution of the habitats of the qualifying features**
- **The structure and function of the habitats of the qualifying features**
- **The supporting processes on which the habitats of the qualifying features rely**
- **The population of each of the qualifying features, and,**
- **The distribution of the qualifying features within the site.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A052 *Anas crecca*; Eurasian teal (Non-breeding)
A054 *Anas acuta*; Northern pintail (Non-breeding)
A056 *Anas clypeata*; Northern shoveler (Non-breeding)
A069 *Mergus serrator*; Red-breasted merganser (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A144 *Calidris alba*; Sanderling (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A160 *Numenius arquata*; Eurasian curlew (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A169 *Arenaria interpres*; Ruddy turnstone (Non-breeding)
A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)

Waterbird assemblage

This is a European Marine Site

This SPA is a part of the Solent Maritime European Marine Site (EMS). These Conservation Objectives should be used in conjunction with the Regulation 35 Conservation Advice document for the EMS. For further details about this please visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx or contact Natural England's enquiry service at enquiries@naturalengland.org.uk or by phone on 0845 600 3078.

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive. They must be considered when a competent authority is required to make a 'Habitats Regulations Assessment' including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where this is available) will also provide a framework to inform the management of the European Site under the provisions of Articles 4(1) and 4(2) of the Wild Birds Directive, and the prevention of deterioration of habitats and significant disturbance of its qualifying features required under Article 6(2) of the Habitats Directive.

These Conservation Objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving the aims of the Wild Birds Directive.

Publication date: 30 June 2014 (Version 2). This document updates and replaces an earlier version dated 29 May 2012 to reflect Natural England's Strategic Standard on European Site Conservation Objectives 2014. Previous references to additional features identified in the 2001 UK SPA Review have also been removed.

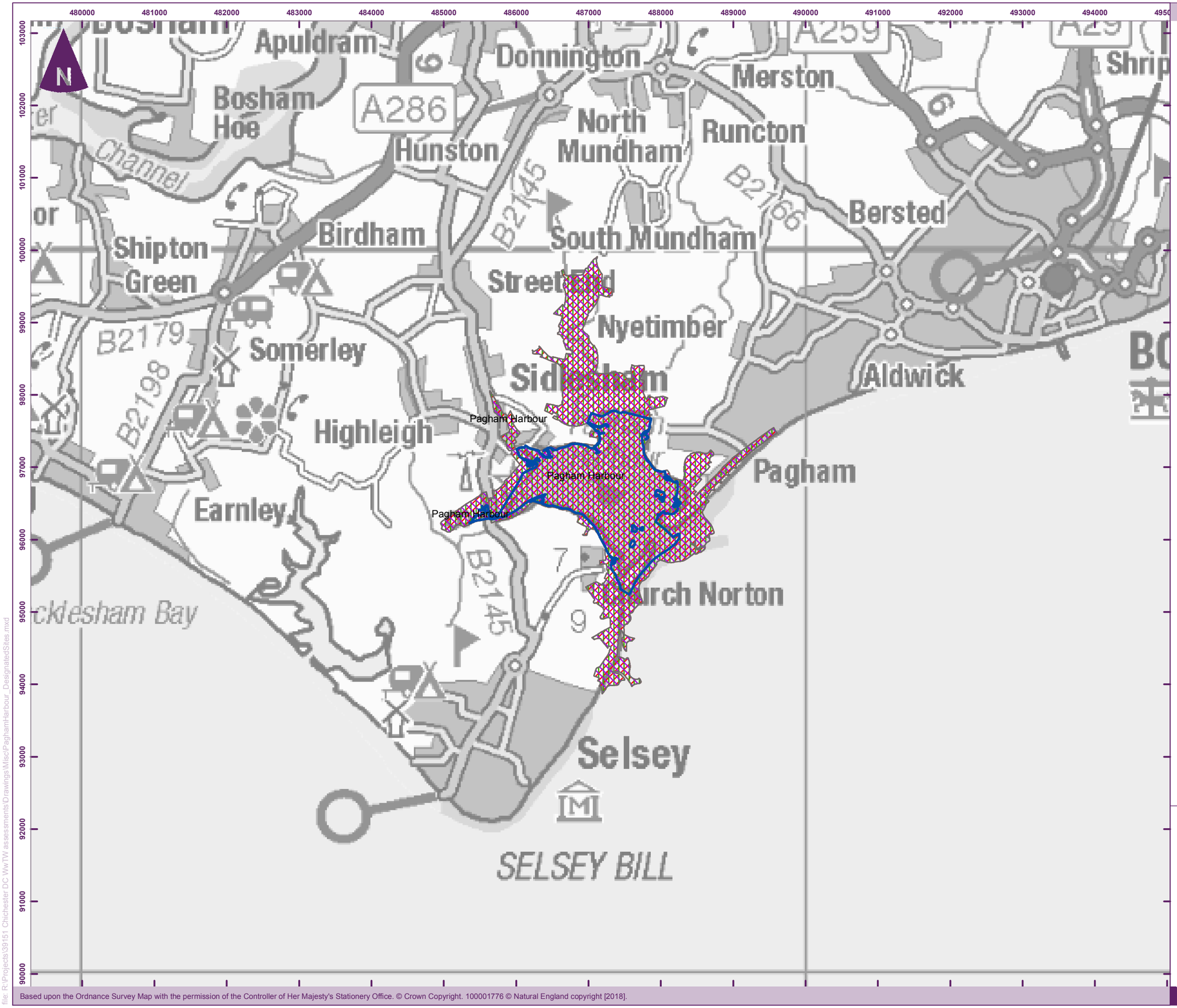
1.3 Pagham Harbour sites

The data included for the Pagham Harbour sites (Pagham Harbour SSSI; Pagham Harbour Ramsar; Pagham Harbour SPA; Pagham Harbour MCZ) is as follows:

Table 1.3 Included data for the Pagham Harbour sites

Data	SSSI	SPA	Ramsar	MCZ
Site map	✓	✓	✓	✓
Citation / Criteria	✓	✓	✓	✓
Conservation Objectives		✓	As for SPA	✓
Condition Tables	✓	As for SSSI*		
Condition Assessment	✓	As for SSSI*		

* Site- and feature-specific condition assessment data are not available for the SPA, Ramsar and MCZ; the SSSI condition assessment data are applied across the sites when considering feature and site conservation status. However, these data should be applied mindfully as (a) the interest features of the sites will not all be the same, and some features will not be covered by the SSSI data; and (b) the site boundaries and extents will not necessarily be coincident.
** Formal conservation objectives are published for the European sites and MCZ only, although the broad objectives are applicable to the SSSI also.



Key

- Pagham Harbour Ramsar (England) © Natural England
- Pagham Harbour Special Protection Area (England) © Natural England
- Pagham Harbour Site of Special Scientific Interest (SSSI) © Natural England
- Pagham Harbour Marine Conservation Zone © Natural England and JNCC

0 0.5 1 1.5 2 2.5 km

Scale at A3: 1:50,000

39151 Chichester DC
WwTW assessments

amec foster wheeler

Pagham Harbour Designated Sites

file: R:\Projects\39151 Chichester DC WwTW assessments\Drawings\Misc\PaghamHarbour_DesignatedSites.mxd

COUNTY: WEST SUSSEX **SITE NAME:** PAGHAM HARBOUR

DISTRICT: CHICHESTER: ARUN

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981. Part of this site is a Local Nature Reserve (under S21 of The National Parks and Access to the Countryside Act 1949)

Local Planning Authority: CHICHESTER DISTRICT COUNCIL; ARUN DISTRICT COUNCIL

National Grid Reference: SZ 875 970 **Area:** 615.9 ha 1521.9 acres

Ordnance Survey Sheet 1:50,000: 197 **1:10,000:** SZ 89 NW, NE, SE

Date Notified (under 1949 Act): 1954 **Date of Last Revision:** 1980

Date Notified (under 1981 Act): 1986 **Date of Last Revision:**

Other Information: This site lies within the South Coast Plain. Pagham Harbour is a proposed NCR site. This site contains Pagham Harbour GCR site and part of Bognor Regis (Palaeobotany) GCR site. This is also a proposed Ramsar/SPA site.

Reasons for Notification:

This site comprises an extensive central area of salt-marsh and tidal mudflats with surrounding habitats including shingle, open water, reed swamp and wet permanent grassland.Pagham Harbour is of national importance for wintering wildfowl and waders and also for breeding birds both within the Harbour and the surrounding grazing pasture. The site supports nationally important communities of plants and invertebrates.

Pagham Harbour was reclaimed for agriculture in the late nineteenth century but was flooded again by a storm in the early twentieth century. The extensive intertidal mudflats are rich in algae and invertebrates and provide important feeding areas for birds.

Salt-marsh is a habitat threatened nationally through reclamation for agriculture.The lower part of the salt-marsh is dominated by the hybrid common cord-grass *Spartina anglica* with patches of the glassworts *Salicornia* spp. Above this zone sea-purslane *Halimione portulacoides* covers large areas with other species such as sea aster *Aster tripolium* in the periphery. At one part of the site within a mixed salt-marsh community greater sea-spurrey *Spergularia media* and sea lavender *Limonium vulgare* are found.The upper margin of the salt-marsh has developed a narrow strip of grassland dominated by sea couch *Elymus pycnanthus*.

Vegetated shingle is a nationally rare community. At Pagham, the type and extent of plant cover is dictated by the shifting nature of the substrates, the sea defence works, and by its relative exposure to the elements. In sheltered areas a diverse grass sward has developed with herbs such as early forget-me-not *Myosotis ramosissima*, biting stonecrop *Sedum acre* and the nationally endangered childing pink *Petrorhagia nanteuilli*. This contrasts with the sparse vegetation of the shingle ridge where the uncommon sea-kale *Crambe maritima* and yellow-vetch *Vicia lutea* are found.

Pagham Harbour has a wide variety of wetland habitats. Brackish drainage ditches dissect the land where common reed *Phragmites australis* dominates. This forms fairly extensive swamps in some areas including the Severals to the west of the Harbour which are important for breeding and migrating reed and sedge warblers. Sidlesham ferry to the north-west provides high water feeding and roosting areas for waders while Pagham Lagoon in the east is a stormy weather sheltering site for sea duck. Here may also be found the nationally endangered starlet sea anemone *Nematostella vectensis*.

The small amount of woodland at Pagham Harbour is dominated by willow and oak. One of these areas supports a small heronry. In contrast, the ancient woodland at Norton Priory is drier with oak standards and a rich ground flora. Scrub is found both in the form of hedges and as more extensive patches with hawthorn *Crataegus monogyna* and gorse *Ulex europaeus* being the main constituents. The damp unimproved grassland surrounding the Harbour is used as a major wader roost and is grazed by large numbers of Brent Geese. Some fields of improved grassland are included in the site as they too, support nationally important populations of birds.

Pagham Harbour is an overwintering area for over 120 species of bird. The numbers of wintering pintail, ringed and grey plover and black-tailed godwit regularly reach 1% of British populations and the site is of international importance for wintering ruff and Brent Geese. The mudflats also provide food for a diverse breeding community of birds including oystercatcher, shelduck and redshank.

Notable invertebrates include the sand dart *Agrotis ripae*, Matthew's wainscot moth *Mythimna favicolor* and the long-winged conehead grasshopper *Conocephalus discolor*.

Geology:

Pagham Harbour is a key site for coastal geomorphology. It is significant both as a classic shingle spit landform and for the links that have been demonstrated between the coastal near shore and offshore forms and sediments. The shingle spit system comprises a series of sub-parallel ridges and recurves, marking different phases of extension and frontal accretion. Shingle reaches the beach *via* the intertidal zone, and the so-called "Pagham delta" and the behaviour of the spits and delta are intimately linked with water and sediment circulation around the Selsey peninsula. The area also provides an excellent example of the role of weed rafting of shingle in coastal sediment budgets.

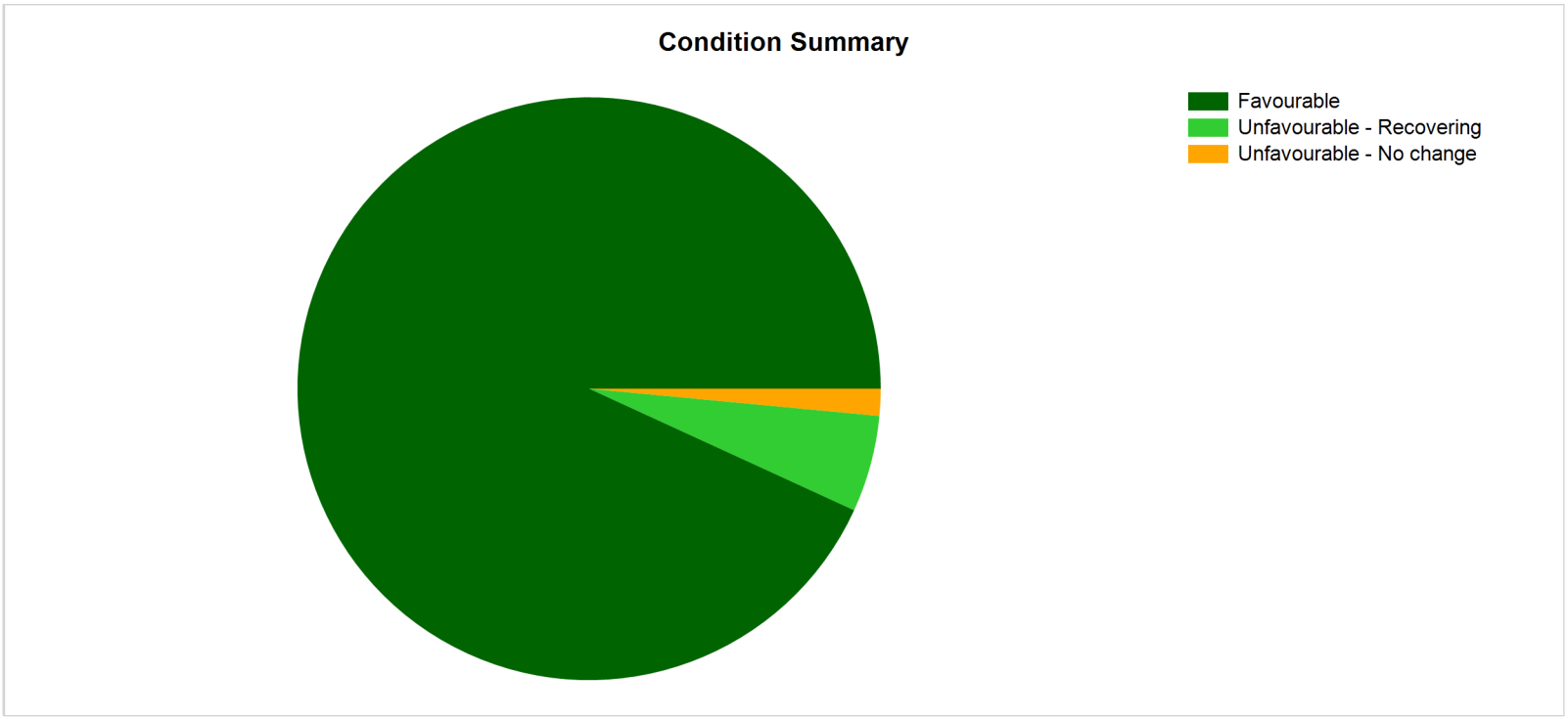
This site also includes, at the north-eastern end, part of a key site for plant fossils from the London Clay (divisions B_1 and B_2). It is the only locality in the Hampshire Basin to yield abundant London Clay plants and the only site known to have yielded plants from the B_2 division of this formation. The site has yielded examples of some one hundred and thirty species (representing seventy families), including numerous type specimens. Dominant families include the Vitaceae, Menispermaceae and Burseraceae.The genera *Bognoria* and *Aldwichia* are only found here, as are some thirty species. An outstanding palaeobotanical site of great importance to studies of Tertiary floras.

Site: Pagham Harbour SSSI

Report generated on: 01 Feb 2018

	Sites	Units	Units Assessed
Total number	1	23	23
Total area (ha)	629.01	629.01	629.01

	% meeting area of favourable or unfavourable recovering	Favourable	Unfavourable - Recovering	Unfavourable - No change	Unfavourable - Declining	Partially destroyed	Destroyed	Not Assessed
Area (ha)	619.61	585.93	33.67	9.41				
Percentage	98.50%	93.15%	5.35%	1.50%	0.00%	0.00%	0.00%	0.00%


Condition Summary
Favourable
Unfavourable - Recovering
Unfavourable - No change

Report generated on: 01 Feb 2018

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Pagham Harbour SSSI - WEST SUSSEX (ARUN, CHICHESTER)									
STANDING OPEN WATER AND CANALS	KRISTOFFER HEWITT	001	1008822	11.5833	0.00	26/10/2010	Unfavourable - Recovering	This unit was apparently affected by a pollution incident. Investigation did not reveal a source of pollution and there are no indications that there is a risk of a recurrence. Survey carried out by University of Brighton indicates that although there is still a rather impoverished flora and fauna, there are clear signs of recovery of the lagoon system. This includes relatively good overall populations of lagoon taxa, including 3 specialist lagoon species, and an absence of several taxa previously recorded that indicated organic enrichment. A previously recorded diverse gastropod community is not evident however. Further monitoring will be carried out to better understand the processes driving the biological composition of the site.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	002	1008829	1.8925	0.00	12/03/2009	Unfavourable - Recovering	Improvements have been made under AMP and through direct management and water qulaity is now improving.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	003	1017439	15.8196	0.00	01/10/2008	Favourable	The grassland is notified for the breeding birds it supports. The most recent Pagham Harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition.	
FEN, MARSH AND SWAMP - Lowland	KRISTOFFER HEWITT	004	1008840	9.4987	0.00	12/04/2005	Unfavourable - Recovering	A Management Agreement has now been signed, and a tender accepted for the works, so reed clearance should now take place in autumn 2005. This assessment has been made on the basis that management of the unit to achieve favourable condition has been secured through the WES agreement just signed, which addresses all reasons for unfavourable condition. It is not based on a full site assessment.	
FEN, MARSH AND SWAMP - Lowland	KRISTOFFER HEWITT	005	1017443	10.339	0.00	28/01/2010	Favourable	The unit, part of the Pagham Harbour Local Nature Reserve, is predominantly occupied by reed swamp dominated by common reed. The habitat is in good condition and well managed, and is considered to support suitable habitat for breeding and non-breeding bird assemblages. Woodland within the northern part of the unit is has not undergone any decline since the previous assessment and remains in good condition.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	006	1017441	12.9443	0.00	01/10/2008	Favourable	The grassland is notified for the breeding birds it supports and the wintering birds (brent geese). The Pagham harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition and the WeBS counts indicates the brent geese numbers are in favourable condition.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	007	1008830	62.5501	0.00	01/10/2008	Favourable	The grassland is notified for the breeding birds it supports and the wintering birds (brent geese). The Pagham harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition and the WeBS counts indicates the brent geese numbers are in favourable condition.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Pagham Harbour SSSI - WEST SUSSEX (ARUN, CHICHESTER)									
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	008	1008831	26.2269	0.00	01/10/2008	Favourable	The grassland is notified for the breeding birds it supports and the wintering birds (brent geese). The Pagham harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition and the WeBS counts indicates the brent geese numbers are in favourable condition.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	009	1008832	32.7494	0.00	28/01/2010	Favourable	e unit, part of the Pagham Harbour Local Nature Reserve, is predominantly occupied by lowland neutral grassland. The area is well managed, involving grazing and coppicing some of the ditches in sections to encourage the aquatic plant diversity. The unit is considered to support suitable habitat for breeding bird assemblage.	
BROADLEAVED, MIXED AND YEW WOODLAND - Lowland	KRISTOFFER HEWITT	010	1008825	2.616	0.00	29/04/2009	Unfavourable - Recovering	WGS has been agreed for the wood and is underway, with works concentrating on removal of bracken, rhododendron and sycamore. Early results are very encouraging.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	011	1008834	10.7349	0.00	28/01/2010	Favourable	The unit is occupied by a mosaic of woodland, lowland neutral grassland and reed swamp dominated by common reed. The area appears to be well managed, and is considered to support suitable habitat for breeding bird assemblage. The woodland exhibits good structural diversity including oak, yew, alder and hawthorn, with bramble and gorse occupying the groundlayer, along with satisfactory levels of standing/ lying deadwood.In addition, a small area of habitat with affinities to dune heath was observed on the eastern margin of the unit adjacent to the public footpath, supporting a good cover of lichens and bryophytes such as Cladonia spp, Rhytidiadelphus squarrosus, Pseudoscleropodium purum and Dicranum scoparium. This area soon grades into neutral grassland towards the centre of the unit.The site is also subject to rabbit grazing, which is not considered to be having a significant adverse impact on the site.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	012	1008823	35.434	0.00	28/01/2010	Favourable	The northern half of the unit is dominated by littoral sediment and upper saltmarsh, dominated by sea-purslane and common cord-grass (Spartina). The southern half of the site is mainly littoral sediment with some amounts of sea-purslane dominated salt marsh and small areas of shingle on the southern margin.The saltmarsh has not appeared to undergo any significant decline since the previous assessment, and is considered to provide suitable supporting habitat for aggregations of non-breeding birds.	
SUPRALITTORAL SEDIMENT	KRISTOFFER HEWITT	014	1017447	19.0505	0.00	12/09/2008	Favourable	First CVSM assessment and the vegetated shingle came out well. The coastal geopmorphology is also in favourable condition.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Pagham Harbour SSSI - WEST SUSSEX (ARUN, CHICHESTER)									
EARTH HERITAGE	KRISTOFFER HEWITT	015	1016777	12.9243	0.00	10/06/2010	Favourable	Site visited with SSSI officer Elaine Webster. SSSI inetrest feature assesed: SD1 - Rumex crispus - Glaucium flavum shingle community.The unit, part of the Pagham Harbour Local Nature Reserve, supports some strandline vegetation including Atriplex prostrata Spear-leaved Orache, Beta maritima Sea Beet, Sedum acre Biting Stonecrop and Suaeda maritima Annual Sea-blite.Since the previous assessment the shingle bar has shifted in position, as part of the natural dynamic processes of the shingle system. This change does not affect the assessment of this unit.	
EARTH HERITAGE	KRISTOFFER HEWITT	016	1017438	57.6464	0.00	10/06/2010	Favourable	Site visited with SSSI Officer Elaine Webster. SSSI inetrest feature assessed: SD1 Rumex crispus - Glaucium flavum shingle community.The unit, part of the Pagham Harbour Local Nature Reserve, supports shingle vegetation in its northern half including several positive indicator species, dominated by Crambe maritima with frequent Elytrigia atherica and occasional Glaucium flavum, Sedum acre, Cerastium diffusum and Solanum dulcamara.However, invasive red valerian Centranthus ruber is at risk of encroaching into the northern half of the unit and requires immediate attention. The council who are responsible for managing the Local Nature Reserve are aware of this problem.Much of this vegetation appears to have encroached from adjacent unit 14.	
BROADLEAVED, MIXED AND YEW WOODLAND - Lowland	KRISTOFFER HEWITT	017	1017442	1.0521	0.00	01/10/2008	Favourable	The woodland is notified for the breeding birds it supports, in particular the small heronry. The Pagham Harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition and the heronry in this unit is doing well.	
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	018	1008833	13.0362	0.00	01/10/2008	Favourable	The rough grassland is notified for the breeding birds it supports. The Pagham Harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition.	
FEN, MARSH AND SWAMP - Lowland	KRISTOFFER HEWITT	019	1017444	2.412	0.00	01/10/2008	Favourable	The grassland and fen is notified for the breeding birds it supports. The Pagham Harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	020	1017445	250.291	0.00	01/10/2008	Favourable	The intertidal sediment is notified for the wintering birds it supports. WeBS and other counts indicates the wintering wader and wildfowl numbers are in favourable condition. The saltmarsh was assessessed on 22 July and was favourable, though it was noted that the Spartina is still dominant over large areas.	
LITTORAL SEDIMENT	KRISTOFFER HEWITT	021	1017446	3.2476	0.00	01/10/2008	Favourable	The intertidal sedimentis notified for the wintering birds it supports. WeBS and other counts indicates the wintering wader and wildfowl numbers are in favourable condition.	

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Pagham Harbour SSSI - WEST SUSSEX (ARUN, CHICHESTER)									
NEUTRAL GRASSLAND - Lowland	KRISTOFFER HEWITT	022	1017440	8.0815	0.00	27/10/2008	Unfavourable - Recovering	The grassland and fen is notified for the breeding birds it supports and the wintering birds (mainly brent geese). The Pagham Harbour LNR breeding bird survey has identified the breeding bird interest as being in favourable condition and the WeBS and other counts indicates the brent geese and other wader/ wildfowl numbers are in favourable condition. Works are continuing on improvements to trhe new scrape to get better control of water levels and these will greatly improve its potential for breeding waders when completed.	
SUPRALITTORAL SEDIMENT	KRISTOFFER HEWITT	023	1029561	9.4054	0.00	10/06/2010	Unfavourable - No change	SSSI interest feature assessed: SD1 - Rumex crispus - Glaucium flavum shingle community.The unit, under private ownership, supports shingle vegetation including several positive indicator species, dominated by Crambe maritima with frequent Elytrigia atherica and occasional Glaucium flavum Yellow-horned Poppy, Echium vulgare Viper?s-bugloss, Sedum acre Biting Stonecrop, Tripleurospermum maritimum Sea Mayweed, Cerastium diffusum Sea Mouse-ear and Solanum dulcamara Bittersweet.However the unit has been heavily invaded by red valerian Centranthus ruber which has established a dense and expanding cover, most likely as a result of garden invasives from the adjacent houses. It appears little action has been taken to remove this species over recent years, and requires immediate action to prevent further encroachment. This should be addressed preferably as part of a wider plan to address this invasive species for the SSSI as a whole.In addition, some of the neighbouring residents keep boats on the unit which has resulted in some degradation of existing shingle vegetation.	LACK OF CORRECTIVE WORKS - INAPPROPRIATE WEED CONTROL,

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Pagham Harbour SSSI - WEST SUSSEX (ARUN, CHICHESTER)									
SUPRALITTORAL SEDIMENT	KRISTOFFER HEWITT	024	1029562	19.4761	0.00	10/06/2010	Favourable	Site visited with SSSI Officer Elaine Webster. SSSI interest feature assessed: SD1 Rumex crispus - Glaucium flavum shingle community.The unit, part of the Pagham Harbour Local Nature Reserve, supports shingle vegetation including several positive indicator species, dominated by Crambe maritima with frequent Elytrigia atherica and occasional Glaucium flavum Yellow-horned Poppy, Echium vulgare Viper?s-bugloss, Sedum acre Biting Stonecrop, Tripleurospermum maritimum Sea Mayweed, Cerastium diffusum Sea Mouse-ear and Solanum dulcamara Bittersweet. In addition there are patches of lichen cover (Cladonia spp and a black lichen which indicates minimal disturbance) scattered across the south-western end of the unit.Much of this vegetation is in good condition with these species occurring at appropriate levels of cover across the unit, especially within the south-western end of the unit.In addition, scattered Silene uniflora Sea Campion occurs within the central part of the unit near to the car park. However this appears to be adversely affected by rabbit grazing in this area which should be monitored.Also of concern is occasional invasive red valerian Centranthus ruber present particularly where the unit nears unit 23. Although not at a significant level of cover yet within this unit, this poses a serious risk to the condition of this unit and should be addressed as soon as possible, preferably as part of a wider plan to address this invasive species for the SSSI as a whole. The council who are responsible for managing the Local Nature Reserve are aware of this problem.	

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:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

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

2. Date this sheet was completed/updated:

Designated: 30 March 1988

3. Country:

UK (England)

4. Name of the Ramsar site:

Pagham Harbour

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):

50 45 48 N 00 45 38 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: Chichester

10 km south-east of Chichester.

Administrative region: West Sussex

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 636.68

Min. -1
Max. 5
Mean 1

12. General overview of the site:

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

Pagham Harbour comprises an extensive central area of saltmarsh and tidal mudflats with surrounding habitats including lagoons, shingle, open water, reed swamp and wet permanent grassland.

The intertidal mudflats are rich in invertebrate and algae, and provide important feeding areas for birds. The lower saltmarsh is dominated by common cord-grass but also includes patches of glasswort. At higher levels sea-purslane is abundant. The area supports internationally important numbers of wintering pintail and nationally important numbers of dark-bellied brent goose, grey plover and black-tailed godwit.

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).

6

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

Qualifying Species/populations (as identified at designation):

Species with peak counts in winter:

Dark-bellied brent goose, *Branta bernicla bernicla*,	2512 individuals, representing an average of 1.1% 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 with peak counts in winter:

Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe	377 individuals, representing an average of 1% 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.

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	neutral, shingle, sand, mud, clay, alluvium, nutrient-rich, sedimentary, gravel
Geomorphology and landscape	lowland, coastal, floodplain, shingle bar, subtidal sediments (including sandbank/mudbank), intertidal sediments (including sandflat/mudflat), open coast (including bay), enclosed coast (including embayment), estuary, islands, lagoon, pools
Nutrient status	mesotrophic
pH	circumneutral
Salinity	brackish / mixosaline, fresh, saline / euhaline
Soil	mainly mineral
Water permanence	usually permanent

Summary of main climatic features	Annual averages (Bognor Regis, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/bognor_regis.html) Max. daily temperature: 13.7° C Min. daily temperature: 7.7° C Days of air frost: 24.0 Rainfall: 717.4 mm Hrs. of sunshine: 1902.9

General description of the Physical Features:

Pagham Harbour is an estuarine basin that comprises an extensive central area of saltmarsh and intertidal mudflats, surrounded by lagoons, shingle, open water, reed swamp and wet permanent grassland.

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).

Pagham Harbour is an estuarine basin that comprises an extensive central area of saltmarsh and intertidal mudflats, surrounded by lagoons, shingle, open water, reed swamp and wet permanent grassland.

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:

Marine/coastal wetland

Code	Name	% Area
G	Tidal flats	33.3
Other	Other	31
E	Sand / shingle shores (including dune systems)	20.1
H	Salt marshes	5.2
F	Estuarine waters	3.3
J	Coastal brackish / saline lagoons	2.4
Sp	Saline / brackish marshes: permanent	2.2
Tp	Freshwater marshes / pools: permanent	0.8
W	Shrub-dominated wetlands	0.6
A	Shallow marine waters	0.6
M	Rivers / streams / creeks: permanent	0.3
9	Canals and drainage channels	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.

This site comprises an extensive central area of saltmarsh and tidal mudflats with surrounding habitats including shingles, open water, reed swamp and wet permanent grassland. Pagham Harbour is of national importance for wintering, wildfowl and waders and also for breeding birds both within the Harbour and the surrounding grazing pasture. The site supports nationally important communities of plants and invertebrates.

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.

Petrorhagia nanteuilii

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 with peak counts in spring/autumn:

Little egret , *Egretta garzetta*, West Mediterranean	60 individuals, representing an average of 3.6% of the GB population (5 year peak mean 1998/9-2002/3)
Whimbrel , *Numenius phaeopus*, Europe/Western Africa	104 individuals, representing an average of 3.4% of the GB population (5 year peak mean 1998/9-2002/3 - spring peak)
Common greenshank , *Tringa nebularia*, Europe/W Africa	20 individuals, representing an average of 3.3% of the GB population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

Slavonian grebe , *Podiceps auritus*, Northwest Europe	14 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9-2002/3)
Northern pintail , *Anas acuta*, NW Europe	462 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)
Grey plover , *Pluvialis squatarola*, E Atlantic/W Africa -wintering	704 individuals, representing an average of 1.3% of the GB population (5 year peak mean 1998/9-2002/3)
Spotted redshank , *Tringa erythropus*, Europe/W Africa	5 individuals, representing an average of 3.6% of the GB population (5 year peak mean 1998/9-2002/3)

Species Information

Nationally important species occurring on the site.

Invertebrates.

Nematostella vectensis

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
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation

Fisheries production
Livestock grazing
Non-consumptive recreation
Scientific research
Sport fishing
Sport hunting
Tourism

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	+	+

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	
Tourism	+	+
Recreation	+	+
Current scientific research	+	
Bait collection	+	+
Arable agriculture (unspecified)		+
Permanent arable agriculture		+
Livestock watering hole/pond	+	+
Permanent pastoral agriculture	+	+
Hunting: recreational/sport	+	+
Sewage treatment/disposal	+	+
Flood control	+	+
Irrigation (incl. agricultural water supply)		+
Transport route		+

Urban development		+

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?
No factors reported	NA				

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)	+	+
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	
Management agreement	+	
Site management statement/plan implemented	+	

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.

Completed.

Environment, Flora and Fauna.
Extensive research and surveys into tidal regimes, sediment movement and the distribution of all major animal and plant groups has been carried out in Pagham Harbour.

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 is an interpretative centre for the Local Nature Reserve.
A full time Education Officer is employed, the programme being particularly directed at schoolchildren.

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.
Land based recreation:

Walking including dog walking - all year.

Bird watching - all year.

Sea bathing - mostly summer.

Wildfowling: Only in agreed areas - 1 September to 20 February

Adjacent seasonal caravan parks - mainly summer.

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

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

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

Barne, JH, Robson, CF, Kaznowska, SS, Doody, JP & Davidson, NC & Buck, AL (eds.) (1998) *Coasts and seas of the United Kingdom. Region 8 Sussex: Rye Bay to Chichester Harbour*. Joint Nature Conservation Committee, Peterborough. (Coastal Directories Series.)

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Covey, R (1998) Chapter 7. Eastern Channel (Folkestone to Durlston Head) (MNCR Sector 7). In: *Benthic marine ecosystems of Great Britain and the north-east Atlantic*, ed. by K. Hiscock, 199-218. Joint Nature Conservation Committee, Peterborough. (Coasts and Seas of the United Kingdom. MNCR series)

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

Doody, JP, Johnston, C & Smith, B (1993) *Directory of the North Sea coastal margin*. Joint Nature Conservation Committee, Peterborough

Fojt, W (1985) *The saltmarsh survey of Great Britain. Sussex county report*. Unpublished, Nature Conservancy Council

Holder, CS & Woolven, SC (1990) Sand dune survey of Great Britain. Site report No. 79. Pagham Beach Dune, West Sussex, 1990. *Nature Conservancy Council, CSD report*, No. **1111**

Irving, R (1994) *Report of the West Sussex Seasearch Project. 1992–1993: Chichester Harbour to Littlehampton*. West Sussex Seasearch Project, Coldwaltham

James, CM (1987) Pagham Harbour. In: *Birds in Sussex 1962 – 1987*, 14-18. Sussex Ornithological Society

May, VJ & Hansom, JD (eds.) (2003) *Coastal geomorphology of Great Britain*. Joint Nature Conservation Committee, Peterborough (Geological Conservation Review Series, No. 28)

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Rayner, RW (ed.) (1975) *The natural history of Pagham Harbour*. Bognor Regis Natural Science Society

Robinson, AWH (1995) The harbour entrances of Poole, Christchurch and Pagham. *Geographical Journal*, **121**(1), 33 50

Sheader, M & Sheader, A (1989) Lagoon survey of the south coast, Dorset to East Sussex, 1989. Final report. *Nature Conservancy Council, CSD Report*, No. **1116**

Sneddon, P & Randall, RE (1994) *Coastal vegetated shingle structures of Great Britain: Appendix 3. Shingle sites in England*. Joint Nature Conservation Committee, Peterborough

Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds.) (2001) *The UK SPA network: its scope and content*. Joint Nature Conservation Committee, Peterborough (3 vols.) www.jncc.gov.uk/UKSPA/default.htm

West Sussex County Council (1987) *A guide to Pagham Harbour Nature Reserve*. West Sussex County Council, Chichester

Wood, C (ed.) (1984) Sussex sublittoral survey. Selsey Bill to Beachy Head. *Nature Conservancy Council, CSD Report*, No. **527**

Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
Telephone**: +41 22 999 0170** • Fax: **+41 22 999 0169** • email: **ramsar@ramsar.org**

EC Directive 79/409 on the Conservation of Wild Birds: Special Protection Area

PAGHAM HARBOUR (WEST SUSSEX)

The site qualifies under Article 4(2) as an internationally important wetland supporting in winter an average of 3045 dark-bellied brent geese Branta bernicla bernicla (2% of the European wintering population). The site also supports nationally important wintering populations: 270 pintail Anas acuta (1% of the British witering population) 781 grey plovers Pluvialis squatarola (3%) and 340 black-tailed godwits Limosa limosa (7%).

The site qualifies also under Article 4(1) by supporting an average of 160 wintering ruff Philomachus pugnax (10% of the British wintering population), and breeding populations of little tern Sterna albifrons and common tern Sterna hirundo.

This citation / map relates to a site entered in the Register of European sites for Great Britain
Register reference number UK9001204
Date of registration 25 AUG 1988
Signed .....
on behalf of the Secretary of State for the Environment

European Site Conservation Objectives for Pagham Harbour Special Protection Area Site Code: UK9012041

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- **The extent and distribution of the habitats of the qualifying features**
- **The structure and function of the habitats of the qualifying features**
- **The supporting processes on which the habitats of the qualifying features rely**
- **The population of each of the qualifying features, and,**
- **The distribution of the qualifying features within the site.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)

A151 *Philomachus pugnax*; Ruff (Non-breeding)

A193 *Sterna hirundo*; Common tern (Breeding)

A195 *Sterna albifrons*; Little tern (Breeding)

This is a European Marine Site

This SPA is a part of the Pagham Harbour European Marine Site (EMS). These Conservation Objectives should be used in conjunction with the Regulation 35 Conservation Advice document for the EMS. For further details about this please visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx or contact Natural England's enquiry service at enquiries@naturalengland.org.uk or by phone on 0845 600 3078.

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive. They must be considered when a competent authority is required to make a 'Habitats Regulations Assessment' including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where this is available) will also provide a framework to inform the management of the European Site under the provisions of Articles 4(1) and 4(2) of the Wild Birds Directive, and the prevention of deterioration of habitats and significant disturbance of its qualifying features required under Article 6(2) of the Habitats Directive.

These Conservation Objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving the aims of the Wild Birds Directive.

Publication date: 30 June 2014 (Version 2). This document updates and replaces an earlier version dated 29 May 2012 to reflect Natural England's Strategic Standard on European Site Conservation Objectives 2014. Previous references to additional features identified in the 2001 UK SPA Review have also been removed.

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 A

1.2 Site code UK9012041

1.3 Compilation date 198803

1.4 Update 199902

1.5 Relationship with other Natura 2000 sites

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name **Pagham Harbour**

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	198803
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	**latitude**
00 45 38 W	50 45 48 N

2.2 Site area (ha) 636.68

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK533	West Sussex	100.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

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
A046a	*Branta bernicla bernicla*			1794 I		C		C	
A151	*Philomachus pugnax*			10 I		C		C	
A195	*Sterna albifrons*		7 P			C		C	
A193	*Sterna hirundo*		0 P			C		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	0.6
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	39.2
Salt marshes. Salt pastures. Salt steppes	5.2
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	20.2
Inland water bodies (standing water, running water)	1.0
Bogs. Marshes. Water fringed vegetation. Fens	2.8
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	30.3
Other arable land	
Broad-leaved deciduous woodland	0.7
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. 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:

Alluvium, Clay, Gravel, Mud, Neutral, Nutrient-rich, Sand, Sedimentary, Shingle

Geomorphology & landscape:

Coastal, Estuary, Floodplain, Intertidal sediments (including sandflat/mudflat), Islands, Lagoon, Lowland, Open coast (including bay), Pools, Shingle bar, Subtidal sediments (including sandbank/mudbank)

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

Sterna albifrons (Eastern Atlantic - breeding)	0.3% of the GB breeding population 5 year mean, 1992-1996
Sterna hirundo (Northern/Eastern Europe - breeding)	% of the GB breeding population Count, as at 1996

Over winter the area regularly supports:

Philomachus pugnax (Western Africa - wintering)	1.4% of the GB population 5 year mean, 1995-1999

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

Over winter the area regularly supports:

Branta bernicla bernicla (Western Siberia/Western Europe)	0.6% of the population 5 year peak mean 1991/92-1995/96

4.3 Vulnerability

Pagham Harbour comprises an extensive central area of salt marsh and tidal mudflats, with surrounding habitats including lagoons, shingle, open water, reed swamp and wet permanent grassland.

The majority of the site is a Local Nature Reserve managed by West Sussex County Council. Historical land drainage for agricultural purposes is being addressed through the Local Nature Reserve Management Plan and Management Agreements, while pollution from inadequate treatment of sewage discharges will be reviewed by the Environmental Agency.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK04 (SSSI/ASSI)	100.0

Natural England Conservation Advice for Marine Protected Areas
Pagham Harbour MCZ

Natural England guidance

This site collection contains Natural England's conservation advice for this site. It fulfils Natural England's responsibility under the Marine and Coastal Access Act 2009 (http://www.legislation.gov.uk/ukpga/2009/23/contents), to give advice on how to further the conserva features and the processes which they are dependent upon.

Natural England's conservation advice for this site is made up of a number of components. You will need to consider:

- Site information (feature and sub-feature descriptions, site overview, general information about the site and features)
- Background information and geography
- Site maps
- Conservation Objectives
- Supplementary advice on conservation objectives
- Advice on operations

Additional information for consideration:

- Feature condition
- Management measures
- Further information

Site information

Site name:	Pagham Harbour MCZ
Designation type:	MCZ
Site identification:	UKMCZ0013
Designation date:	21 November 2013
Designated features (click to see site specific description): **View marine condition monitoring data for this site (../MarineCondition/PublicFeatures.aspx?SiteCode=UKMCZ0013)**	Defolin's lagoon snail (Caecum armoricum) Lagoon sand shrimp (Gammarus insensibilis) Seagrass beds
General information on the site features:	The general information on the designated features from the MCZ features catalogue (http://jncc.defra.gov.uk/page-4527) is useful for understanding the
Designated area (ha):	283.099
Component Sites of Special Scientific Interest (SSSI):	Pagham Harbour SSSI (../SiteDetail.aspx?SiteCode=S1000620&SiteName=pagham&countyCode=&res
Overlapping Protected Areas:	Pagham Harbour LNR (../SiteDetail.aspx?SiteCode=L1009061&SiteName=pagham&countyCode=&resp Pagham Harbour Ramsar (MarineSiteDetail.aspx?SiteCode=UK11052&SiteName=pagham&countyCode=& Pagham Harbour SPA (MarineSiteDetail.aspx?SiteCode=UK9012041&SiteName=pagham&countyCode=&

Background information and geography

Pagham Harbour MCZ lies between Bognor Regis and Chichester in West Sussex. This is one of the smallest designated MCZs which encompasses a total area of almost 3 km2, including the main harbour area, Ferry Pool lagoon and the shingle spits which form the r avian populations. The long-term preservation of the harbour and surrounding habitats has also allowed two extremely rare invertebrate species to thrive here, which have been protected in their own right as features of the MCZ. The MCZ also protects the intertidal sea declines.

Site maps

Use the MAGIC website (http://magic.defra.gov.uk/MagicMap.aspx?srs=WGS84&startscale=20000.000000000236&chosenLayers=mczIndex,mczfociPIndex,mczhociPIndex,mczbshPIndex,mczhociIndex,mczbshIndex,backdropDIndex,backdropIndex,europeIndex,vmlBWIndex,25kBWIndex,50kBWIndex,250kBWIndex,miniscaleBWIndex to see site maps, including habitats, species and other marine designations.

These maps are based on best available evidence, there are some caveats associated with the maps on MAGIC.

There are some instances where the feature, subfeature or supporting habitat name varies on MAGIC from the conservation advice. The alternative names (https://www.gov.uk/government/publications/conservation-advice-for-marine-protected-areas-alternative-feature

Conservation objectives

The site's conservation objectives apply to the Marine Conservation Zone and the individual species and/or habitat for which the site has been designated (the 'Designated features' listed below).

The conservation objective of each of the zones is that the protected habitats:

1. are maintained in favourable condition if they are already in favourable condition.
2. be brought into favourable condition if they are not already in favourable condition.

For each protected feature, favourable condition means that, within a zone:

1. its extent is stable or increasing.
2. its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deter

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining:

1. the quality and quantity of its habitat.
2. the number, age and sex ratio of its population Any temporary reduction of numbers of a species is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery.

Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

This should be read in conjunction with the accompanying supplementary advice section, which provides more detailed advice and information to help achieve the objectives set out above.

Designated features:

Refer to the site information table above for the list of features within this site.

Designated Features:

- Intertidal seagrass beds
- Defolin's lagoon snail (*Caecum armoricum*)
- Lagoon sand shrimp (*Gammarus insensibilis*)

Supplementary Advice on Conservation Objectives

See supplementary advice on conservation objectives for this site (SupAdvice.aspx?SiteCode=UKMCZ0013&SiteName=pagham&SiteNameDisplay=Pagham+Harbour+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=), which aim to describe the range

Last updated: 20th March 2017

Advice on Operations

See the advice on operations (FAPMatrix.aspx?SiteCode=UKMCZ0013&SiteName=pagham&SiteNameDisplay=Pagham+Harbour+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=) for this site to view information on the sensitivity of features in this site

Last updated: 15th September 2017

Feature Condition

See the condition assessment for features in this site.

Management measures

If you are carrying out an environmental assessment, planning an operation or assessing an operation or proposal, it is important to consult with the following organisations where applicable. To find out if any management measures, byelaws or other restrictions apply t
SiteCode=UKMCZ0013&SiteName=pagham&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=) or you can use the following links for more information.

The Marine Management Organisation (https://www.gov.uk/government/organisations/marine-management-organisation) license, regulate and plan marine activities in the seas around England and Wales so that they're carried out in a sustainable way.
Environment Agency (https://www.gov.uk/government/organisations/environment-agency/about) are responsible for regulating major industry and waste, water quality and resources, fisheries, inland river, estuary and harbour navigations, conservation and ecology.

Sussex Inshore Fisheries and Conservation Authority (http://www.sussex-ifca.gov.uk/)
Chichester District Council (http://www.chichester.gov.uk/)
Arun District Council (http://www.arun.gov.uk/)

Further information

For further information relating to this designated site you can refer to the following resources:

- MCZ summary documents (http://publications.naturalengland.org.uk/category/1499649)
- EU guidance on species protection (http://ec.europa.eu/environment/nature/conservation/species/guidance/index_en.htm)
- OSPAR Quality Status Report (http://qsr2010.ospar.org/en/index.html)

Site specific information:

- Pagham Harbour MCZ Factsheet (http://publications.naturalengland.org.uk/publication/4680895541805056)
- Pagham Harbour MCZ designation order (http://www.legislation.gov.uk/ukmo/2013/17/created)

Other information:

- Joint Nature Conservation Committee (http://jncc.defra.gov.uk/default.aspx?page=3) provides advice on habitats and biodiversity and is responsible for the identification of MPAs in UK offshore waters
- This site is a Marine Protected Area. (https://www.gov.uk/government/publications/2010-to-2015-government-policy-marine-environment/2010-to-2015-government-policy-marine-environment#appendix-4-marine-protected-areas)
- Refer to the Marine Protected Areas Conservation Advice package collection (https://www.gov.uk/government/collections/conservation-advice-packages-for-marine-protected-areas).

For further information about this site contact: Natural England enquiries Telephone: 0300 060 3900. Email: enquiries@naturalengland.org.uk (mailto:enquiries@naturalengland.org.uk)

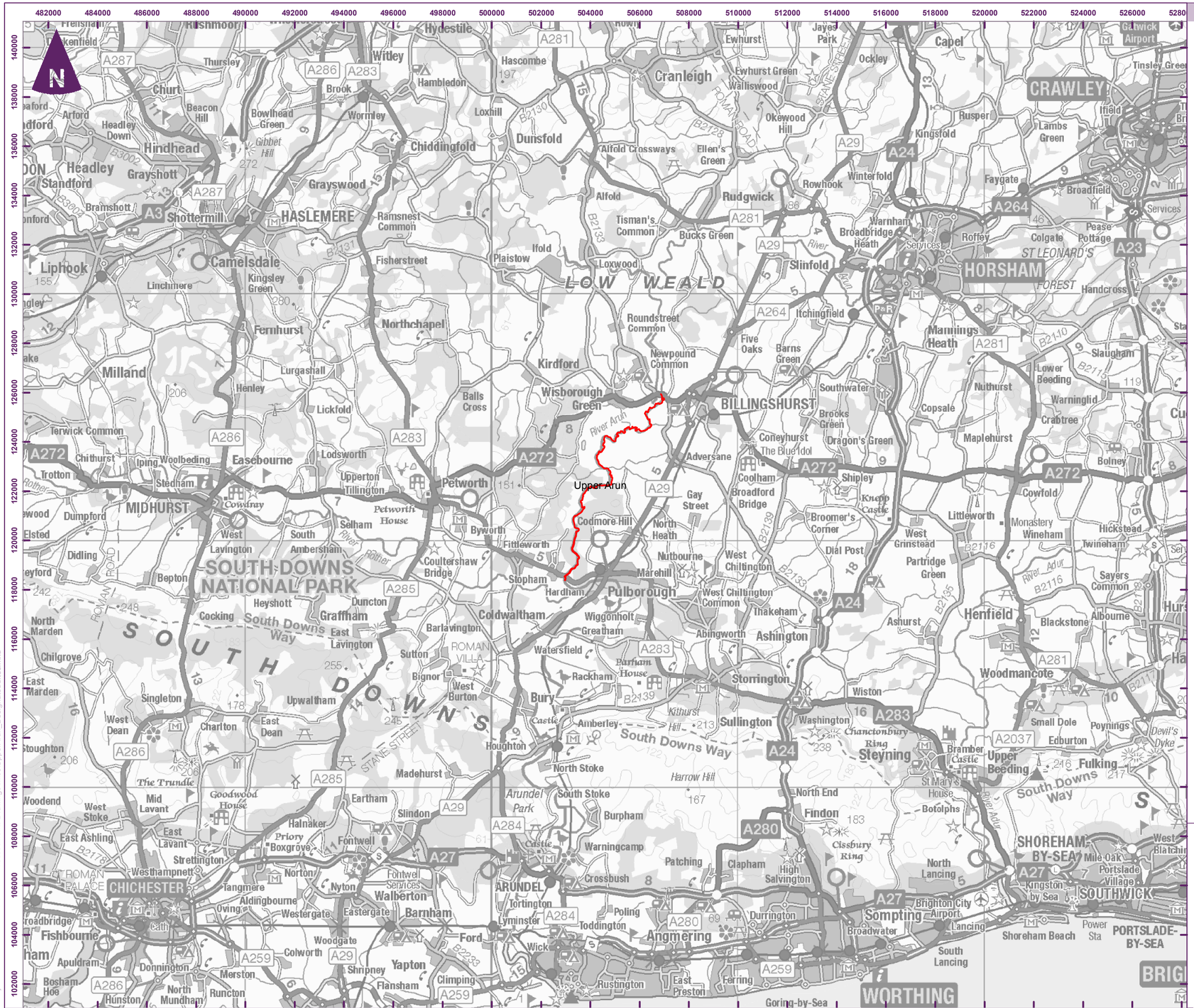
For further information on the Conservation Advice Project, including Designated Sites System (DSS) guidance, Frequently Asked Questions and a Glossary of terminology, please contact: MCAProject@naturalengland.org.uk (maileto:MCAProject@naturalengland.org.

1.4 Upper Arun SSSI

The data included for the Upper Arun SSSI are as follows:

Table 1.4 Included data for the Chichester Harbour sites

Data	SSSI
Site map	✓
Citation / Criteria	✓
Conservation Objectives	Not available
Condition Tables	✓
Condition Assessment	✓



Key

Upper Arun Site of Special Scientific Interest (SSSI) © Natural England

39151 Chichester DC
WwTW assessments

amec foster wheeler

Upper Arun Designated Sites

February 2018 UpperArun_DesignatedSites.mxd whilh

file: R:\Projects\39151 Chichester DC WwTW assessments\Drawings\Misc\UpperArun_DesignatedSites.mxd

COUNTY: WEST SUSSEX SITE NAME: UPPER ARUN

DISTRICT: CHICHESTER; HORSHAM

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981.

Local Planning Authority: CHICHESTER DISTRICT COUNCIL, Horsham District Council

National Grid Ref: TQ 030184–069259 Area: 40 (ha.) 99 (ac.)

Ordnance Survey Sheet 1:50,000: 197 1:10,000: TQ 02 NE, SE, SW, TQ 01 NW

Date Notified (Under 1949 Act): – Date of Last Revision: –

Date Notified (Under 1981 Act): 1988 Date of Last Revision: –

Other Information:
This is a new site.

Reasons for Notification:
The Upper Arun consists of a 13km length of the River Arun, flowing south across the weald clay and lower greensand between New Bridge, Billingshurst and Stopham Bridge, Pulborough. It supports an outstanding assemblage of breeding dragonflies including a number of rare species.

The Upper Arun is relatively unpolluted and supports a diverse riverine flora. This, together with a varied river structure caused by cattle trampling and other erosion, has resulted in an extremely complex habitat upon which the dragonflies depend for breeding, feeding and resting sites. Common clubrush *Schoenoplectus lacustris* and reed canary-grass *Phalaris arundinacea* are abundant, together with sedges *Carex* spp, water plantain *Alisma plantago-aquatica*, branched bur-reed *Sparganium erectum*, arrowhead *Sagittaria sagittifolia* and yellow water-lily *Nuphar lutea*. The river banks are largely vegetated with grasses such as tufted hair-grass *Deschampsia cespitosa* together with nettle *Urtica dioica* and docks *Rumex* spp. In places the banks have been trodden-in by cattle and are bare of vegetation.

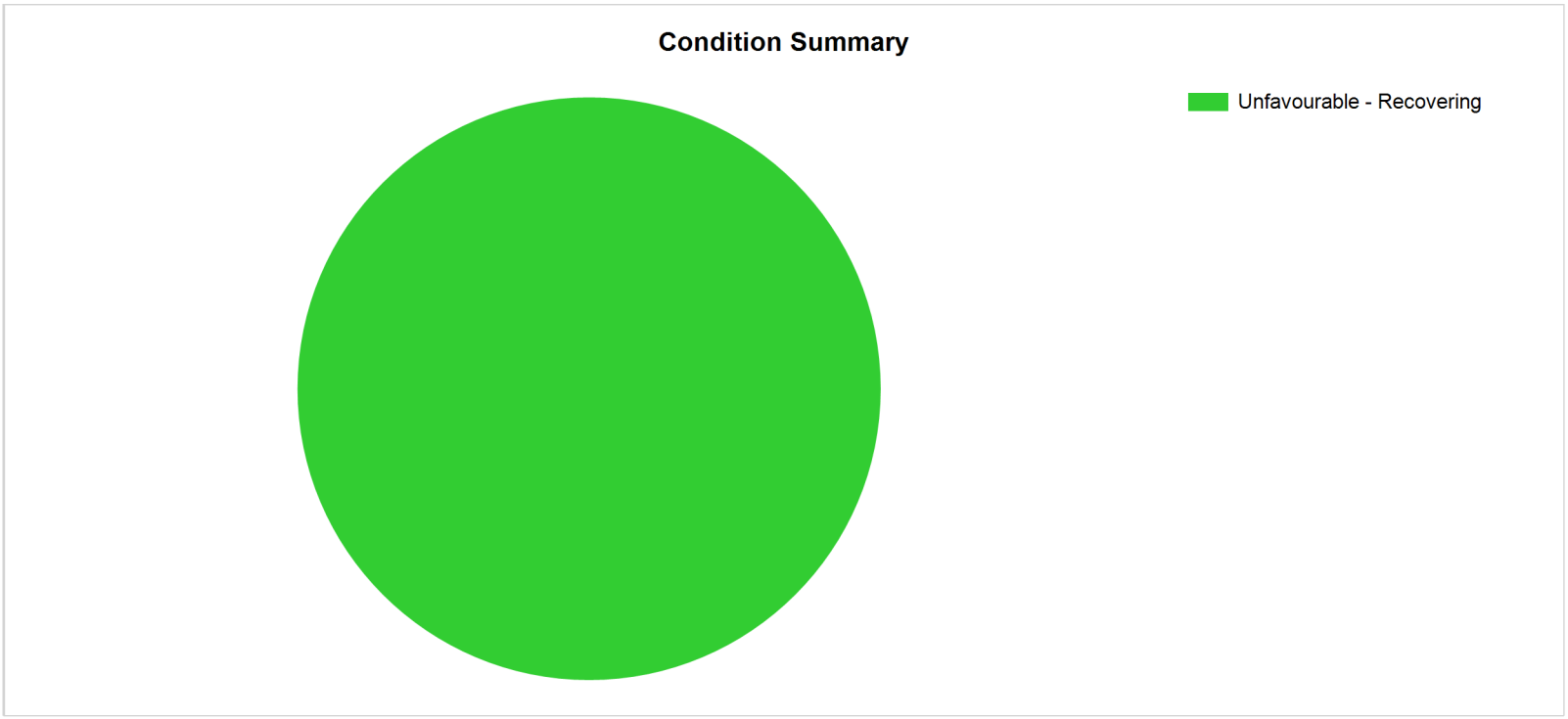
Fifteen species of dragonfly breed within the river, including the nationally rare scarce chaser *Libellula fulva*, for which this is the best stretch of river in West Sussex. Also found are the notable species club-tailed dragonfly *Gomphus vulgatissimus*, brilliant emerald *Somatochlora metallica* and the hairy dragonfly *Brachytron pratense.*

Site: Upper Arun SSSI

Report generated on: 01 Feb 2018

	Sites	Units	Units Assessed
Total number	1	4	4
Total area (ha)	17.58	17.58	17.58

	% meeting area of favourable or unfavourable recovering	Favourable	Unfavourable - Recovering	Unfavourable - No change	Unfavourable - Declining	Partially destroyed	Destroyed	Not Assessed
Area (ha)	17.58		17.58					
Percentage	100.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%


Condition Summary
Unfavourable - Recovering

Report generated on: 01 Feb 2018

Main Habitat	Responsible Officer	Unit Number	Unit Id	Area (ha)	NNR Overlap Area (ha)	Latest Assessment Date	Assessment Description	Comment	Adverse Condition Reasons
Upper Arun SSSI - WEST SUSSEX (HORSHAM)									
RIVERS AND STREAMS	Conservation Delivery Team	001	1008658	4.1245	0.00	24/10/2011	Unfavourable - Recovering	CSM guidance was used to assess the indirect attribute of habitat. At most recording stops , the abundance of emergent, submerged and floating vegetation was relatively low, and there were very few occurrances of bare surfaces (only in few places where cattle had been able to access the banks, and stocking rates had been sufficient to create these areas).Overall there was a notable lack of heterogeneity in the habitat structure along the river corridor. At most stops the bankside vegetation was dominated by nettle and thistle, sometimes with bramble and docks, with little evidence of grazing , or other vegetation management. This was the overriding negative factor. At the majority of stops vegetation could be described as `luxuriant? -although in nearly all cases this was dominated by `weedy? species. There were sections dominated by bankside trees and other sections that were more open, and so it seems likely that for this attribute, the ecological requirements across the assembledge were catered for, even if for the single spp, brilliant emerald Somatochlora metallica it was less than ideal. NB:Odonata survey undertaken and assessed alongside previous records (see 2010 assessment comments). Although number of species passes, not all recorded breeding within 3 year cycle.	
RIVERS AND STREAMS	Conservation Delivery Team	002	1008663	3.4135	0.00	24/10/2011	Unfavourable - Recovering	CSM guidance was used to assess the indirect attribute of habitat. At most recording stops , the abundance of emergent, submerged and floating vegetation was relatively low, and there were very few occurrances of bare surfaces (only in few places where cattle had been able to access the banks, and stocking rates had been sufficient to create these areas).Overall there was a notable lack of heterogeneity in the habitat structure along the river corridor. At most stops the bankside vegetation was dominated by nettle and thistle, sometimes with bramble and docks, with little evidence of grazing , or other vegetation management. This was the overriding negative factor. At the majority of stops vegetation could be described as `luxuriant? -although in nearly all cases this was dominated by `weedy? species. There were sections dominated by bankside trees and other sections that were more open, and so it seems likely that for this attribute, the ecological requirements across the assembledge were catered for, even if for the single spp, brilliant emerald Somatochlora metallica it was less than ideal. NB:Odonata survey undertaken and assessed alongside previous records (see 2010 assessment comments). Although number of species passes, not all recorded breeding within 3 year cycle	

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RIVERS AND STREAMS	Conservation Delivery Team	003	1008665	3.0892	0.00	24/10/2011	Unfavourable - Recovering	CSM guidance was used to assess the indirect attribute of habitat. At most recording stops , the abundance of emergent, submerged and floating vegetation was relatively low, and there were very few occurrances of bare surfaces (only in few places where cattle had been able to access the banks, and stocking rates had been sufficient to create these areas).Overall there was a notable lack of heterogeneity in the habitat structure along the river corridor. At most stops the bankside vegetation was dominated by nettle and thistle, sometimes with bramble and docks, with little evidence of grazing , or other vegetation management. This was the overriding negative factor. At the majority of stops vegetation could be described as `luxuriant? -although in nearly all cases this was dominated by `weedy? species. There were sections dominated by bankside trees and other sections that were more open, and so it seems likely that for this attribute, the ecological requirements across the assembledge were catered for, even if for the single spp, brilliant emerald Somatochlora metallica it was less than ideal. NB:Odonata survey undertaken and assessed alongside previous records (see 2010 assessment comments). Although number of species passes, not all recorded breeding within 3 year cycle	
RIVERS AND STREAMS	Conservation Delivery Team	004	1008666	6.9526	0.00	24/10/2011	Unfavourable - Recovering	CSM guidance was used to assess the indirect attribute of habitat. At most recording stops , the abundance of emergent, submerged and floating vegetation was relatively low, and there were very few occurrances of bare surfaces (only in few places where cattle had been able to access the banks, and stocking rates had been sufficient to create these areas).Overall there was a notable lack of heterogeneity in the habitat structure along the river corridor. At most stops the bankside vegetation was dominated by nettle and thistle, sometimes with bramble and docks, with little evidence of grazing , or other vegetation management. This was the overriding negative factor. At the majority of stops vegetation could be described as `luxuriant? -although in nearly all cases this was dominated by `weedy? species. There were sections dominated by bankside trees and other sections that were more open, and so it seems likely that for this attribute, the ecological requirements across the assembledge were catered for, even if for the single spp, brilliant emerald Somatochlora metallica it was less than ideal. NB:Odonata survey undertaken and assessed alongside previous records (see 2010 assessment comments). Although number of species passes, not all recorded breeding within 3 year cycle