URBAN EDGE ENVIRONMENTAL CONSULTING

NATURAL PROGRESSION

Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036

HRA Report for the Submission Plan

June 2019

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Client:	Eastleigh Borough Council	
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Abbreviations

µg/l	Micrograms per litre
µg/m^3	Micrograms per cubic metre
AOD	Above Ordnance Datum
APIS	Air Pollution Information System
Bgl	Below ground level
BOD	Biochemical Oxygen Demand
CJEU	Court of Justice of the European Union
CL	Critical Load/Level
CP	Critical Period
dBht	Decibels above the hearing threshold
DWF	Dry Weather Flow
EBLP	Eastleigh Borough Local Plan
Ha	Hectare
HRA	Habitats Regulations Assessment
IWMS	Integrated Water Management Study
IVCP	Itchen Valley Country Park
kg N/ha/yr	Kilograms nitrogen per hectare per year
LSE	Likely significant effect
Ml/d	Megalitres per day
MDO	Minimum Deployable Output
N	Nitrogen
NDep	Nitrogen deposition
NH_3	Ammonia

nm^2	Square nautical miles
NBLR	North of Bishopstoke Link Road
NO_X	Nitrogen oxides
NVC	National Vegetation Classification
DO	Dissolved Oxygen
P	Phosphorous
PC	Process Contribution
PEC	Predicted Environmental Concentration
pSPA	potential Special Protection Area
PUSH	Partnership for Urban South Hampshire
rCSMG	revised Common Standards Monitoring
SAC	Special Area of Conservation
SD	Southern damselfly
SGO	Strategic Growth Option
SPA	Special Protection Area
SRMP	Solent Recreation Mitigation Partnership
SRP	Soluble Reactive Phosphorous
ST	Sensitivity Test
TAL	Technically Achievable Limit
WWTW	Waste Water Treatment Works
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
WeBS	Wetland Bird Survey

0 Executive Summary

0.1 Introduction

0.1.1 Eastleigh Borough Council is preparing a Local Plan to guide strategic and site-specific development across the borough for the period 2016 – 2036. As an integral part of this process, the Council has undertaken a Habitats Regulations Assessment.

0.1.2 Habitats Regulations Assessment (HRA) is a requirement of the Conservation of Habitats and Species Regulations 2017 (commonly referred to as 'the Habitats Regulations'), and must be applied to any plan or project not directly connected with or necessary to the management of a European site, if it is likely to have a significant effect on a European site either alone or in combination with other plans or projects.

0.1.3 To date the HRA for the Eastleigh Borough Local Plan (EBLP) has been comprised of the following documents:

- AECOM (November 2015): *Issues and Options Eastleigh Borough Local Plan – Habitats Regulations Assessment Screening Report;*
- AECOM (May 2016): *Air Quality Analysis to Support Habitats Regulations Assessment – Eastleigh Borough Local Plan 2011-2036;*
- Urban Edge Environmental Consulting (UEEC; June 2018): *Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036: HRA Report for the Proposed Submission Plan (June 2018);* and
- Urban Edge Environmental Consulting (UEEC; October 2018): *Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036: Revised HRA Report following representations on the Proposed Submission Plan (October 2018).*

0.1.4 The current HRA Report responds to recent case law from the Court of Justice of the European Union and changes in Natural England's position in relation to nutrient neutral development.

0.1.5 The HRA incorporates evidence on likely impact pathways and conducts an Appropriate Assessment in view of European site conservation objectives. Where adverse effects are identified, either alone or in combination with other plans and projects, the report defines a mitigation strategy capable of preventing adverse effects on ecological integrity. No reliance is placed on mitigation during the screening assessment. Chapter 2 presents information about the overall methodology used for the HRA.

0.2 Scope of the Assessment

0.2.1 European sites considered within the scope of this assessment include:

- Emer Bog Special Area of Conservation (SAC)
- Mottisfont Bats SAC
- New Forest SAC
- River Itchen SAC
- Solent Maritime SAC
- New Forest Special Protection Area (SPA)
- Solent & Southampton Water SPA
- Solent & Dorset Coast potential SPA
- New Forest Ramsar site
- Solent & Southampton Water Ramsar

0.2.2 Acknowledging that the EBLP is not directly connected with or necessary to the management of any of these sites for nature conservation, the HRA screening report (AECOM, 2015) considered that Emer Bog SAC and Mottisfont Bats SAC could be screened-out of the assessment process. This was on the basis of their reasons for designation and distance from Eastleigh borough, reasons which remain valid for the current HRA. Chapters 3 and 4 present information about the remaining sites, including their qualifying features and conservation objectives.

0.3 Impact Pathways

0.3.1 The following impact pathways are considered for likely significantly effects on the European sites:

- Atmospheric pollution;
- Coastal squeeze;
- Disturbance;
- Hydrological impacts (flow & quality) on the River Itchen SAC and Solent Maritime SAC, including their headwaters.
- Impacts on land outside European site boundaries (including non-designated terrestrial sites used by waders and dark-bellied Brent goose *Branta bernicla bernicla*, and otter *Lutra lutra* foraging and dispersal routes);
- Noise and vibration;
- Non-native species;
- Water abstraction; and
- Water pollution.

0.3.2 Chapter 6 describes the available evidence about these impact pathways in relation to the European sites.

0.4 Summary of Findings

0.4.1 In summary, the assessment of the EBLP finds that:

- No likely significant effects were identified in relation to Emer Bog SAC, Mottisfont Bats SAC, New Forest SAC/Ramsar or Solent and Dorset Coast pSPA, either alone or in combination with other plans and projects.
- Significant effects through coastal squeeze are not likely for Solent Maritime SAC or Solent and Southampton Water SPA/Ramsar, either alone or in combination with other plans and projects.
- Significant effects through atmospheric pollution are not likely for Solent Maritime SAC or Solent and Southampton Water SPA/Ramsar, either alone or in combination with other plans and projects.
- Significant effects through impacts to land outside the boundary of Solent and Southampton Water SPA/Ramsar (non-designated terrestrial wader and Brent goose sites) are not likely, either alone or in combination with other plans and projects.
- Significant effects resulting from recreation are not likely for River Itchen SAC, either alone or in combination with other plans and projects.
- There will be no adverse effect on the integrity of River Itchen SAC as a result of atmospheric pollution, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of River Itchen SAC as a result of noise and vibration, hydrological impacts, impacts to land outside the SAC boundary (otter dispersal corridors), non-native species, water abstraction or water pollution, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of Solent Maritime SAC as a result of non-native species, site-specific hydrological impacts or water pollution, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of New Forest SPA as a result of disturbance, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of Solent and Southampton Water SPA/Ramsar as a result of disturbance, noise and vibration or water pollution, either alone or in combination with other plans and projects.

0.4.2 Full details can be found in Chapters 7 and 9, while the mitigation strategy is presented in Chapter 8.

0.5 Conclusion

0.5.1 The Eastleigh Borough Local Plan can be considered compliant with the Habitats Regulations with regards to: Emer Bog SAC, Mottisfont Bats SAC, New Forest SAC/SPA/Ramsar; River Itchen SAC; Solent Maritime SAC; Solent & Dorset Coast pSPA; and Solent & Southampton Water SPA/Ramsar.

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1 Introduction

1.1 Purpose of this Report

1.1.1 This report has been prepared for Eastleigh Borough Council as part of the Habitats Regulations Assessment (HRA) for the Eastleigh Borough Local Plan 2016-2036 (EBLP). The report accompanies the Submission Plan and forms part of the evidence upon which it is based.

1.2 The Eastleigh Borough Local Plan

1.2.1 The Eastleigh Borough Local Plan 2016-2036 will set the planning strategy for the borough and address housing and employment needs for a period of 20 years up to 2036. The plan sets out proposed strategic and development management policies, development allocations and actions to meet the environmental, social and economic challenges facing the borough. When adopted the Local Plan will provide a strategy for the distribution, scale and form of development and supporting infrastructure, a set of proposals to deliver the strategy, policies against which to assess planning applications, and proposals for monitoring the successful implementation of the plan.

1.2.2 The spatial development strategy proposed by the EBLP includes provision for approximately 14,580 new dwellings over the plan period, 144,050m^2 of new employment floorspace, a Strategic Growth Option (SGO) at north of Bishopstoke and north and east of Fair Oak, together with a range of strategic sites and smaller greenfield allocations. Employment development will be focused on existing urban areas, Eastleigh Riverside and other allocations.

1.2.3 Figure 1.1 shows the proposed Key Diagram for the EBLP.

1.3 Habitats Regulations Assessment

1.3.1 Habitats Regulations Assessment is a requirement of the Conservation of Habitats and Species Regulations 2017 ('the Habitats Regulations'), the UK's transposition of *European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora* ('the Habitats Directive'). HRA must be applied to any plan or project not directly connected with or necessary to the management of a European site, if it is likely to have a significant effect on a European site either alone or in combination with other plans or projects.

1.3.2 European sites provide ecological infrastructure for the protection of rare, endangered or vulnerable natural habitats and species of exceptional importance within the European Union. These sites consist of Special Areas of Conservation (SAC, designated under the Habitats Directive) and Special Protection Areas (SPA, designated under *European Council Directive 2009/147/EC on the conservation of wild birds* ('the Birds Directive')). Additionally the National Planning Policy Framework (MHCLG, 2019) and Circular 06/05 (ODPM, 2005) require that

Ramsar sites (UNESCO, 1971) are treated as if they are fully designated European sites for the purpose of considering development proposals that may affect them.

1.3.3 To date the HRA for the EBLP has been comprised of the following documents:

- AECOM (November 2015): *Issues and Options Eastleigh Borough Local Plan – Habitats Regulations Assessment Screening Report;*
- AECOM (May 2016): *Air Quality Analysis to Support Habitats Regulations Assessment – Eastleigh Borough Local Plan 2011-2036;*
- Urban Edge Environmental Consulting (UEEC; June 2018): *Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036: HRA Report for the Proposed Submission Plan (June 2018);* and
- Urban Edge Environmental Consulting (UEEC; October 2018): *Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036: Revised HRA Report following representations on the Proposed Submission Plan (October 2018).*

1.3.4 The October 2018 HRA Report presented certain revisions to the June 2018 HRA in response to representations made on the Proposed Submission Plan. Appendix V presents a list of the representations responded to, and cross-refers to amended sections of the current HRA Report.

1.3.5 The current HRA Report responds to recent case law from the Court of Justice of the European Union (CJEU) and changes in Natural England's position in relation to nutrient neutral development. Appendix VI presents an analysis of implications for the HRA resulting from the CJEU *Holohan* judgment[1].

1.4 Scope and Structure of this Document

1.4.1 The document is structured around the following sections:

- Chapter Two: HRA methodology;
- Chapter Three: European sites, qualifying features, conservation objectives, condition status;
- Chapter Four: European site characterisation;
- Chapter Five: Information about the Eastleigh Borough Local Plan at the Submission stage, including incorporated mitigation measures;
- Chapter Six: Evidence relating to the pathways of impacts to European sites;
- Chapter Seven: Impact assessment against the sites' conservation objectives;
- Chapter Eight: Mitigation strategy;
- Chapter Nine: Determining adverse effects on European site integrity; and
- Chapter Ten: Summary and conclusions.

[1] Case C-461/17 Court of Justice of the European Union (2018): *Holohan v An Bord Pleanala.*

Figure 1.1: Local Plan Key Diagram

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2 Methodology

2.1 Good Practice Guidance

2.1.1 Draft guidance on HRA has been defined by DEFRA (2012) and DCLG (2006) with more detailed draft guidance from Natural England (Tyldesley, 2009) and a range of other bodies[2]. More recently *The Habitats Regulations Assessment Handbook* (Tyldesley & Chapman, 2013) was developed to improve earlier methodologies on the basis of recent good practice and case law, and in response to Defra's Habitats and Birds Directives Implementation Review. The requirement for HRA stems from Articles 6(3) and 6(4) of the Habitats Directive, which are represented by four stages within the HRA process as listed in Table 2.1 which illustrates their relationship to stages within the DEFRA (2012) guidance.

2.1.2 The Screening Assessment and Appropriate Assessment for the Submission EBLP have been undertaken with reference to the *HRA Handbook*, updating the findings of earlier stages of HRA for the EBLP.

Table 2.1: Stages of HRA in guidance from Tyldesley & Chapman (2013) & DEFRA (2012)

HRA Handbook stage	Equivalent DEFRA stage
Stage 1: Screening for Likely Significant Effects	Stage 1: Screening for likely significant effects
Stage 2: Appropriate Assessment & Integrity Test	Stage 2: Appropriate assessment
Stage 3: Alternative Solutions	Derogations Test 1: Alternative solutions
Stage 4: Imperative Reasons of Overriding Public Interest and Compensatory Measures	Derogations Test 2: Imperative reasons of overriding public interest Derogations Test 3: Compensatory measures

2.1.3 In *The Habitats Regulations Assessment Handbook* (Tyldesley & Chapman, 2013) section F.1.1.2 (Introduction and overview to 'Plan' assessment) it is recognised that the assessment of a plan may not be as precise and detailed as that of a project at application stage. Plans, and in particular strategic plans such as a core strategy, also vary in their degree of specificity ranging from very general statements which may cover a wide geographic area to more prescriptive proposals that are scale and location specific.

2.1.4 An HRA must determine whether or not a plan or project will adversely affect the integrity of the European site(s) concerned, in view of the site's conservation objectives. Where adverse effects are anticipated changes must be made to the plan or project. The process is characterised by the precautionary principle, defined as (European Commission, 2000):

[2] For example European Commission (2018) and RSPB (Dodd *et al*, 2007)

"If a preliminary scientific evaluation shows that there are reasonable grounds for concern that a particular activity might lead to damaging effects on the environment, or on human, animal or plant health, which would be inconsistent with the protection normally afforded to these within the European Community, the Precautionary Principle is triggered.

"Decision-makers then have to determine what action to take. They should take account of the potential consequences of taking no action, the uncertainties inherent in the scientific evaluation, and they should consult interested parties on the possible ways of managing the risk. Measures should be proportionate to the level of risk, and to the desired level of protection. They should be provisional in nature pending the availability of more reliable scientific data.

"Action is then undertaken to obtain further information enabling a more objective assessment of the risk. The measures taken to manage the risk should be maintained so long as the scientific information remains inconclusive and the risk unacceptable."

2.2 Screening for Likely Significant Effects

2.2.1 *The Handbook* defines a list of 'screening categories' to provide a rigorous and transparent approach to determining which aspects of the plan could potentially result in significant (adverse) effects. These are listed in Table 2.2, where green indicates that the proposal can be screened-out, orange denotes proposals which may have a significant effect in combination and require further analysis, and red specifies proposals likely to have a significant effect. The colour-coded categories provide the means of recording the results of the assessment in such a way that important issues are identified whilst proposals that have no effect are screened out.

Table 2.2: Screening categories (Source: Tyldesley & Chapman, 2013)

Cat.	Description
A	General statement of policy / aspiration
B	Policy listing general criteria for testing the acceptability / sustainability of proposals
C	Proposal referred to but not proposed by the plan
D	Environmental protection / site safeguarding policy
E	Policy/proposal steers change in such a way as to protect European sites from adverse effects
F	Policy that cannot lead to development or other change
G	Policy/proposal that could not have any conceivable effect on a European site
H	Policy/proposal the (actual or theoretical) effects of which cannot undermine the conservation objectives (either alone or in combination with other aspects of this or any other plan/project)
I	Policy/proposal with a likely significant effect on a European site alone
J	Policy/proposal with an effect on a site but not likely to be significant alone; check for likely significant effects in combination
K	Policy/proposal not likely to have a significant effect either alone or in combination (after the in combination test)
L	Policy/proposal likely to have a significant effect in combination (after the in combination test)

2.2.2 All policies and potential development allocations being proposed for inclusion in the Local Plan were screened for likely significant effects (LSE) on European sites. Chapters 3 and 4 define which European sites are considered during the assessment, together with their qualifying features, conservation objectives and baseline information about the sites. The ways in which each site might be significantly affected by the EBLP (impact pathways) are described in Chapter 6. The 2015 screening assessment for the EBLP (AECOM, 2015) considered whether the plan could result in the following likely significant effects:

- Atmospheric pollution;
- Coastal squeeze;
- Disturbance;
- Impacts on land outside European site boundaries (including functionally connected land, and otter foraging and dispersal routes);
- Noise and vibration;
- Non-native species;
- Water abstraction; and
- Water pollution.

2.2.3 The screening assessment has been revised and updated at the current stage to provide an overall screening of the EBLP 2016-2036 at the Submission stage; see Appendix I. The following additional likely significant effects were identified for consideration:

- Hydrological impacts (flow & quality) on the River Itchen SAC and Solent Maritime SAC, including their headwaters.

2.2.4 The screening assessment assumes that proposed allocations individually contribute to strategically operating impacts (e.g. atmospheric pollution, disturbance, water abstraction and water pollution); as such Appendix I does not list strategically operating impacts as an LSE for proposed allocations, focusing instead on site specific impacts. Extant planning permissions and proposals with resolution to grant permission (listed in policy DM24) which are referred to but not proposed by the EBLP are not re-assessed individually but are considered for in combination effects.

2.3 The Appropriate Assessment Stage

2.3.1 The purpose of the Appropriate Assessment is to further analyse likely significant effects identified during the screening stage, as well as any effects which were uncertain or not well understood and taken forward for assessment in accordance with the precautionary principle. The Appropriate Assessment evaluates the implications of the plan, either alone or in combination with other plans or projects, in light of the conservation objectives of affected European sites. The Appropriate Assessment stage includes a test of whether the plan proposals will result in adverse effects on site integrity (Chapter 9) which can be defined as:

"The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified." (ODPM, 2005)

2.4 Counteracting Measures

2.4.1 This section draws on Principle C.5 of the *HRA Handbook* (Tyldesley & Chapman, 2013) to identify different types of counteracting measure and describe how they should be considered within the HRA. There is a well-established policy and ethical approach to assessment which recognises a hierarchy of counteracting measures, which prefers avoidance of adverse effects in the first instance, then cancellation, then reduction, and finally compensatory measures where these can be adequately justified. This approach is embedded in guidance (e.g. CIEEM, 2018; DEFRA, 2012), professional standards (BS42020:2013) and the National Planning Policy Framework (para. 118; MHCLG, 2019).

2.4.2 A distinction must be drawn between measures intended to avoid, cancel or reduce adverse effects on European sites (collectively referred to as mitigation measures) and those which are intended to compensate for adverse effects (compensatory measures); the latter must only be considered following application of the Imperative Reasons of Overriding Public Interest test:

- Mitigation: Avoidance measures: intended to stop or prevent effects from occurring, or to eliminate the risk of them occurring. Successful avoidance measures mean there will be no adverse effect, and hence no requirement to assess effects in combination.
- Mitigation: Cancellation measures: intended to completely neutralise adverse effects. In this context a proposal will have a potential effect, but its potentially negative outcomes have been cancelled without residual effect, and there is no requirement to assess effects in combination.
- Mitigation: Reduction measures: intended to diminish an effect either by reducing the scale of the effect, or its likelihood of occurring, or both. Such measures can reduce the severity/likelihood of an effect to the point where it can no longer be regarded as a likely significant effect, but may result in a risk of residual effects. Residual effects need to be considered for their potential to lead to cumulative or in combination effects.
- Compensatory measures: intended to offset the harm to the integrity of a European site that would occur as a result of a plan or project. They are considered only after having established that the harm to the site itself cannot be further reduced by mitigation or alternative solutions, and are the measures required to ensure that the overall coherence of Natura 2000 is protected.

2.4.3 In the recent *People Over Wind* judgment[3], the CJEU ruled that measures intended to avoid or reduce the harmful effects of a plan or project on a European site (i.e. mitigation measures) cannot be taken into account by a competent authority when considering, at the HRA screening stage, whether the plan or project is likely to have a significant effect on a European site. In its

[3] Case C 323/17 Court of Justice of the European Union (2018): *People Over Wind, Peter Sweetman v Coillte Teoranta.*

Note 05/2018, the Planning Inspectorate[4] has interpreted the *People Over Wind* judgment as applying to all mitigation measures, whether or not they are incorporated into the plan or project, and this HRA proceeds on that basis. However, as the PINS Note indicates, consideration is needed on a case by case basis as to whether a factor has been introduced to avoid or reduce harm (i.e. a mitigation measure) or whether it is in fact simply an integral part of the plan or project (not mitigation).

2.4.4 Thus where mitigation measures are incorporated into the plan or project, are effective, reliable, timely, guaranteed and of sufficient duration, they should be taken into account at the integrity test stage (Stage 2). A competent authority can impose *additional* mitigation measures over and above incorporated mitigation, if necessary, so as to ensure that a plan or project would not adversely affect the integrity of a European site, either alone or in combination with other plans and projects. Additional mitigation measures should also be considered at the integrity test stage.

2.5 In Combination Effects

2.5.1 Other plans and projects being prepared or implemented in the area may have the potential to cause negative effects on European sites. These effects may act in combination with the effects of the EBLP, possibly leading an insignificant effect to become significant. It is therefore important to consider which other plans and projects could generate similar effects as development within Eastleigh borough, at the same European sites, and which may act in-combination.

2.5.2 The plans and projects listed below were identified for consideration during in combination assessment:

- Extant planning permissions in Eastleigh borough which are referred to but not proposed by the EBLP;
- Strategic development at North of Whiteley, Winchester district
- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Welborne Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- South Downs Local Plan (emerging)
- Test Valley Borough Revised Local Plan 2011 – 2029 (adopted 2016)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)

[4] Planning Inspectorate (2018): *PINS Note 05/2018: Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind, Peter Sweetman v Coillte Teoranta*. 9 May 2018.

- Partnership for Urban South Hampshire (PUSH) Spatial Position Statement 2016-2034
- North Solent Shoreline Management Plan (2010) and related coastal strategies
- Hampshire Local Transport Plan (2011-2031)
- Joint Hampshire Minerals and Waste Plan (adopted 2013) (includes Portsmouth, Southampton, New Forest National Park and South Downs National Park)

2.5.3 In combination effects are considered in Chapter 6.

3 European Sites, Qualifying Features and Conservation Objectives

3.1 European Sites within the Scope of the Assessment

3.1.1 The HRA screening exercise (AECOM, 2015) for the EBLP identified the following European sites for consideration:

- Emer Bog SAC
- Mottisfont Bats SAC
- New Forest SAC
- River Itchen SAC
- Solent Maritime SAC
- New Forest SPA
- Solent & Southampton Water SPA
- New Forest Ramsar
- Solent & Southampton Water Ramsar

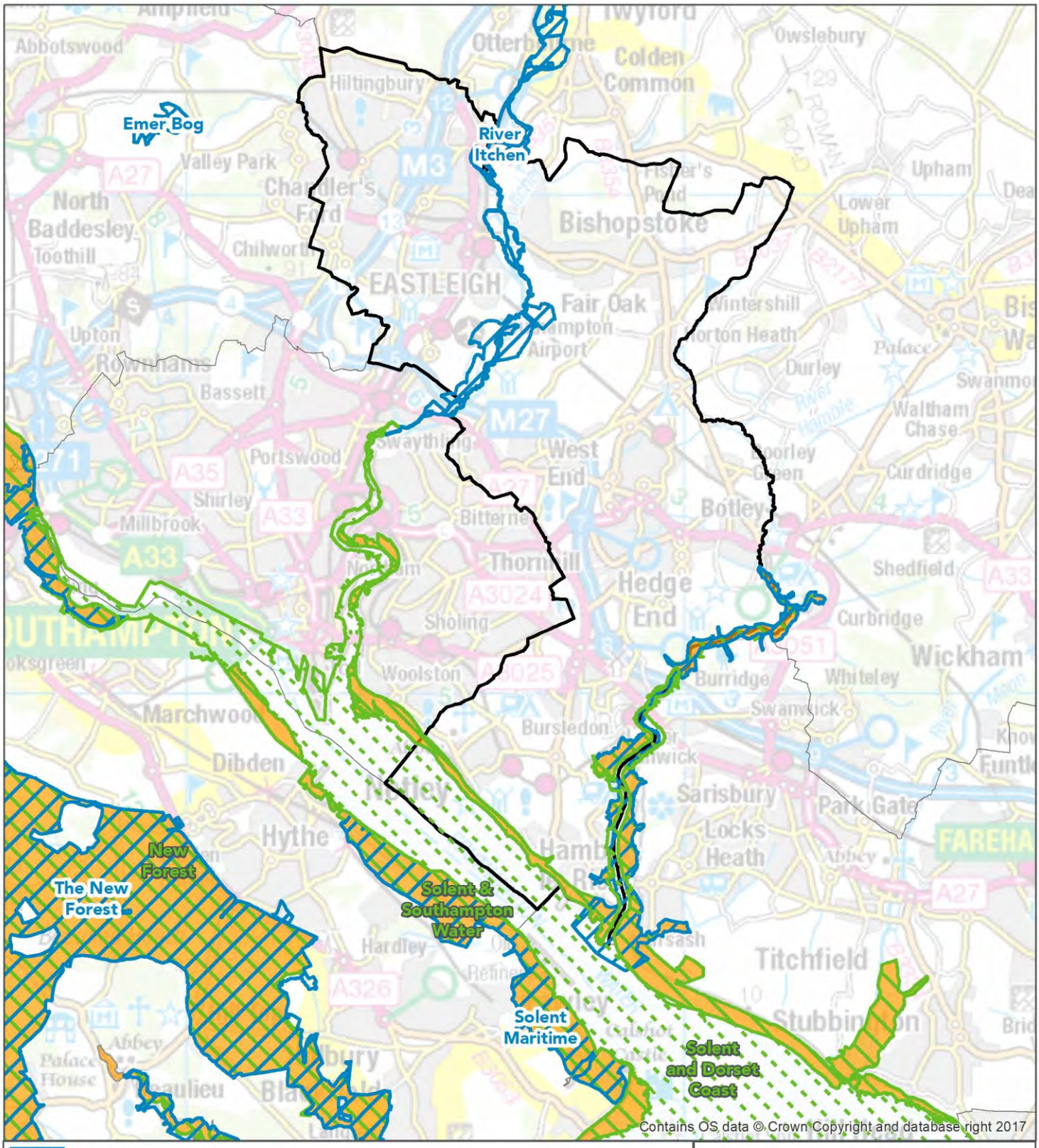
3.1.2 Acknowledging that the EBLP is not directly connected with or necessary to the management of any of these sites for nature conservation, the HRA screening report (AECOM, 2015) considered that Emer Bog SAC and Mottisfont Bats SAC could be screened-out of the assessment process. This was on the basis of their reasons for designation and distance from Eastleigh borough, reasons which remain valid for the current HRA. However, Natural England has recently published proposals[6] for a new Solent and Dorset Coast potential SPA (pSPA) which now requires specific consideration in the assessment.

3.1.3 In summary, therefore, the current HRA report considers the EBLP in relation to the following European sites only; see Figure 3.1:

- New Forest SAC/SPA/Ramsar;
- River Itchen SAC;
- Solent Maritime SAC;
- Solent & Dorset Coast pSPA; and
- Solent & Southampton Water SPA/Ramsar.

3.1.4 These European sites have been designated to conserve a wide variety of habitats of European importance, along with species populations of high conservation significance. Table 3.1 summarises the qualifying features of each site for ease of reference.

[6] Natural England: Open Consultation: Solent & Dorset Coast pSPA. Accessed online [22/1/16].



Special Areas of Conservation
Special Protection Areas
Potential Special Protection Area
Ramsar Sites
Borough

0 2 4 Kilometers

N

Figure 3.1: European sites

ENVIRONMENTAL CONSULTING
Unit 5 Westergate Business Centre
Brighton
BN2 4QN

Scale	Date
1:100,000	Feb2018
Created by	**Reviewed by**
NP	NP

Drawing number
UE0247HRA-IntlSites180201

Eastleigh Local Plan HRA

Table 3.1: European site qualifying features

New Forest SAC	New Forest SPA	New Forest Ramsar	River Itchen SAC
<u>Annex I Habitat</u> - Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) - Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* - Northern Atlantic wet heaths with *Erica tetralix* - European dry heaths - *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) - Depressions on peat substrates of the *Rhynchosporion* - Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) - *Asperulo-Fagetum* beech forests - Old acidophilous oak woods with *Quercus robur* on sandy plains - Bog woodland ***** - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) ***** - Transition mires and quaking bogs	<u>Breeding</u> - Honey Buzzard *Pernis apivorus* - Hobby *Falco subbuteo* - Nightjar *Caprimulgus europaeus* - Woodlark *Lullula arborea* - Dartford Warbler *Sylvia undata* - Wood warbler *Phylloscopus sibilatrix* <u>Non-breeding</u> - Hen Harrier *Circus cyaneus* **New Forest SAC (contd…)** <u>Annex I Habitat (contd…)</u> - Alkaline fens <u>Annex II Species</u> - Southern damselfly *Coenagrion mercuriale* - Stag beetle *Lucanus cervus* - Great crested newt *Triturus cristatus*	<u>Criterion 1</u> Valley mires and wet heaths are found throughout the site and are of outstanding scientific interest. The mires and heaths are within catchments whose uncultivated and undeveloped state buffer the mires against adverse ecological change. This is the largest concentration of intact valley mires of their type in Britain <u>Criterion 2</u> Diverse assemblage of wetland plants and animals including several nationally rare species. Seven species of nationally rare plant are found on the site, as are at least 65 British Red Data Book species of invertebrate <u>Criterion 3</u> The mire habitats are of high ecological quality and diversity and have undisturbed transition zones. The invertebrate fauna of the site is important due to the concentration of rare and scare wetland species. The whole site complex, with its examples of semi-natural habitats is essential to the genetic and ecological diversity of southern England	<u>Annex I Habitat</u> - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation <u>Annex II Species</u> - White-clawed (or Atlantic stream) Crayfish *Austropotamobius pallipes* - Southern damselfly *Coenagrion mercuriale* - Bullhead *Cottus gobio* - Brook Lamprey *Lampetra planeri* - Otter *Lutra lutra* - Atlantic Salmon *Salmo salar*.

Solent Maritime SAC	Solent and Dorset Coast pSPA	Solent & Southampton Water SPA	Solent & Soton Water Ramsar
Annex I Habitat - Estuaries - *Spartina* swards (*Spartinion maritimae*) - Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) - Sandbanks - slightly covered by sea water all the time - Mudflats and sandflats not submerged at low tide - Annual vegetation drift lines - Perennial vegetation of stony banks - *Salicornia* and other annuals colonising mud and sand - Shifting white dunes with *Ammophila arenaria* - Coastal lagoons* Annex II Species - Desmoulin's whorl snail *Vertigo moulinsiana*	Breeding - Sandwich tern *Sterna sandvicensis* - Common tern *Sterna Hirundo* - Little tern *Sterna albifrons*	Breeding - Mediterranean Gull *Larus melanocephalus* - Little Tern *Sterna albifrons* - Sandwich Tern *Sterna sandvicensis* - Common Tern *Sterna hirundo* - Roseate Tern *Sterna dougallii* Overwintering - Black-tailed Godwit *Limosa limosa islandica* - Dark-bellied Brent Goose *Branta bernicla bernicla* - Ringed Plover *Charadrius hiaticula* - Teal *Anas crecca* Bird Assemblage - Over winter the area regularly supports 51,361 individual waterfowl (5 year peak mean 1998)	Criterion 1 - Several outstanding wetland habitat types, including unusual double tidal flow, a major sheltered channel, saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs Criterion 2 - Nationally rare species assemblage Criterion 5 - Winter assemblage of 51,343 waterfowl (5 year peak mean 02/03) Criterion 6 Breeding - Sandwich Tern *Sterna sandvicensis* - Common Tern *Sterna hiruno* - Little Tern *Sterna albifrons* - Roseate Tern *Sterna dougallii* Overwintering - Black-tailed Godwit *Limosa limosa islandica* - Dark-bellied Brent Goose *Branta bernicla bernicla* - Teal *Anas crecca* On passage - Ringed Plover *Charadrius hiaticula*

* Denotes priority feature

3.2 Special Areas of Conservation

3.2.1 Special Areas of Conservation are strictly protected sites designated under the EC Habitats Directive (92/43/EEC). Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level, excluding birds which are conserved by SPA and Ramsar sites.

New Forest SAC

3.2.2 The New Forest SAC is a complex habitat mosaic over 29,214ha which encompasses a wide range of Annex I habitats which are qualifying features for its selection as an SAC. These are:

- Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- Depressions on peat substrates of the *Rhynchosporion*
- Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)
- *Asperulo-Fagetum* beech forests
- Old acidophilous oak woods with *Quercus robur* on sandy plains
- Bog woodland (Priority habitat)
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (Priority habitat)

3.2.3 The SAC also supports Annex I habitats Transition mires and quaking bogs and Alkaline fens, and a number of species of conservation importance; those listed as qualifying Annex II species are the southern damselfly *Coenagrion mercuriale*, stag beetle *Lucanus cervus* and great crested newt *Triturus cristatus*.

River Itchen SAC

3.2.4 The River Itchen SAC covers an area of 304ha. The Itchen is a classic example of a sub-type 1 chalk river, which is dominated throughout by aquatic *Ranunculus spp*. The Itchen also supports a number of Annex II species, of which southern damselfly and bullhead are among the primary reasons for the selection of this site as an SAC. The Annex I habitat and Annex II species comprise:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
- Southern damselfly *Coenagrion mercuriale*
- Bullhead *Cottus gobio*
- Brook lamprey *Lampetra planeri*
- Otter *Lutra lutra*
- Atlantic salmon *Salmo salar*.

Solent Maritime SAC

3.2.5 The Solent Maritime SAC covers an area of 11,243ha on both sides of the Solent and was selected for a total of three Annex 1 habitat types. A further seven habitat types were subsequently identified as being present as qualifying features:

- Estuaries
- *Spartina* swards
- Atlantic salt meadows
- Sandbanks which are slightly covered by water at all times
- Mudflats and sandbanks not covered by water at all times
- Coastal lagoons (Priority feature)
- Annual vegetation of drift lines
- Perennial vegetation of stony banks
- *Salicornia* and other annuals colonising mud and sand
- Shifting dunes along the shoreline with *Ammophila arenaria*

3.2.6 The site also supports Desmoulin's whorl snail *Vertigo moulinsiana* which is an Annex II species listed as a qualifying feature of the SAC.

3.3 Special Protection Areas

3.3.1 The EC Wild Birds Directive (2009/147/EC) provides for the protection, management and control of all species of naturally occurring wild birds in the European territory of Member States. In particular it requires Member States to classify areas to be given special protection for the rare or vulnerable species listed in Annex I (Article 4.1) and for regularly occurring migratory species (Article 4.2) and for the protection of wetlands, especially wetlands of international importance. These areas are known as Special Protection Areas.

New Forest SPA

3.3.2 The New Forest SPA covers an area of 27,969ha located in southern Hampshire, west of the Solent. It comprises a complex mosaic of habitats overlying mainly nutrient-poor soils over plateau gravels. The major components are the extensive wet and dry heaths with their rich valley mires and associated wet and dry grasslands, the ancient pasture woodlands and inclosure woodlands, the network of clean rivers and streams, and frequent permanent and temporary ponds.

3.3.3 The New Forest SPA qualifies under Article 4.1 of the Birds Directive by supporting breeding populations of European importance of the following species listed on Annex I of the Directive:

- Nightjar *Caprimulgus europaeus*, 300 pairs representing at least 8.8% of the breeding population in Great Britain (count as at 1991)
- Woodlark *Lullula arborea*, 177 pairs representing at least 29.5% of the breeding population in Great Britain (no count period specified)
- Honey buzzard *Pernis apivorus*, 2 pairs representing at least 12.5% of the breeding population in Great Britain (no count period specified)
- Dartford warbler *Sylvia undata*, 538 pairs representing at least 33.6% of the breeding population in Great Britain (no count period specified)

3.3.4 It also qualifies under Article 4.1 by supporting the following overwintering Annex 1 species:

- Hen harrier *Circus cyaneus*, 15 individuals representing at least 2.0% of the wintering population in Great Britain (no count period specified)

3.3.5 The site qualifies under Article 4.2 of the Birds Directive by supporting breeding populations of European importance of the following regularly occurring migratory species:

- Hobby *Falco subbuteo*, 25 pairs representing at least 5.0% of the population in Great Britain (no count period specified)
- Wood warbler *Phylloscopus sibilatrix*, unspecified pairs representing at least 2.0% of the population in Great Britain (no count period specified)

Solent and Dorset Coast pSPA

3.3.6 In early 2016 Natural England proposed a new marine designation for three species of bird; common, Sandwich and little tern *Sterna hirundo*, *S. albifrons* and *S. sandvicensis*. The site is located on the south coast within the English Channel and is approximately 255.2nm^2 in size, extending from the Isle of Purbeck in the West to Bognor Regis in the East, following the coastline on either side to the Isle of Wight and into Southampton Water. The proposed site is intended to protect important foraging areas at sea used by breeding colonies in nearby SPA.

3.3.7 The site is proposed to be classified under Article 4.1 of the Birds Directive by supporting breeding populations of European importance of the following species listed on Annex 1 of the Directive:

- Sandwich tern *Sterna sandvicensis*, 4.01% of GB population (441 pairs) (2008-14)

- Common tern *Sterna hirundo*, 4.77% of GB population (492 pairs) (2009-14)
- Little tern *Sterna albifrons*, 3.31% of GB population (63 pairs) (2009-14)

Solent and Southampton Water SPA

3.3.8 The Solent and Southampton Water SPA extends over 5,401ha from Hurst Spit to Hill Head along the south coast of Hampshire, and from Yarmouth to Whitecliff Bay along the north coast of the Isle of Wight. The site comprises a series of estuaries and harbours with extensive mud-flats and saltmarshes together with adjacent coastal habitats including saline lagoons, shingle beaches, reedbeds, damp woodland and grazing marsh. The mud-flats support beds of *Enteromorpha spp.* and *Zostera spp.* and have a rich invertebrate fauna that forms the food resource for the estuarine birds.

3.3.9 In summer, the SPA is of importance for breeding seabirds, including gulls and four species of tern. In winter, the SPA holds a large and diverse assemblage of waterbirds, including geese, ducks and waders. Dark-bellied Brent goose *Branta bernicla bernicla* also feed in surrounding areas of agricultural land outside the designated site boundaries.

3.3.10 The Solent and Southampton Water Special Protection Area (SPA) qualifies under Article 4.1 of the Birds Directive by supporting breeding populations of European importance of the following species listed on Annex 1 of the Directive:

- Mediterranean gull *Larus melanocephalus* 2 pairs representing at least 15.4% of the breeding population in Great Britain (5 year peak mean, 1994-1998)
- Little tern *Sterna albifrons*, 49 pairs representing at least 2.0% of the breeding population in Great Britain (5 year peak mean, 1993-1997)
- Roseate tern *Sterna dougalli* 2 pairs representing at least 3.1% of the breeding population in Great Britain (5 year peak mean, 1993-1997)
- Common tern *Sterna hirundo*, 267 pairs representing at least 2.2% of the breeding population in Great Britain (5 year peak mean, 1993-1997)
- Sandwich tern *Sterna sandvicensis*, 231 pairs representing at least 1.7% of the breeding population in Great Britain (5 year peak mean, 1993-1997)

3.3.11 The site qualifies under Article 4.2 of the Birds Directive by supporting overwintering populations of European importance of the following regularly occurring migratory species:

- Teal *Anas crecca* 4,400 individuals representing at least 1.1% of the wintering North-western Europe population (5 year peak mean, 1992/3-1996/7)
- Dark-bellied Brent goose *Branta bernicla bernicla* 7,506 individuals representing at least 2.5% of the wintering Western Siberia/Western Europe population (5 year peak mean, 1992/3-1996/7)
- Ringed plover *Charadrius hiaticula* 552 individuals representing at least 1.2% of the wintering Europe/Northern Africa-wintering population (5 year peak mean, 1992/3-1996/7)

- Black-tailed godwit *Limosa limosa islandica* 1,125 individuals representing at least 1.7% of the wintering Icelandic-breeding population (5 year peak mean, 1992/3-1996/7)

3.3.12 The SPA also qualifies under Article 4.2 of the Birds Directive due to supporting an internationally important assemblage of birds. Over winter the area regularly supports: 51,361 waterfowl (5 year peak mean 1991/92-1995/96) which include: dark-bellied Brent goose *Branta bernicla bernicla*, teal *Anas crecca*, ringed plover *Charadrius hiaticula*, black-tailed godwit *Limosa limosa islandica*.

3.4 Ramsar Sites

3.4.1 Ramsar sites are wetlands of international importance designated under the Ramsar Convention (UNESCO, 1971). In the UK, the first Ramsar sites were notified in 1976 and since then many more have been designated. The initial emphasis was on selecting sites of importance to waterbirds, and consequently many Ramsar sites are also Special Protection Areas.

New Forest Ramsar

3.4.2 The New Forest Ramsar site qualifies under the following Ramsar Convention criteria:

- Criterion 1: Valley mires and wet heaths are found throughout the site and are of outstanding scientific interest. The mires and heaths are within catchments whose uncultivated and undeveloped state buffer the mires against adverse ecological change. This is the largest concentration of intact valley mires of their type in Britain.
- Criterion 2: The site supports a diverse assemblage of wetland plants and animals including several nationally rare species. Seven species of nationally rare plant are found on the site, as are at least 65 British Red Data Book species of invertebrate.
- Criterion 3: The mire habitats are of high ecological quality and diversity and have undisturbed transition zones. The invertebrate fauna of the site is important due to the concentration of rare and scare wetland species. The whole site complex, with its examples of semi-natural habitats is essential to the genetic and ecological diversity of southern England.

Solent and Southampton Water Ramsar

3.4.3 The Solent and Southampton Water Ramsar site qualifies under the following Ramsar Convention criteria:

- Criterion 1: The site is one of the few major sheltered channels between a substantial island and mainland in European waters, exhibiting an unusual strong double tidal flow and has long periods of slack water at high and low tide. It includes many wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.

- Criterion 2: The site supports an important assemblage of rare plants and invertebrates. At least 33 British Red Data Book invertebrates and at least eight British Red Data Book plants are represented on site.
- Criterion 5: The site supports an internationally important assemblage of species; 51,343 waterfowl over winter (5 year peak mean 1998/99-2002/2003).
- Criterion 6: The site supports species or populations occurring at international levels of importance comprising the following species.

Breeding

- *Roseate tern Sterna dougallii* 1 apparently occupied nests, representing an average of 1.9% of the GB population (Seabird 2000 Census)
- Little tern *Sterna albifrons* 22 apparently occupied nests, representing an average of 1.1% of the GB population (Seabird 2000 Census)
- Sandwich tern *Sterna sandivicensis* 268 apparently occupied nests, representing an average of 2.5% of the GB population (Seabird 2000 Census)
- Common tern *Sterna Hirundo* 192 apparently occupied nests, representing an average of 1.8% of the GB population (Seabird 2000 Census)
- Mediterranean gull *Larus melanocephalus, 11 apparently occupied nests, representing an average of 10.1% of the GB population (Seabird 2000 Census)*
- Black-headed gull *Larus ridibundus, 6,911 apparently occupied nests, representing an average of 5.4% of the GB population (Seabird 2000 Census)*

On passage

- Ringed plover *Charadrius hiaticula* 397 individuals, representing an average of 1.2% of the GB population (5 year peak mean 1998/9-2002/3)

Overwintering

- Dark-bellied Brent goose *Branta bernicla bernicla* 6,456 individuals, representing an average of 3% of the population (5 year peak mean 1998/9-2002/3)
- Teal *Anas crecca* 5,514 individuals, representing an average of 1.3% of the north western European population (5 year peak mean 1998/9-2002/3)
- Black-tailed godwit *Limosa limosa islandica* 1,240 individuals, representing an average of 3.5% of the population (5 year peak mean 1998/9-2002/3)

3.5 Conservation Objectives for SAC and SPA

3.5.1 The Habitats Directive requires that Member States maintain or where appropriate restore habitats and species populations of European importance to favourable conservation status. European site conservation objectives are referred to in the Habitats Regulations and Article 6(3) of the Habitats Directive. They are for use when there is a need to undertake an Appropriate Assessment under the relevant parts of the respective legislation. The

conservation objectives are set for each feature (habitat or species) of an SAC/SPA. Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Habitats and Birds Directives. The conservation objectives defined by Natural England for the SACs and SPAs included within the scope of this HRA are given in Table 3.2.

3.5.2 Natural England has recently published or updated its *Supplementary advice on conserving and restoring site features* for each site[7].

Table 3.2: Conservation objectives for SAC and SPA

Conservation objectives for SAC (and New Forest Ramsar)
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: *[To the extent applicable to qualifying natural habitats or qualifying species:]* ▪ 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 population of qualifying species; and ▪ The distribution of qualifying species within the site.
Conservation objectives for (p)SPA (and Solent and Southampton Water Ramsar)
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.

[7] Natural England (2019): *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: The New Forest Special Area of Conservation*. 18 March 2019.
Natural England (2019): *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: New Forest Special Protection Area*. 19 March 2019.
Natural England (2019): *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: River Itchen Special Area of Conservation*. 19 March 2019.
Natural England (2018): *Conservation Advice for Marine Protected Areas: Solent Maritime SAC: Supplementary Advice on Conservation Objectives*. 16 March 2018.
Natural England (2019): *Conservation Advice for Marine Protected Areas: Solent and Southampton Water SPA: Supplementary Advice on Conservation Objectives*. 15 March 2019.

3.6 Conservation Objectives for Ramsar Sites

3.6.1 Ramsar sites do not have agreed conservation objectives, but in most instances overlap with SPA site boundaries. However, it should be noted that Ramsar qualifying features can include a range of habitats and non-bird species common to SAC designations, as well as bird species and assemblages and their supporting habitats, which are common to SPAs.

3.6.2 Of the Ramsar sites around Eastleigh, the qualifying Ramsar Convention criteria for the Solent and Southampton Water site overlap substantially with the features of the equivalent SPA. No additional conservation objectives are defined to assess these features, and those relating to the equivalent SPA can be used in the assessment.

3.6.3 Conversely, the Ramsar criteria for the New Forest overlap with the features of its equivalent SAC. No additional conservation objectives are defined to assess these features, and those relating to the SAC can be used in the assessment.

3.7 Condition Status

3.7.1 The conservation status of European sites is not routinely reported by Natural England, but it carries out condition monitoring of Sites of Special Scientific Interest (SSSI) at regular intervals. Although not exactly matching the boundaries of European sites, and being notified for different purposes, the condition status of a SSSI helps to give an impression of the overall ecological status of the SAC/SPA/Ramsar with which it coincides. The latest condition assessments (May 2019) of SSSIs forming part of the European sites within the scope of this assessment are illustrated on Figure 3.2.

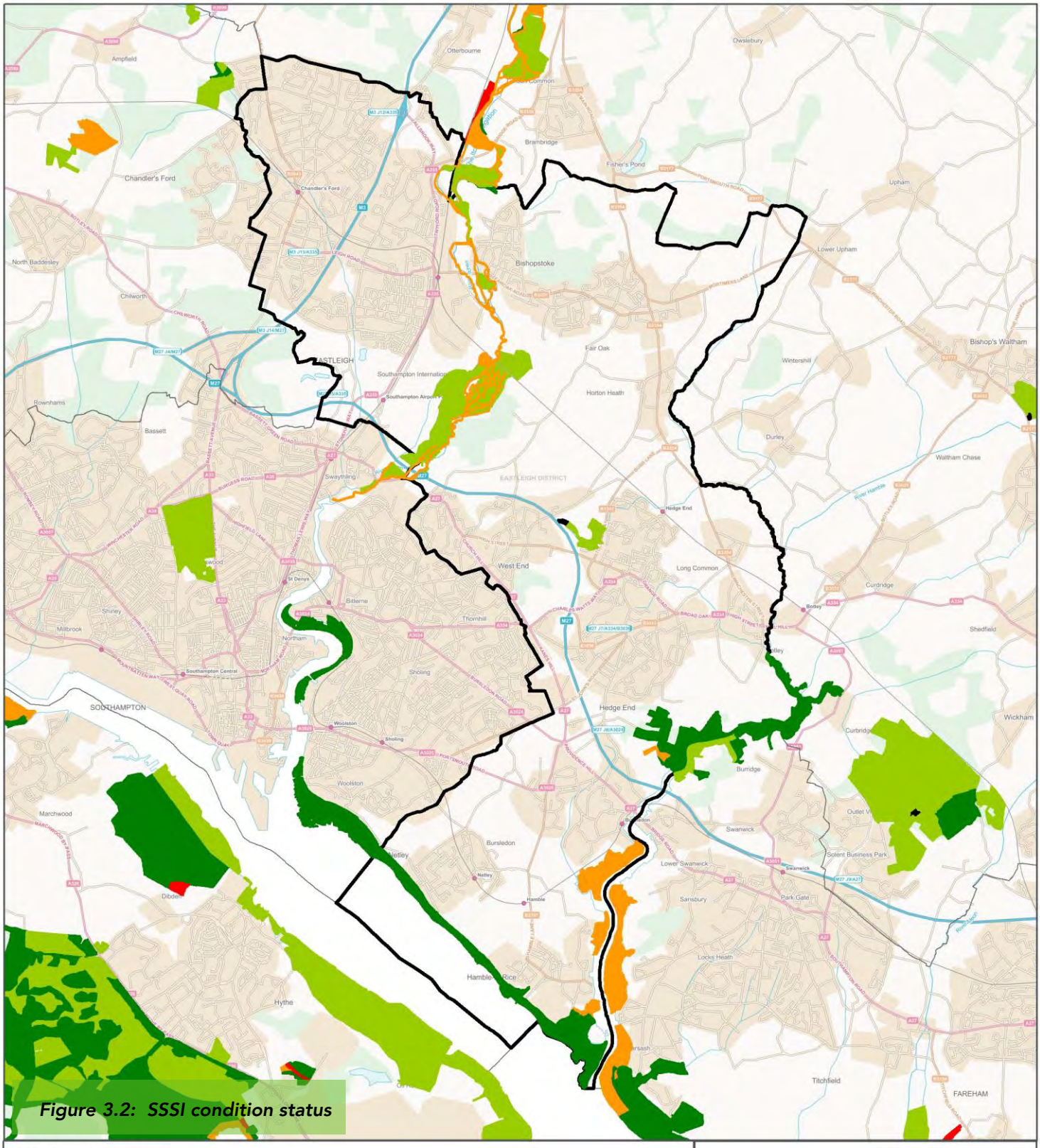


Figure 3.2: SSSI condition status

SSSI Units Condition

- FAVOURABLE
- UNFAVOURABLE RECOVERING
- UNFAVOURABLE NO CHANGE
- UNFAVOURABLE DECLINING
- DESTROYED
- Borough

0 1.5 3 Kilometers

N

ENVIRONMENTAL CONSULTING
Unit 5 Westergate Business Centre
Brighton
BN2 4QN

Scale	Date
1:86,910	Jun2019
Created by	**Reviewed by**
NP	NP

Drawing number

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Eastleigh Local Plan HRA

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4 European Site Characterisation

4.1 SPA Bird Populations and Ecology

4.1.1 The following summaries have been adapted from the UK SPA Reviews, published by the Joint Nature Conservancy Committee (Stroud *et al.*, 2001; Stroud *et al.*, 2016), together with a review of other available literature on the behaviour and ecology of these species[8]. Where available species accounts have been supplemented by core count data presented in the Wetlands Bird Survey (WeBS) report for 2014/15 (Frost *et al.* 2016) and earlier years. The data were obtained from Southampton Water. This area does not exactly correspond with the boundaries of the SPA, but provides an insight to species population trends throughout the area.

Dark-bellied Brent Goose

4.1.2 Brent Geese have a circumpolar distribution breeding in the extreme high Arctic in all northern countries. The Dark-bellied Brent Goose *Branta bernicla bernicla* breeds in the Russian high Arctic. The main wintering areas of Dark-bellied Brent Geese in the UK are in England, along the North Sea and Channel coasts, from The Wash south to Poole Harbour. Important concentrations are found around The Wash, along the Norfolk, Essex and north Kent coasts, and in the natural harbours of the south coast.

4.1.3 The UK population of Dark-bellied Brent Geese is estimated at 103,300 individuals representing 31% of the biogeographic population (Kirby 1995), 94% of which occur within SPA sites for which the species is a qualifying feature. The species is a vulnerable species of European conservation concern and an Amber listed Bird of Conservation Concern in the UK, due to being a species of European Concern with a localised and important non-breeding population.

4.1.4 The traditional wintering habitat is mostly shallow coasts and estuaries with extensive mudflats and intertidal areas, as Dark-bellied Brent Geese rarely occur far from the sea and feed on intertidal plants such as *Zostera, Enteromorpha* and a small range of littoral plants. In recent years the species has taken to grazing on coastal cultivated grasslands and winter cereal fields. An investigation carried out in one of the species' wintering areas (UK) found that it was most likely to forage on dry, improved grasslands that had high abundances of the grass *Lolium perenne*, were between 5 and 6 ha in area, and were at a distance of up to 1.5 km inland or 4-5 km along the coast from coastal roosting sites (IUCN 2013).

4.1.5 Of the sites being assessed by the HRA, the following support internationally important populations:

- Solent and Southampton Water SPA: 7,506 individuals representing at least 2.5% of the wintering Western Siberia/Western Europe population (5year peak mean, 1992/3-1996/7).

[8] http://www.iucnredlist.org, http://www.bto.org/about-birds, http://www.birdlife.org/datazone/species/search

- Solent and Southampton Water Ramsar: 6,456 individuals, representing an average of 3% of the population (5 year peak mean 1998/9-2002/3).

4.1.6 This species is considered to be susceptible to disturbance from vehicles in the UK, although it is relatively tolerant of human disturbance, e.g. walkers, compared to other species. In its winter range the species may be persecuted by farmers, as in recent years it has increasingly taken to grazing on cultivated grasslands and winter cereal fields near the coast (IUCN 2013).

4.1.7 As shown in Table 4.1 Southampton Water is not consistently maintaining internationally important numbers of Dark-bellied Brent Geese (over 2,400 individuals). The average numbers recorded for Southampton Water in the 2006-2011 and 2011-2016 periods fell below the threshold for an internationally important population, although they were still within the limits set for a nationally important population (910 individuals). It should be noted that this WeBS recording area does not include the Solent which forms a substantial part of the SPA.

Table 4.1: WeBS Core Count data for Dark-bellied Brent Goose

Survey Area	06/07	07/08	08/09	09/10	10/11	5yr avg
Southampton Water	1,151	1,674	869	10,55[12]	1,649	1,280
Survey Area	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**5yr avg**
Southampton Water	2,496	1,257	2,395	3,355	1,893	2,279

(X) Incomplete count X[10] WeBS low tide count

X[11] Roost count X[12] Supplementary daytime count

Black-tailed Godwit

4.1.8 The Icelandic population of Black-tailed Godwit *Limosa limosa islandica* breeds mainly in Iceland and sporadically in the Faeroes, Britain and Ireland. This sub-species winters mainly in Britain, Ireland and western France, and south to Morocco, with the main concentrations on the muddy estuaries of the south coasts of Ireland and England.

4.1.9 The UK population of Black-tailed Godwit is estimated at 7,410 individuals (Cayford & Waters 1996), representing 13% of the biogeographic population (Rose and Scott 1997), 100% of which occur within SPA sites for which the species is a qualifying feature. The species is a vulnerable species of European conservation concern and a Red listed Bird of Conservation Concern in the UK, due to being a species of European Concern which has undergone a severe decline in the UK non-breeding population size, of more than 50%, over 25 years (or the longer-term).

4.1.10 Overwintering Black-tailed Godwits often winter in brackish habitat (such as sheltered estuaries and lagoons with large intertidal mudflats) and roost on damp pasture, often inland. Black-tailed Godwits feed mostly on worms whilst the tide is out.

4.1.11 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent and Southampton Water SPA; Black-tailed Godwit *Limosa limosa islandica* 1,125 individuals representing at least 1.7% of the wintering Icelandic-breeding population (5 year peak mean, 1992/3-1996/7)

- Solent and Southampton Water Ramsar; Black-tailed Godwit *Limosa limosa islandica* 1,240 individuals, representing an average of 3.5% of the population (5 year peak mean 1998/9-2002/3)

4.1.12 This species is threatened by the loss of nesting habitat owing to wetland drainage and agricultural intensification. Detrimental activities include the conversion of wet meadows to arable land, increased fertilisation and drainage of grassland, artificial flooding of nesting habitats, earlier and more frequent cutting as farmers adapt to climate change, spring burning, overgrowing by scrub, land claiming by businesses and developers, the construction of roads and parks, and disturbance by walkers. Habitat fragmentation may cause particular problems for this species, which nests in dispersed colonies and sub-colonies as protection against predators and may be unlikely to breed successfully in small areas of habitat (IUCN 2013).

4.1.13 As shown in Table 4.2 the average numbers recorded for Southampton Water fall below the threshold for an internationally important population, although they are still within the limits set for a nationally important population (over 430 individuals).

Table 4.2: WeBS Core Count data for Black-tailed Godwit

Survey Area	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**5 yr avg**
Southampton Water	295	374	490	514	414	428
Survey Area	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**5 yr avg**
Southampton Water	438	314	420	571	443	437

Ringed Plover

4.1.14 The Ringed Plover *Charadrius hiaticula* is an arctic and northern temperate breeding wader. Through much of its range it is an essentially high Arctic breeding bird, but the range extends to the temperate coasts of north-western Europe, including the UK as well as a few inland areas of Europe. The UK supports both breeding and non-breeding individuals.

4.1.15 The UK population of breeding Ringed Plover is estimated at 8,500 pairs (Lloyd *et al* 1991). During the winter the UK supports 28,600 individuals representing 14% of the biogeographic population (Rose and Scott 1997), 21% of which occur within SPA sites for which the species is a qualifying feature. A further 30,000 birds will pass through the UK during winter migrations. This represents 30% of the biogeographic population. The species is not considered a species of European conservation concern but is a UK Amber listed Bird of Conservation Concern because of an important non-breeding population and a decline in breeding population.

4.1.16 Ringed Plovers have a wide breeding distribution around the coast of Britain and Ireland. In England, the extensive sandy and shingle beaches between the Thames and the Humber hold most of the population, but the islands off western Scotland are also very important for the population. Southerly populations, such as those in Britain and Ireland, breed mainly on coastal sand, gravel and shingle beaches, upper saltmarshes and artificial habitats such as the shores of gravel pits and reservoirs; although short-grazed coastal pastures, Outer Hebridean machair and arable fields in eastern England may also be frequently used. Breeding Ringed Plovers are highly site faithful.

4.1.17 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent and Southampton Water SPA; Ringed Plover *Charadrius hiaticula* 552 individuals representing at least 1.2% of the wintering Europe/Northern Africa - wintering population (5 year peak mean, 1992/3-1996/7)
- Solent and Southampton Water Ramsar; Ringed Plover *Charadrius hiaticula* 397 individuals, representing an average of 1.2% of the GB population (5 year peak mean 1998/9-2002/3)

4.1.18 Southampton Water did not meet table-qualifying levels for Ringed Plover in the WeBS counts for 2006 to 2011 or 2011 to 2016, as indicated by the absence of records.

Common Tern

4.1.19 The Common Tern is a common and widespread breeding species of both coastal and inland regions in the northern hemisphere. It is a long-distance migrant and winters mainly in the southern hemisphere.

4.1.20 The breeding population of common terns in Great Britain is estimated to be 10,000 pairs (Musgrove et al. 2013), representing at least 2% of the Northern & Eastern European breeding population (500,000 pairs derived by division by 3 of the upper estimate of 1,500,000 individuals: AEWA 2012), 46% of which occur within SPA sites for which the species is a qualifying feature. The species is not considered a species of European conservation concern but is an Amber listed Bird of Conservation Concern in the UK because of its localised breeding population.

4.1.21 Common Terns breed around coasts and beside inland freshwater bodies. Coastal sites are mainly small rocky islets, shingle beaches, sand-spits and dunes, as well as among short vegetation (occasionally more scrubby growth). Inland sites include shingle banks in rivers, islands in lakes and gravel pits, marshes and shallow lagoons. More artificial sites, including waste ground, specially made floating rafts and even gravel-covered flat-roofs, are occasionally used.

4.1.22 A significant proportion of the British population breeds in Scotland, particularly in the northern and western Isles and on the west coast, but with sizeable colonies also along the east coast firths. Common Terns also commonly breed inland on riverine shingle and islands, not only in Scotland but also in England. Coastal colonies in England are mainly concentrated in the north-east, East Anglia, at a few localities along the south coast, and in the north-west. The only Welsh colonies are on Anglesey. Inland breeding takes place mainly in eastern Scotland and in central, eastern and southern England. Colonies in Ireland are well spread around the coasts, with scattered inland breeding through the midlands.

4.1.23 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent & Southampton Water SPA; Common tern *Sterna hirundo*, 267 pairs representing at least 2.2% of the breeding population in Great Britain (5yr peak mean, 1993-1997)

- Solent and Southampton Water Ramsar; Common tern *Sterna Hirundo* 192 apparently occupied nests, representing an average of 1.8% of the GB population (Seabird 2000 Census)

4.1.24 During the breeding season the species is vulnerable to human disturbance at nesting colonies (e.g. from off-road vehicles, recreation, motor-boats, personal watercraft and dogs), and to the flooding of nest sites as a result of naturally fluctuating water levels. On its breeding grounds the species is also threatened by habitat loss as a result of coastal development, erosion and vegetation overgrowth (rapid vegetation succession encroaching upon nesting habitats (IUCN 2013).

4.1.25 As shown in Table 4.3 Southampton Water is not currently maintaining internationally important numbers of Common Tern (over 1,800 individuals). There are currently no British thresholds set for this species, however, Southampton Water exceeds the limits suggested by Holt (2012) for a nationally important population (over 200 individuals). It should be noted that at the current time the recording of terns during WeBS surveys is optional.

Table 4.3: WeBS Core Count data for Common Tern

Survey Area	***06/07***	***07/08***	***08/09***	***09/10***	***10/11***	***Mean***
Southampton Water	*(133)*	*(2)*	*(310)*	*(260)*	*(159)*	*(310)*
Survey Area	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	***Mean***
Southampton Water	*480*	*112*	*(24)*	*(35)*	*3*	*198*

Little Tern

4.1.26 The Little Tern has a widely scattered global distribution. The European breeding distribution is discontinuous, but extends from the Gulf of Bothnia to the coasts of the Mediterranean and North Africa. Through much of this area, the species is restricted to the coast, although it breeds along a number of major river systems.

4.1.27 The UK population of Little Tern is estimated at 2,400 pairs (Lloyd *et al* 1991), representing 8% of the biogeographic population (Rose and Scott 1997), 67% of which occur within SPA sites for which the species is a qualifying feature. The species is a declining species of European conservation concern and an Amber listed Bird of Conservation Concern in the UK because it is a species of European Concern, with a localised breeding population which has suffered a decline in its range.

4.1.28 Breeding occurs at scattered colonies around much of the coast of Britain and Ireland, from the north of Scotland to the south coast of England. All British and Irish Little Terns nest on the coast, utilising sand and shingle beaches and spits, as well as tiny islets of sand or rock close inshore. The greater part of the population occurs in south and east England from Hampshire to Norfolk (Lloyd *et al*. 1991). There are small, scattered colonies on the coasts of north-east and north-west England, eastern Scotland, the Outer and Inner Hebrides, and in Wales. The Irish population is mainly found on the west and south-east coasts. Feeding takes place close to the colony, to a maximum distance of 6 km, but not more than 1.5 km offshore (Cramp *et al.* 1974).

4.1.29 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent and Southampton Water SPA; Little Tern *Sterna albifrons*, 49 pairs representing at least 2.0% of the breeding population in Great Britain (5 year peak mean, 1993-1997)
- Solent and Southampton Water Ramsar; Little Tern *Sterna albifrons* 22 apparently occupied nests, representing an average of 1.1% of the GB population (Seabird 2000 Census)

4.1.30 The species is threatened by habitat destruction such as the development and industrial reclamation of coastal breeding habitats (e.g. for the development of new harbour facilities) It is also highly vulnerable to human disturbance (including birdwatchers) at coastal and inland nesting sites which can lead to nest failures. Pesticide pollution and artificially induced water-level fluctuations in saltmarshes may also pose a threat to the species' reproductive success.

4.1.31 Southampton Water did not meet nationally or internationally important population levels for Little Tern in the WeBS counts for 2011 to 2016, as indicated by the absence of records.

Roseate Tern

4.1.32 The global distribution of Roseate Tern comprises a number of discrete ranges, with breeding occurring around the edges of the North Atlantic, Indian and south-west Pacific Oceans. In Europe, the breeding population is confined to Britain, Ireland and France (Brittany), as well as the Azores.

4.1.33 The UK population of breeding Roseate Terns is estimated at 64 pairs (Stone *et al* 1997) which represents 3% of the biogeographic population (Rose and Scott 1997), 88% of which are found within SPA sites for which the species is a qualifying feature. The species is listed as a rare species of conservation concern in Europe and an Amber listed Bird of Conservation Concern in the UK due to a recent decline in the breeding population.

4.1.34 Breeding takes place on the coast, with colonies established on sand-spits and dunes, shingle beaches and low rocky islets. Its diet consists predominantly of small pelagic fish, particularly sandeel (which are particularly important during chick rearing).

4.1.35 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent and Southampton Water SPA; Roseate Tern *Sterna dougalli* 2 pairs representing at least 3.1% of the breeding population in Great Britain (5 year peak mean, 1993-1997)
- Solent and Southampton Water Ramsar; *Roseate Tern Sterna dougallii* 1 apparently occupied nests, representing an average of 1.9% of the GB population (Seabird 2000 Census)

4.1.36 At the northern European breeding grounds, the most significant threats are human disturbance (e.g. from habitat development, off-road vehicles and recreation) and predation from both natural and introduced avian and ground predators (IUCN 2013).

4.1.37 A single individual was recorded in Southampton Water over the last 5 years (2011).

Mediterranean Gull

4.1.38 The global distribution of Mediterranean Gull *Larus melanocephalus* is highly restricted, with breeding limited to just a few localities in Europe, particularly along the northern coast of the Black Sea. In the UK, which is at the north-western limit of the species' world range, breeding is extremely localised.

4.1.39 The UK population of breeding Mediterranean Gull is estimated at 31 pairs (Ogilvie *et al* 1996) which represents 0.1% of the biogeographic population (Rose and Scott 1997), 74% of which occur within SPA sites for which the species is a qualifying feature. The species is not considered a species of European conservation concern but is an Amber listed Bird of Conservation Concern in the UK because of its small breeding population.

4.1.40 It nests near water on flood-lands, fields and grasslands and on wet or dry areas of islands favouring sparse vegetation but generally avoiding barren sand. Outside of the breeding season the species becomes entirely coastal favouring estuaries, harbours, saline lagoons and other sheltered waters. It is not known where the birds that breed in England spend the non-breeding season, but it seems likely that they use coastal areas near to the nesting colonies in south-east and south England.

4.1.41 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent and Southampton Water SPA; Mediterranean Gull *Larus melanocephalus* 2 pairs representing at least 15.4% of the breeding population in Great Britain (5 year peak mean, 1994-1998)
- Solent and Southampton Water Ramsar; *Mediterranean Gull Larus melanocephalus, 11 apparently occupied nests, representing an average of 10.1% of the GB population (Seabird 2000 Census)*

4.1.42 This species sustains heavy losses as a result of tourist disturbance at breeding colonies. The species may also be threatened by habitat loss resulting from tourism development, and by marine pollution (IUCN 2013).

4.1.43 As shown in Table 4.4 Southampton Water is not currently maintaining internationally important numbers of Mediterranean Gull (over 770 individuals), but exceeds the threshold set for sites of national importance (18 individuals).

Table 4.4: WeBS Core Count data for Mediterranean Gull

Survey Area	***06/07***	***07/08***	***08/09***	***09/10***	***10/11***	***5 yr avg***
Southampton Water	*(112)*	*(309)*	*(30)*	*(36)*	*1254*	*348*
Survey Area	***11/12***	***12/13***	***13/14***	***14/15***	***15/16***	***5 yr avg***
Southampton Water	*478*	*39*	*873*	*92*	*135*	*323*

Teal

4.1.44 In Europe, Teal *Anas crecca* breed discontinuously from Iceland, Britain, Ireland, and France eastward to Russia. In winter, the species occurs across much of Europe, wherever there are suitable wetland habitats, including inland and coastal wetlands. Most non-breeding Teal in the UK, as elsewhere in Europe, originate from the east and north, including Iceland, Fennoscandia, and Russia. Winter flocks also contain locally breeding birds that, within Europe, are of a more sedentary or dispersive nature.

4.1.45 The UK population of Teal is estimated at 135,000 (Kirby 1995) which represents 17% of the biogeographic population (Rose and Scott 1997), 47% of which are found within SPA sites for which this species is a qualifying feature. It is also estimated that 2,100 pairs of breeding birds are resident in the UK (BTO 2013). The species is not considered to be of conservation concern in Europe but is an Amber listed Bird of Conservation Concern in the UK due to its important non-breeding population.

4.1.46 Non-breeding Teal are widespread throughout Britain and Ireland, favouring areas of shallow water on estuarine coastal lagoons, coastal and inland marshes, and flooded pastures and ponds. They are absent only from mountainous areas, coastal stretches with high cliffs and inland areas which lack suitable freshwater habitats.

4.1.47 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- Solent and Southampton Water SPA; Teal *Anas crecca* 4,400 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean, 1992/3-1996/7)
- Solent and Southampton Water Ramsar; Teal *Anas crecca* 5,514 individuals, representing an average of 1.3% of the population (5 year peak mean 1998/9-2002/3)

4.1.48 This species is threatened by lowland habitat loss and degradation. It is also threatened by disturbance from human recreational activities and construction work (IUCN 2013).

4.1.49 Southampton Water did not meet table-qualifying levels for Eurasian Teal in the WeBS counts for 2011 to 2016, as indicated by the absence of records.

Nightjar

4.1.50 The Nightjar's *Caprimulgus europaeus* global distribution lies in the Palearctic where it breeds from North Africa and western Europe, widely across temperate regions of Eurasia as far as central Asia and western China.

4.1.51 In the UK, Ireland and central Europe its distribution tends to be sporadic, reflecting the scattered availability of good breeding habitats (Cramp 1985; Hagemeijer & Blair 1997). Nightjars breeding in the UK are concentrated in southern and south-eastern England and East Anglia, with much smaller numbers and lower densities occurring in Wales, the Midlands, north-east England and south-west Scotland. There may be less than 30 pairs throughout the whole of Ireland.

4.1.52 The UK breeding population of Nightjar is estimated by surveying the numbers of male birds heard 'churring' (calling) and is around 4,600 pairs (Conway *et al.*, 2007). This represents 2.3% of the biogeographic population. The SPA suite supports approximately 46% of the UK population (Stroud *et al.*, 2016). The species is considered depleted and of conservation concern in Europe, it is an Amber listed Bird of Conservation Concern in the UK due to a recent decline in breeding range.

4.1.53 Nightjar breeding habitats include heathland, often with scattered pine or birch, woodland edges and clearings, young forestry plantations and, particularly in south-east England, coppiced woodland. Forestry plantations are used up to 15–20 years after planting. In clear-felled areas of Thetford Forest, nests have been found in a variety of habitats, including extensive, non-vegetated areas and sparse bracken. Birds forage over a variety of habitats including deciduous or mixed woods, orchards, gardens, riparian habitats and freshwater wetlands, heathland and young plantations.

4.1.54 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- New Forest SPA; Nightjar *Caprimulgus europaeus*, 300 pairs representing at least 8.8% of the breeding population in Great Britain

4.1.55 The National Nightjar Survey recorded 781 churring males in Hampshire in 2004. This represents a 52% increase in numbers for the county since the previous survey was carried out in1992 (BTO 2004). Table 4.5 shows the percentage of Nightjars which are supported by the New Forest SPA.

Table 4.5: Distribution of Nightjars within SPA in Britain (JNCC, 2001)

Site Name	Site Total	% of Biogeographic Pop.	% of GB Pop.
Ashdown Forest	35	<0.1 1	1.0
Breckland	415	0.2	12.2
Dorset Heathland	386	0.2	11.4
East Devon Heaths	83	<0.1	2.4
Minsmere – Walberswick	24	<0.1	0.7
New Forest	300	0.1	8.8
Sandlings	109	<0.1	3.2
Thames Basin Heaths	264	0.1	7.8
Thorne and Hatfield Moors	66	<0.1	1.9
Wealden Heaths	103	<0.1	3.0

Woodlark

4.1.56 Woodlark *Lullula arborea* is widely distributed across Europe from Iberia to the Russian steppes but has a generally southern distribution, occurring only in the southernmost parts of Scandinavia and Britain. In the UK, breeding is confined to southern England with most birds

occurring in Dorset, Hampshire (especially the New Forest), Surrey, Sussex, Breckland and the Suffolk Coast.

4.1.57 The UK population of breeding Woodlark is estimated at 3,100 pairs (Conway *et al.*, 2009) which represents 0.2% of the biogeographic population (Hagemeijer & Blair 1997), 31% of which are found within SPA sites for which this species is a qualifying feature. The species is considered depleted and of conservation concern in Europe.

4.1.58 Favoured breeding habitat is dependent on location, with birds in the south west using agricultural land, whilst those in the south are typically found on heathland such as that present in the New Forest. Migratory behaviour also varies across the species' English distribution. East Anglian birds largely desert their breeding grounds in the winter, although a greater proportion of the birds in southern England remain on breeding areas throughout the year.

4.1.59 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- New Forest SPA; Woodlark *Lullula arborea*, 184 pairs representing at least 12.3% of the breeding population in Great Britain (Count as at 1997)

4.1.60 Table 4.6 shows the percentage of Woodlarks which are supported by the New Forest SPA.

Table 4.6: Distribution of Woodlarks within SPA in Britain (JNCC, 2001)

Site Name	Site Total	% of Biogeographic Pop.	% of GB Pop.
Breckland	430	<0.1	28.7
Dorset Heathland	60	<0.1	4.0
Minsmere – Walberswick	20	<0.1	1.3
New Forest	184	<0.1	12.3
Sandlings	154	<0.1	10.3
Thames Basin Heaths	149	<0.1	9.9
Wealden Heaths	105	<0.1	7.0

Honey Buzzard

4.1.61 The global breeding distribution of the Honey Buzzard *Pernis apivorus* is largely restricted to the Western Palearctic. The UK is at the edge of the European breeding range and the species has probably always been a rare but scattered breeder.

4.1.62 The UK population of breeding Honey Buzzard is estimated at 33 pairs (Ogilvie, 2003) which represents 0.05% of the biogeographic population (Hagemeijer & Blair 1997), 12% of which are found within SPA sites for which this species is a qualifying feature. The species is not considered of conservation concern in Europe, but is an Amber listed Bird of Conservation Concern in the UK due to its small breeding population.

4.1.63 In the UK, Honey Buzzards occur in three broad habitat types: high-quality mixed deciduous forests in the lowlands of southern England, central hill country with mixed farmland/woodland,

and upland, even-aged coniferous plantations. These habitats are also preferred elsewhere in Europe. Beech *Fagus* sp. forests with sandy, light soils have been favoured in the New Forest, traditionally regarded as the species stronghold, largely thought to be due to the association of this habitat with an abundance of social wasps on which the species selectively feeds its young. However, breeding performance is not adversely affected by the temporary unavailability of wasps, as amphibians, and pigeon and passerine nestlings are taken in inclement weather.

4.1.64 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- New Forest SPA; Honey Buzzard *Pernis apivorus*, 2 pairs representing at least 10.0% of the breeding population in Great Britain

Dartford Warbler

4.1.65 The global breeding range of the Dartford Warbler *Sylvia undata* is largely restricted to the western part of the Mediterranean region and almost the entire world population breeds in Europe, with more than 75% thought to breed in Spain and large numbers also occurring in southern and western France, southern Italy and Portugal.

4.1.66 Southern England is at the northern limit of the species world range. Here the main concentrations occur in Dorset, Hampshire and Surrey with smaller numbers in the south west and East Anglia.

4.1.67 The UK population of breeding Dartford Warbler is estimated at 3,200 pairs (Wotton *et al.*, 2009) which represents 0.5% of the biogeographic population (Hagemeijer & Blair 1997), 52% of which are found within SPA sites for which this species is a qualifying feature. The species is depleted in Europe and considered of most conservation concern; it is an Amber listed Bird of Conservation Concern in the UK due to its localised breeding population.

4.1.68 In Britain, the species is almost exclusively found on lowland dry heathland with Heather *Calluna vulgaris* and Gorse *Ulex spp*. Large areas of heathland typically hold higher densities of breeding birds than fragmented and isolated habitats, with up to 10-15 pairs/km2 present in the best areas. Territories containing Gorse *Ulex spp*. tend to be more productive (Catchpole & Phillips 1992), most likely due to the greater abundance of invertebrate prey and increased shelter during the winter. Birds generally remain on the breeding grounds throughout the year, although there is a partial migration of adults, notably in October.

4.1.69 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- New Forest SPA; Dartford Warbler *Sylvia undata*, 538 pairs representing at least 33.6% of the breeding population in Great Britain

4.1.70 Table 4.7 shows the percentage of Dartford Warblers which are supported by the New Forest SPA.

Table 4.7: Distribution of Dartford Warblers within SPA in Britain (JNCC, 2001)

Site Name	Site Total	% of Biogeographic Pop.	% of GB Pop.
Ashdown Forest	29	<0.1	1.8
Dorset Heathland	418	<0.1	26.1
East Devon Heathlands	128	<0.1	8.0
New Forest	538	<0.1	33.6
Thames Basin Heaths	445	<0.1	27.8
Wealden Heaths	123	<0.1	7.7

Hen Harrier

4.1.71 Hen Harriers *Circus cyaneus* have a widespread global distribution. In the Palearctic, migrants winter in southern parts of Europe, the Middle East and through southern areas of central and eastern Asia, although Hen Harriers breeding in Europe tend to be more sedentary. In the UK, breeding is now confined to Northern Ireland, and northern and western Britain, especially Scotland.

4.1.72 The winter distribution of Hen Harriers in the UK significantly differs from that during the breeding season. In autumn, birds disperse from many moorland nesting areas and move to winter in lowlands, especially around the coast. There are significant concentrations on the south and east coast of England, especially within the East Anglia estuaries, the Greater Thames estuary and Solent area.

4.1.73 The UK population of non-breeding Hen Harrier is estimated at 1,710 individuals (Holling *et al.* 2012) which represents approximately 3.7% of the biogeographic population (Hagermeyer and Blair 1997), 15% of which are found within SPA sites for which this species is a qualifying feature. It is also estimated that 483 pairs of breeding birds are resident in the UK (JNCC 2013). The New Forest population is considered to be non-breeding. The species is considered a depleted species of most conservation concern in Europe and is a Red listed Bird of Conservation Concern in the UK due to historical population decline.

4.1.74 Hen Harriers hunt especially over salt-marshes taking small passerines, small mammals and waders. Hen Harriers also occur in lowland heaths and on chalk downland, with significant winter concentrations in Hampshire and Dorset, on downland in Oxfordshire, Berkshire and Wiltshire, as well as in the East Anglia Brecks. During winter, Hen Harriers gather at communal roost sites at night. These can hold significant numbers of individuals (sometimes over 20) and are usually located in wetlands such as carr woodland, marshes and reedbeds, although they sometimes occur on heather moorland, lowland heath and conifer plantations.

4.1.75 Of the sites being assessed by the HRA, the following have been assessed as supporting internationally important populations:

- New Forest SPA; Hen Harrier *Circus cyaneus,* 15 individuals representing at least 2.0% of the wintering population in Great Britain

4.1.76 Table 4.8 shows the percentage of Hen Harriers which are supported by the New Forest SPA.

Table 4.8: Distribution of Hen Harriers within SPA in Britain (JNCC, 2001)

Site Name	Site Total	% of Biogeographic Pop.	% of GB Pop.
Blackwater Estuary	4	<0.1	0.5
Broadland	22	<0.1	2.9
Colne Estuary	4	<0.1	0.5
Dengie	5	<0.1	0.7
Dorset Heathlands	20	<0.1	2.7
Foulness	6	<0.1	0.8
Humber Flats, Marshes & Coast	20	<0.1	2.7
Loch of Inch and Torrs Warren	8	<0.1	1.1
Minsmere - Walberswick	15	<0.1	2.0
Muirkirk & North Lowther Uplands	10	<0.1	1.3
New Forest	15	<0.1	2.0
North Norfolk Coast	16	<0.1	2.1
Orkney Mainland Moors	13	<0.1	1.7

4.2 Solent and Dorset Coast pSPA

4.2.1 The following population data for the pSPA are drawn from the assessment of ornithological interest (section 5) prepared as part of the departmental brief[9] recommending that the Solent and Dorset Coast be considered as a potential SPA.

Sandwich tern

4.2.2 The breeding population of Sandwich terns in Great Britain is estimated to be 11,000 pairs (Musgrove et al. 2013), representing about 19.3% of the Western Europe/West Africa breeding population (57,000 pairs derived by division by 3 of the upper estimate of 171,000 individuals: AEWA 2012). In the UK, the species is restricted to relatively few large colonies, most of which are on the east coast of Britain with a few smaller ones on the south and north-west coasts of England and Northern Ireland. Colonies are mostly confined to coastal shingle beaches, sand dunes and offshore islets (Mitchell et al. 2004).

4.2.3 The principal Sandwich tern breeding colonies supported by the Solent & Dorset Coast pSPA during the breeding season are located at: Poole Harbour SPA, Solent & Southampton Water SPA and Chichester & Langstone Harbours SPA. The sum of the site-specific recent 5 year means across these three principal source colony SPAs yields a figure of 441 pairs or 882 breeding adults supported by the pSPA which constitutes 4.01% of the GB breeding population; see Table 4.9.

[9] *Ibid.*

Common tern

4.2.4 The breeding population of common terns in Great Britain is estimated to be 10,000 pairs (Musgrove et al. 2013), representing at least 2% of the Northern & Eastern European breeding population (500,000 pairs derived by division by 3 of the upper estimate of 1,500,000 individuals: AEWA 2012). A significant proportion of the British population breeds in Scotland. Coastal colonies in England are concentrated in the north-east, East Anglia, at a few localities along the south coast, and in the north-west (Mitchell et al. 2004). Common terns breed not only around coasts but, unlike the other tern species which breed in the UK, also breed frequently beside inland freshwater bodies.

Table 4.9: Summary of breeding populations of Sandwich tern within SPAs contributing to the foraging population of the Solent & Dorset Coast pSPA

Species	Poole Harbour	Solent/Soton Water	Chich/Lang Hbrs
Popln. at citation (pairs)	n/a	231	31
Old % of GB popln.	n/a	1.7	0.2
Data age	n/a	1993-97	1993-97
Recent mean (pairs)	181	104	156
Recent % of GB popln.	1.65	0.94	1.42
Data age	2010-14	2010-14	2008-11&2013
Solent & Dorset Coast pSPA population (pairs x2 for individuals)			882
Solent & Dorset Coast pSPA population: % of GB breeding popln.			4.01

4.2.5 The principal common tern breeding colonies supported by the Solent & Dorset Coast pSPA during the breeding season are located at: Poole Harbour SPA, Solent & Southampton Water SPA and Chichester & Langstone Harbours SPA. The sum of the site-specific recent 5 year means across these SPAs yields a figure of 492 pairs or 984 breeding adults supported by the pSPA which constitutes 4.92% of the GB breeding population; see Table 4.10.

Table 4.10: Summary of breeding populations of common tern within SPAs contributing to the foraging population of the Solent & Dorset Coast pSPA

Species	Poole Harbour	Solent/Soton Water	Chich/Lang Hbrs
Popln. at citation (pairs)	155	267	33
Old % of GB popln.	1.3	2.2	0.3
Data age	1993-97	1993-97	1992-96
Recent mean (pairs)	178.4	164.2	149.0
Recent % of GB popln.	1.38	1.6	1.5
Data age	2010-14	2010-14	2009-11/13-14
Solent & Dorset Coast pSPA population (pairs x2 for individuals)			983.2
Solent & Dorset Coast pSPA population: % of GB breeding popln.			4.92

Little tern

4.2.6 The breeding population of little tern in Great Britain is estimated to be 1,900 pairs (Musgrove et al. 2013), representing about 10.3% of the Eastern Atlantic breeding population (18,500 pairs derived by division by 3 of the upper estimate of 55,500 individuals: AEWA 2012). Breeding occurs in scattered colonies along much of the east and west coasts of Britain, from the north of Scotland to (and including) the south coast of England (Mitchell et al. 2004). The greater part of the population occurs in south and east England from Dorset to Norfolk (Mitchell et al. 2004). All British little terns nest on the coast, utilising sand and shingle beaches and spits, as well as tiny islets of sand or rock close inshore (Mitchell et al. 2004).

4.2.7 The principal little tern breeding colonies supported by the Solent & Dorset Coast pSPA during the breeding season are located at: Solent & Southampton Water SPA and Chichester & Langstone Harbours SPA. The sum of the site-specific recent 5 year means across these SPAs yields a figure of 63 pairs or 126 breeding adults supported by the pSPA which constitutes 3.31% of the GB breeding population; see Table 4.11.

Table 4.11: Summary of breeding populations of little tern within SPAs contributing to the foraging population of the Solent & Dorset Coast pSPA

Species	Solent/Southampton Water	Chichester/Langstone Hbrs
Popln. at citation (pairs)	49	100
Old % of GB popln.	2.0	4.2
Data age	1993-97	1992-96
Recent mean (pairs)	19	43
Recent % of GB popln.	1.02	2.28
Data age	2010-14	2010-14
Solent & Dorset Coast pSPA popln. (pairs x2 for individuals)		126
Solent & Dorset Coast pSPA popln.: % GB breeding popln.		3.31

4.3 Qualifying Species of Special Areas of Conservation

4.3.1 The following summaries have been adapted from the descriptions published by the Joint Nature Conservancy Committee[10] together with a review of other available literature on the behaviour and ecology of these species.

Southern Damselfly

4.3.2 The southern damselfly is a small, weak flying damselfly – a relative of the dragonflies. It is at the northern edge of its global range in the UK, which is reflected in its southern and western distribution and in the narrow range of habitat types in which it occurs in the UK (Purse, 2002; Rouquette, 2005). These are found in two distinct landscape types; base-rich lowland heathland and calcareous streams and fens (Rouquette, 2005). The former is characterised by the

[10] http://jncc.defra.gov.uk/ProtectedSites/SACselection/SAC_species.asp

heathland streams and valley mires found in the New Forest and Preseli Hills and the latter most commonly by the historic water meadow systems associated with the rivers Itchen and Test in Hampshire.

4.3.3 The Southern Damselfly *Coenagrion mercuriale* has very specialised habitat requirements, being confined to shallow, well-vegetated, base-rich runnels and flushes in open areas or small side-channels of chalk rivers. Most sites are on wet heath. The larvae live in flushes and shallow runnels, often less than 10cm deep, with slow-flowing water. Adults fly from June to August. Females lay eggs onto submerged plants, and the predatory aquatic larvae probably take two years to mature.

4.3.4 Strong populations of Southern Damselfly occur in the River Itchen SAC, estimated to be in the hundreds of individuals. The site in central southern England represents one of the major population centres in the UK. It also represents a population in a managed chalk-river flood plain, an unusual habitat for this species in the UK, rather than on heathland.

4.3.5 The New Forest SAC in central southern England is an outstanding locality for Southern Damselfly, with several population centres and strong populations estimated to be in the hundreds or thousands of individuals. The heathland habitat on which it occurs is more typical for the species.

Stag Beetle

4.3.6 The stag beetle *Lucanus cervus* is the UK's largest terrestrial beetle, and amongst the most spectacular, reaching 7cm in length. Larvae develop in decaying tree stumps and fallen timber of broad-leaved trees in contact with the ground.

4.3.7 Development takes around 3-4 years. Adults are active on warm evenings, but probably only the males fly regularly and come readily to lights. Adults have been recorded from May to September or even October, though they are most abundant in early summer.

4.3.8 The New Forest represents stag beetle in its Hampshire/Sussex population centre, and is a major stronghold for the species in the UK. The forest is one of the most important sites in the UK for fauna associated with rotting wood, and was identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).

Great Crested Newt

4.3.9 The Great Crested Newt *Triturus cristatus* is the largest native British newt, reaching up to around 17cm length. Adult males have jagged crests running along the body and tail. Newts require aquatic habitats for breeding. Eggs are laid singly on pond vegetation in spring, and larvae develop over summer to emerge in August – October, normally taking 2–4 years to reach maturity. Juveniles spend most time on land, and all terrestrial phases may range a considerable distance from breeding sites.

4.3.10 The Great Crested Newt widespread throughout much of England and Wales, but occurs only sparsely in south-west England, mid Wales and Scotland. It is absent from Northern Ireland. The total UK population is relatively large and is distributed over sites that vary greatly in their

ecological character. One estimate has put the national population at around 400,000 animals in 18,000 breeding sites. Many of the largest populations are centred on disused mineral-extraction sites, but lowland farmland forms the majority of great crested newt habitat in the UK.

4.3.11 Approximately 45 breeding populations are known within Hampshire, and these are concentrated along the south coast and eastern border of the county. Although the New Forest ponds are relatively well known, a comprehensive survey of ponds and their species has never been carried out across most of Hampshire. Thus, further populations may exist elsewhere (Hampshire Biodiversity Partnership 2000).

Bullhead

4.3.12 The Bullhead *Cottus gobio* is a small bottom-living fish that inhabits a variety of rivers, streams and stony lakes. It appears to favour fast-flowing, clear shallow water with a hard substrate (gravel/cobble/pebble) and is frequently found in the headwaters of upland streams. However, it also occurs in lowland situations on softer substrates so long as the water is well-oxygenated and there is sufficient cover. It is not found in badly polluted rivers.

4.3.13 The Itchen is a classic chalk river that supports high densities of Bullhead throughout much of its length. The river provides good water quality, extensive beds of submerged plants that act as a refuge for the species, and coarse sediments that are vital for spawning and juvenile development.

White-clawed Crayfish

4.3.14 The White-clawed Crayfish *Austropotamobius pallipes* (also known as the Atlantic Stream Crayfish), lives in a diverse variety of clean aquatic habitats but especially favours hard-water streams and rivers.

4.3.15 In Britain the most significant threats to the survival of this species are posed by non-native crayfish species such as the North American Signal Crayfish *Pacifastacus leniusculus*, which out-competes White-clawed Crayfish and by crayfish plague which can be introduced into a waterbody by entry of Signal Crayfish and also by water, fish or equipment that has been in contact with Signals.

4.3.16 In Hampshire there are few records prior to the 1980s. The River Itchen, formerly believed to be a stronghold for the species, was still supporting White-clawed Crayfish along much of its length up until the mid-1990s. However, the future of this species in Hampshire is very uncertain; it is believed to be critically endangered and is unlikely to survive in the county unless factors responsible for its decline can be addressed (Hampshire Biodiversity Partnership 2000).

Brook Lamprey

4.3.17 The Brook Lamprey *Lampetra planeri* is a primitive, jawless fish resembling an eel, and is the smallest of the lampreys found in the UK. Like other lamprey species, the Brook Lamprey requires clean gravel beds for spawning and soft marginal silt or sand for the larvae. It spawns mostly in parts of the river where the current is not too strong.

4.3.18 The River Itchen is an extensive river systems, including important tributaries, which provides conservation of the range of habitat features, such as suitable areas of gravels, silt or sand required for spawning, required by the species.

Otter

4.3.19 The Otter *Lutra lutra* is a semi-aquatic mammal, which occurs in a wide range of ecological conditions, including inland freshwater and coastal areas (particularly in Scotland). Inland populations utilise a range of running and standing freshwaters. These must have an abundant supply of food (normally associated with high water quality), together with suitable habitat, such as vegetated river banks, islands, reedbeds and woodland, which are used for foraging, breeding and resting.

4.3.20 Before 1960, Otters utilised most river catchments in Hampshire. Yet a comprehensive survey in 1989/901 revealed the presence of Otters on only three river catchments in the county. Additional surveys and monitoring have identified otters on the River Avon, scant evidence within the New Forest particularly the lower Lymington River and Keyhaven Marshes and a breeding population in the River Itchen catchment (Hampshire Biodiversity Partnership 2000).

4.3.21 The Itchen Otter population follows the release of three captive-bred animals in 1993 to the River Itchen to boost its natural and isolated remnant population, this catchment continues to support the strongest Otter population in Hampshire (Hampshire Biodiversity Partnership 2000).

Atlantic Salmon

4.3.22 The Atlantic Salmon *Salmo salar* is an anadromous species (i.e. adults migrate from the sea to breed in freshwater). Spawning takes place in shallow excavations called redds, found in shallow gravelly areas in clean rivers and streams where the water flows swiftly. The young that emerge spread out into other parts of the river. After a period of 1-6 years the young salmon migrate downstream to the sea as 'smolts'. Salmon have a homing instinct that draws them back to spawn in the river of their birth after 1-3 years in the sea. This behaviour has resulted in genetically distinct stock between rivers and even within individual rivers, with some evidence of further genetic distinctiveness in the tributaries of large rivers.

4.3.23 The Atlantic Salmon is a widespread species in the UK and is found in several hundred rivers, many of which have adult runs in excess of 1,000. The latest estimates of the UK spawning population size (ICES 2000) are, however, about 50% down on the ten-year average. This decrease could be due to a number of factors including: pollution, the introduction of non-native salmon stocks, physical barriers to migration, exploitation from netting and angling, physical degradation of spawning and nursery habitat, and increased marine mortality.

Desmoulin's whorl snail

4.3.24 Desmoulin's whorl snail *Vertigo moulinsiana* is the largest Vertigo species, with a shell height up to about 2.6 mm. It is restricted to calcareous wetlands, usually bordering lakes or rivers, or in fens. High humidity appears to be important in determining local distribution within sites. It normally lives on reed-grasses and sedges, such as reed sweet-grass *Glyceria maxima* and tussocks of greater pond-sedge *Carex riparia* and lesser pond-sedge *C. acutiformis*, where it

feeds on the microflora, and in autumn it may ascend taller reeds and scrub. Like all Annex II *Vertigo* species, it is highly dependent on maintenance of existing local hydrological conditions.

4.3.25 When the Solent Maritime SAC was designated in 2005 the site supported a small population of Desmoulin's whorl snail in the freshwater fen and brackish reedbeds at the top of Fishbourne Channel in Chichester Harbour. This is the only recorded site for Desmoulin's whorl snail within the Solent Maritime SAC and the species was last recorded here in 2005. No individuals were found during surveys in 2009 and 2010. The population in Fishbourne Channel is likely to have been a small relict population that was originally more widespread prior to development of housing and infrastructure in the area[11].

4.4 Qualifying Habitats of Special Areas of Conservation

4.4.1 The following accounts are adapted from the JNCC site descriptions of the three SACs (New Forest, River Itchen and Solent Maritime), which are considered in the HRA[12].

Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

4.4.2 Hatchet Pond in the New Forest in the south of England is in fact three ponds, one of which is an example of an oligotrophic waterbody amidst wet and dry lowland heath developed over fluvial deposits. It contains shoreweed *Littorella uniflora* and isolated populations of northern species such as bog orchid *Hammarbya paludosa* and floating bur-reed *Sparganium angustifolium*, alongside rare southern species such as Hampshire-purslane *Ludwigia palustris*. Hatchet Pond is therefore important as a southern example of this lake type where northern species, more common in the uplands of the UK, co-exist with southern species.

Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea

4.4.3 In the New Forest vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* occurs on the edge of large temporary ponds, shallow ephemeral pools and poached damp hollows in grassland, which support a number of specialist species in a zone with toad rush *Juncus bufonius*. These include the two nationally scarce species coral-necklace *Illecebrum verticillatum* and yellow centaury *Cicendia filiformis*, often in association with allseed *Radiola linoidesand* chaffweed *Anagallis minima*. Heavy grazing pressure is of prime importance in the maintenance of the outstanding flora of these temporary pond communities. Livestock maintain an open habitat, controlling scrub ingress, and trampling the surface. Commoners' animals also transport seed in their hooves widely from pond to pond where suitable habitat exists. Temporary ponds occur throughout the Forest in depressions capable of holding water for part of the year. Most ponds are small (between 5-10m across) and, although great in number, amount to less than 10ha in total area.

[11] Natural England Conservation Advice for Marine Protected Areas: Solent Maritime SAC. Accessed online [9/1/18] at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK0030059&SiteName=solent&countyCode=&responsiblePerson=#condition

[12] http://jncc.defra.gov.uk/ProtectedSites/SACselection/SAC_habitats.asp

Northern Atlantic wet heaths with Erica tetralix

4.4.4 The New Forest contains the most extensive stands of lowland northern Atlantic wet heaths in southern England, mainly of the M16 *Erica tetralix – Sphagnum compactum* type. M14 *Schoenus nigricans– Narthecium ossifragum* mire is also found on this site. The wet heaths are important for rare plants, such as marsh gentian *Gentiana pneumonanthe* and marsh clubmoss *Lycopodiella inundata*, and a number of dragonfly species, including the scarce blue-tailed damselfly and small red damselfly *Ceriagrion tenellum*. There is a wide range of transitions between wet heath and other habitats, including dry heath, various woodland types, *Molinia* grasslands, fen, and acid grassland. Wet heaths enriched by bog myrtle *Myrica gale* are a prominent feature of many areas of the Forest. Unlike much lowland heath, the New Forest heaths continue to be extensively grazed by cattle and horses, favouring species with low competitive ability.

European dry heaths

4.4.5 The New Forest represents European dry heaths in southern England and is the largest area of lowland heathland in the UK. It is particularly important for the diversity of its habitats and the range of rare and scarce species which it supports. The New Forest is unusual because of its long history of grazing in a traditional fashion by ponies and cattle. The dry heaths of the New Forest are of the H2 Calluna vulgaris – Ulex minor heath type, and H3 Ulex minor – Agrostis curtisii heath is found on damper areas. There are a wide range of transitions between dry heath and wet heath, Molinia grassland, fen, acid grassland and various types of scrub and woodland. Both the New Forest and the two Dorset Heath SACs are in southern England. All three areas are selected because together they contain a high proportion of all the lowland European dry heaths in the UK. There are, however, significant differences in the ecology of the two areas, associated with more oceanic conditions in Dorset and the continuous history of grazing in the New Forest.

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

4.4.6 The New Forest represents *Molinia* meadows in southern England. The site supports a large area of the heathy form of M24 Molinia *caerulea–Cirsium dissectum* fen-meadow. This vegetation occurs in situations of heavy grazing by ponies and cattle in areas known locally as 'lawns', often in a fine-scale mosaic with 4010 Northern Atlantic wet heaths and other mire and grassland communities. These lawns occur on flushed soils on slopes and on level terrain on the floodplains of rivers and streams. The New Forest *Molinia* meadows are unusual in the UK in terms of their species composition, management and landscape position. The grasslands are species-rich, and a particular feature is the abundance of small sedges such as carnation sedge *Carex panicea*, common sedge *C. nigra* and yellow-sedge *C. viridula ssp. oedocarpa*, and the more frequent occurrence of mat-grass *Nardus stricta* and petty whin *Genista anglica* compared to stands elsewhere in the UK.

Depressions on peat substrate of the Rhynchosporion

4.4.7 The New Forest, one of three sites selected in southern England, is considered to hold the largest area in England of Depressions on peat substrates of the *Rhynchosporion*, in complex

habitat mosaics associated primarily with the extensive valley bogs of this site. The habitat type is developed in three situations: in natural bog pools of patterned bog surfaces, in flushes on the margins of valley mires and in areas disturbed by peat-digging, footpaths, tracks, ditches etc. In places the habitat type is rich in brown mosses *Cratoneuron spp.* and *Scorpidium scorpioides*, suggesting flushing by mineral-rich waters. The mosaics in which this habitat type occurs are an important location for bog orchid *Hammarbya paludosa*

Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)

4.4.8 The New Forest is the largest area of mature, semi-natural beech *Fagus sylvatica* woodland in Britain and represents Atlantic acidophilous beech forests in the most southerly part of the habitat's UK range. The mosaic with other types of woodland and heath has allowed unique and varied assemblages of epiphytic lichens and saproxylic invertebrates to be sustained, particularly in situations where the woodland is open and the tree trunks receive plenty of light. The traditional common grazing in the Forest by cattle and ponies provides opportunities to explore the impact of large herbivores on the woodland system.

Asperulo-Fagetum beech forests

4.4.9 The New Forest is the largest area of mature, semi-natural beechen *Fagus sylvatica* woodland in Britain; much of it is a form of W14 *Fagus sylvatica – Rubus fruticosus* woodland that conforms to the Annex I type *Asperulo-Fagetum* beech forests. The mosaic with other types of woodland and heath has allowed unique and varied assemblages of epiphytic lichens and saproxylic invertebrates to be sustained, particularly in situations where the woodlands are open and the tree trunks receive plenty of light. The traditional common grazing in the Forest by cattle and ponies provides opportunities to explore the impact of large herbivores on the woodland system.

Old acidophilous oak woods with Quercus robur on sandy plains

4.4.10 The New Forest is representative of old acidophilous oak woods in the southern part of its UK range. It is the most extensive area of active wood-pasture with old oak *Quercus spp.* and beech *Fagus sylvatica* in north-west Europe and has outstanding invertebrate and lichen populations. This site was preferred over other sites that lack a succession of age-classes because, although scattered over a wide area, the oak stands are found within a predominantly semi-natural landscape with a more balanced age-structure of trees. The traditional common grazing in the Forest by cattle and ponies provides opportunities to explore the impact of large herbivores on the woodland system. The New Forest has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).

Bog woodland (priority feature)

4.4.11 Within the New Forest, in southern England, birch – willow *Betula – Salix* stands occur over valley bog vegetation, with fringing alder *Alnus – Sphagnum* stands where there is some water movement. These stands appear to have persisted for long periods in stable association with

the underlying *Sphagnum* bog-moss communities. The rich epiphytic lichen communities and pollen record provide evidence for the persistence of this association. The Bog woodland occurs in association with a range of other habitats for which the site has also been selected

Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (priority feature)

4.4.12 The New Forest contains many streams and some small rivers that are less affected by drainage and canalisation than those in any other comparable area in the lowlands of England. Associated with many of the streams, particularly those with alkaline and neutral groundwater, are strips of alder *Alnus glutinosa* woodland which, collectively, form an extensive resource with a rich flora. In places there are examples of transitions from open water through reed swamp and fen to alder woodland. The small rivers show natural meanders and debris dams, features that are otherwise rare in the lowlands, with fragmentary ash *Fraxinus excelsior* stands as well as the alder strips. In other places there are transitions to Old acidophilous oak woods with *Quercus robur* on sandy plains and Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*), for which this site has also been selected.

Transition mires and quaking bogs

4.4.13 The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and Alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich. The vegetation normally has intimate mixtures of species considered to be acidophile and others thought of as calciphile or basophile. In some cases the mire occupies a physically transitional location between bog and fen vegetation, as for example on the marginal lagg of raised bog or associated with certain valley and basin mires. In other cases these intermediate properties may reflect the actual process of succession, as peat accumulates in groundwater-fed fen or open water to produce rainwater-fed bog isolated from groundwater influence. Many of these systems are very unstable underfoot and can therefore also be described as 'quaking bogs'.

4.4.14 The following NVC communities form the core of transition mire vegetation in the UK:

- M4 *Carex rostrata – Sphagnum recurvum* mire
- M5 *Carex rostrata – Sphagnum squarrosum* mire
- M8 *Carex rostrata – Sphagnum warnstorfii* mire
- M9 *Carex rostrata – Calliergon cuspidatum/giganteum* mire
- S27 *Carex rostrata – Potentilla palustre* tall-herb fen

4.4.15 However this is not an exhaustive list and numerous other communities form important components of some mire sites.

Alkaline fens

4.4.16 Alkaline fens consist of a complex assemblage of vegetation types characteristic of sites where there is tufa and/or peat formation with a high water table and a calcareous base-rich water supply. The core vegetation is short sedge mire (mire with low-growing sedge vegetation) of the following NVC types:

- *M9 Carex rostrata – Calliergon cuspidatum/giganteum mire*
- *M10 Carex dioica – Pinguicula vulgaris mire*
- M13 *Schoenus nigricans – Juncus subnodulosus mire*

4.4.17 At most sites there are well-marked transitions to a range of other fen vegetation, predominantly, but not exclusively, to M14 *Schoenus nigricans – Narthecium ossifragum* mire and S24 *Phragmites australis – Peucedanum palustre* tall-herb fen in the lowlands.

Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

4.4.18 The Itchen is a classic example of a sub-type 1 chalk river. The river is dominated throughout by aquatic *Ranunculus spp.* The headwaters contain pond water-crowfoot *Ranunculus peltatus*, while two *Ranunculus* species occur further downstream: stream water-crowfoot *R. penicillatus ssp. pseudofluitans*, a species especially characteristic of calcium-rich rivers, and river water-crowfoot *R. fluitans.*

Estuaries

4.4.19 The Solent encompasses a major estuarine system on the south coast of England with four coastal plain estuaries (Yar, Medina, King's Quay Shore, Hamble) and four bar-buil estuaries (Newtown Harbour, Beaulieu, Langstone Harbour, Chichester Harbour). The site is the only one in the series to contain more than one physiographic sub-type of estuary and is the only cluster site. The Solent and its inlets are unique in Britain and Europe for their hydrographic regime of four tides each day, and for the complexity of the marine and estuarine habitats present within the area. Sediment habitats within the estuaries include extensive estuarine flats, often with intertidal areas supporting eelgrass Zostera spp. and green algae, sand and shingle spits, and natural shoreline transitions. The mudflats range from low and variable salinity in the upper reaches of the estuaries to very sheltered almost fully marine muds in Chichester and Langstone Harbours. Unusual features include the presence of very rare sponges in the Yar estuary and a sandy 'reef' of the polychaete *Sabellaria spinulosa* on the steep eastern side of the entrance to Chichester Harbour.

Spartina swards (Spartinion maritimae)

4.4.20 Solent Maritime is the only site for smooth cord-grass *Spartina alterniflora* in the UK and is one of only two sites where significant amounts of small cord-grass *S. maritime* are found. It is also one of the few remaining sites for Townsend's cord-grass *S.x townsendii* and holds extensive areas of common cord-grass *Spartina anglica*, all four taxa thus occurring here in close

proximity. It has additional historical and scientific interest as the site where *S. alterniflora* was first recorded in the UK (1829) and where *S.* x *townsendii* and, later, *S. anglica* first occurred

Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

4.4.21 The Solent contains the second-largest aggregation of Atlantic salt meadows in south and south-west England. Solent Maritime is a composite site composed of a large number of separate areas of saltmarsh. In contrast to the Severn estuary, the salt meadows at this site are notable as being representative of the ungrazed type and support a different range of communities dominated by sea-purslane *Atriplex portulacoides*, common sea-lavender *Limonium vulgare* and thrift *Armeria maritima*. As a whole the site is less truncated by man-made features than other parts of the south coast and shows rare and unusual transitions to freshwater reedswamp and alluvial woodland as well as coastal grassland. Typical Atlantic salt meadow is still widespread in this site, despite a long history of colonisation by cord-grass *Spartina spp*.

Sandbanks which are slightly covered by sea water all the time

4.4.22 Sandbanks which are slightly covered by sea water all the time consist of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20m below chart datum (but sometimes including channels or other areas greater than 20m deep). The habitat comprises distinct banks (i.e. elongated, rounded or irregular 'mound' shapes) which may arise from horizontal or sloping plains of sandy sediment.

4.4.23 Shallow sandy sediments are typically colonised by a burrowing fauna of worms, crustaceans, bivalve molluscs and echinoderms. Mobile epifauna at the surface of the sandbank may include shrimps, gastropod molluscs, crabs and fish. Sand-eels *Ammodytes* spp., an important food for birds, live in sandy sediments. Where coarse stable material, such as shells, stones or maerl is present on the sediment surface, species of foliose seaweeds, hydroids, bryozoans and ascidians may form distinctive communities. Shallow sandy sediments are often important nursery areas for fish, and feeding grounds for seabirds (especially puffins *Fratercula arctica,* guillemots *Uria aalge* and razorbills *Alca torda*) and sea-duck (e.g. common scoter *Melanitta nigra*).

Mudflats and sandflats not covered by water at low tide

4.4.24 Intertidal mudflats and sandflats are submerged at high tide and exposed at low tide. They form a major component of the qualifying habitats Estuaries and Large shallow inlets and bays in the UK but also occur extensively along the open coast and in lagoonal inlets. The physical structure of the intertidal flats ranges from mobile, coarse-sand beaches on wave-exposed coasts to stable, fine-sediment mudflats in estuaries and other marine inlets. This habitat type can be divided into three broad categories (clean sands, muddy sands and muds); although in practice there is a continuous gradation between them. Within this range the plant and animal communities present vary according to the type of sediment, its stability and the salinity of the water.

Coastal Lagoons (priority feature)

4.4.25 Coastal lagoons are areas of shallow, coastal salt water, wholly or partially separated from the sea by sandbanks, shingle or, less frequently, rocks. Lagoons show a wide range of geographical and ecological variation; five main sub-types have been identified in the UK, on the basis of their physiography, as meeting the definition of the Annex I habitat type; Isolated lagoons, percolation lagoons, silled lagoons, sluiced lagoons and lagoonal inlets.

Annual vegetation of drift lines

4.4.26 This habitat type occurs on deposits of shingle lying at or above mean high-water spring tides. The types of deposits involved are generally at the lower end of the size range of shingle (2-200 mm diameter), with varying amounts of sand interspersed in the shingle matrix. These shingle deposits occur as fringing beaches that are subject to periodic displacement or overtopping by high tides and storms. The distinctive vegetation, which may form only sparse cover, is therefore ephemeral and composed of annual or short-lived perennial species.

4.4.27 In the UK this habitat type is not always easy to classify using the NVC because it is highly variable between sites and from year to year at the same site. It can include NVC types SD2 *Honkenya peploides –Cakile maritime* strandline community and SD3 *Matricaria maritima – Galium aparine* strandline community on stony substrates. MC6 *Atriplex prostrata – Beta vulgaris ssp.* Maritime sea-bird cliff community and other vegetation with abundant orache Atriplex spp. may also occur on shingle shores.

Perennial vegetation of stony banks

4.4.28 Shingle structures develop when a sequence of foreshore beaches is deposited at the limit of high tide. More permanent ridges are formed as storm waves throw pebbles high up on the beach, from where the backwash cannot remove them. Several beaches may be piled against each other and extensive structures can form. The ecological variation in this habitat type depends on stability, the amount of fine material accumulating between pebbles, climatic conditions, width of the foreshore, and past management of the site. The ridges and lows formed also influence the vegetation patterns, resulting in characteristic zonations of vegetated and bare shingle.

Salicornia and other annuals colonising mud and sand

4.4.29 This pioneer saltmarsh vegetation colonises intertidal mud and sandflats in areas protected from strong wave action and is an important precursor to the development of more stable saltmarsh vegetation. It develops at the lower reaches of saltmarshes where the vegetation is frequently flooded by the tide, and can also colonise open creek sides, depressions or pans within saltmarshes, as well as disturbed areas of upper saltmarshes.

4.4.30 There is little variation within this habitat type, which typically comprises a small number of species. The following NVC types are represented: SM7 *Arthrocnemum perenne* stands, SM8 Annual *Salicornia* salt-marsh community, SM9 *Suaeda maritime* salt-marsh community, SM27 Ephemeral salt-marsh vegetation with *Sagina maritime*. The first three communities include open stands of perennial glasswort *Sarcocornia perennis*, glasswort *Salicornia* spp., or annual

seablite *Suaeda maritima*. The density of these plants can vary and may be lower on sites with sandier substrates. Other species that may be found include common saltmarsh-grass *Puccinellia maritima*, common cord-grass *Spartina anglica* and sea aster *Aster tripolium*. *Sarcocornia perennis* is absent from Scotland. A further form of the habitat (SM27) consists of ephemeral vegetation colonising open pans in upper saltmarshes. Characteristic plants of this vegetation type include sea pearlwort *Sagina maritime* and knotted pearlwort *S. nodosa.*

Shifting dunes along the shoreline with Ammophila arenaria (`white dunes`)

4.4.31 This habitat type encompasses most of the vegetation of unstable dunes where there is active sand movement. Under these conditions sand-binding marram *Ammophila Arenaria* is always a prominent feature of the vegetation and is usually dominant. In the UK the majority of such vegetation falls within NVC type SD6 *Ammophila Arenaria* mobile dune community. This is a dynamic vegetation type maintained only by change. It can occur on both accreting and eroding dunes, but will rapidly change and disappear if stability is imposed.

5 The Eastleigh Borough Local Plan

5.1 Introduction

5.1.1 The Eastleigh Borough Local Plan 2016-2036 will set the planning strategy for the borough and address housing and employment needs for a period of 20 years up to 2036. The plan sets out proposed strategic and development management policies, development allocations and actions to meet the environmental, social and economic challenges facing the borough. When adopted the Local Plan will provide a strategy for the distribution, scale and form of development and supporting infrastructure, a set of proposals to deliver the strategy, policies against which to assess planning applications, and proposals for monitoring the successful implementation of the plan.

5.2 Key Policy Proposals: EBLP Submission Version

5.2.1 The spatial development strategy proposed by the EBLP includes:

- Provision for approximately 14,580 new dwellings over the plan period, comprising: 7,570 dwellings with planning permission or resolution to grant permission; 1,210 dwellings on proposed allocations carried forward from the 2011-2029 EBLP; 4,050 dwellings on newly proposed allocations; and allowance for windfall development of 1,860 dwellings;
- Provision for approximately 144,050m^2 of new employment floorspace;
- A Strategic Growth Option (SGO) comprising two new communities north of Bishopstoke (1,000 dwellings) and north and east of Fair Oak (4,300 dwellings), delivering approximately 5,300 new dwellings (3,350 within the plan period) and 30,000m^2 of employment floorspace, schools, district/local centres, open space and infrastructure;
- Approximately 5,680 dwellings on strategic sites around Eastleigh, Horton Heath, Hedge End, Boorley Green & Botley, Fair Oak, and Hedge End rail station;
- Approximately 4,400 dwellings on smaller sites which already have planning permission or as windfall development;
- Approximately 610 dwellings on new small greenfield allocations (at Allbrook, Bishopstoke, Bursledon, Fair Oak, Hedge End, Netley and West End) and 605 dwellings on identified sites within existing urban areas;
- Employment development focused on existing urban areas, Eastleigh Riverside, and allocations at Chalcroft Business Park, Botley, Bursledon, Chandler's Ford, Hedge End, Horton Heath and West End;
- A new link road from the Allbrook Link Road to the B3037 east of Fair Oak, delivered over four phases, serving the SGO and development at Allbrook Hill; and

- The Botley bypass; a new link road between Burnetts Lane and Bubb Lane serving Chalcroft Business Park; the Sunday's Hill bypass; and a range of junction improvements and other highway, pedestrian/cycle and public transport improvements.

5.2.2 Allocations and other significant proposals put forward in the EBLP 2016-2036 are shown on Figure 5.1 to Figure 5.4. Extant planning permissions and proposals with resolution to grant permission (listed in policy DM24) which are referred to but not proposed by the EBLP are not shown.

5.3 Incorporated Mitigation Measures

5.3.1 The draft plan includes incorporated mitigation measures which were devised in response to the HRA process and these are summarised in Table 5.1. Incorporated mitigation measures are considered when assessing the impacts of the EBLP at the integrity test stage.

Table 5.1: Incorporated mitigation measures

Incorporated mitigation measures
S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
… 12. … Development will not be permitted unless it is demonstrated through project-level Appropriate Assessment (Habitat Regulations Assessment) that it (either alone or in combination with other plans and projects, and subject only to imperative reasons of overriding public interest in the absence of alternative solutions) will not adversely affect the integrity of the River Itchen Special Area of Conservation or any other European Site. Any mitigation measures required to ensure no adverse impact on the SAC or other European sites (including those identified in the supporting text to policy DM11) must be implemented in accordance with policy DM11.
S6 New Allbrook Hill, Bishopstoke and Fair Oak link road
… 2. … This will include the provision of appropriately designed bridges across the river and its tributaries, measures to manage hydrology, and any other measures required.
DM6 Sustainable surface water management and watercourse management
New development (excluding extensions to dwellings and changes of use), will only be permitted if it incorporates Sustainable Drainage Systems (SuDS). Wherever feasible, naturalised filtration should be included within the treatment train… … i. manage surface water runoff as close to its source as possible… … iii. ensure that discharge rates at least mirror greenfield rates before development… … Where development drains into a waterway connected to the Natura 2000 or Ramsar network a site specific Construction Environment Plan must be prepared before construction.
DM8 Pollution
In respect of the Solent and Southampton Water SPA and Ramsar sites and supporting habitat, construction noise should be kept below 69dBA max (measured at the sensitive receptor which is the nearest point of the SPA/Ramsar or supporting habitat) during the bird overwintering period, or works timed so that they do not coincide with the wintering bird season. Natural England will provide advice on a case by case basis where construction noise exceeds 69dBA max.

Incorporated mitigation measures
DM10 Water and Waste Water
Where new water supply or waste water infrastructure is required or proposed in support of new development the development will be phased alongside the provision of the infrastructure to ensure: - compliance with the Habitats Regulations …
DM11 Nature conservation
… The Council will work with PUSH, Natural England, the Environment Agency and other wildlife organisations to develop and implement a strategic approach to the protection of European sites from the direct and indirect effects of development including recreational disturbance. Within Eastleigh Borough this will include: a. implementing the Solent Recreation Mitigation Strategy and contributions to recreation mitigation for the New Forest or alternative agreed approaches if required; b. preserving the water quality and flows within the Itchen and Hamble; c. protection of the River Itchen SAC in particular the maintenance and where appropriate restoration of habitats and species to favourable conservation status (as defined by article 1 of the Habitats Directive) ; d. contributing to major elements of the PUSH Green Infrastructure Strategy and other strategies for the provision and enhancement of multifunctional green infrastructure including green routes, ecological networks and biodiversity enhancements… Development which is likely to adversely affect the integrity of an international or European nature conservation site will not be permitted. Any mitigation measures required to ensure no adverse impact must be implemented… *[A summary of the mitigation measures discussed in Chapter 8 of this HRA Report is included within the supporting text to policy DM11.]*
Policy DM37 Recreational activity on the River Hamble
i. new moorings and replacement or relocation of existing moorings will only be permitted outside the mooring restriction areas shown on the policies map, and subject to the advice of the River Hamble Harbour Authority and in accordance with policy DM11… iii. Within the Mooring Restriction Areas the replacement or relocation of existing moorings will be permitted where … they do not: … c. adversely affect the nature conservation … value of the River Hamble
Site allocation policies
Repeated references to the need to protect hydrological flows and water quality, prevent the spread of non-native species, control pollution during construction, and/or maintain otter dispersal routes, in the following policies: FO1, FO2, F03, FO4, FO8, BU1, BU2, BU3, BU7, CF1, CF2, E1, E6, E7, E10, E11, AL1, AL2, HE1, HE2, HE3, HE4, WE2, BO1, BO2, BO3, BO4, BO5

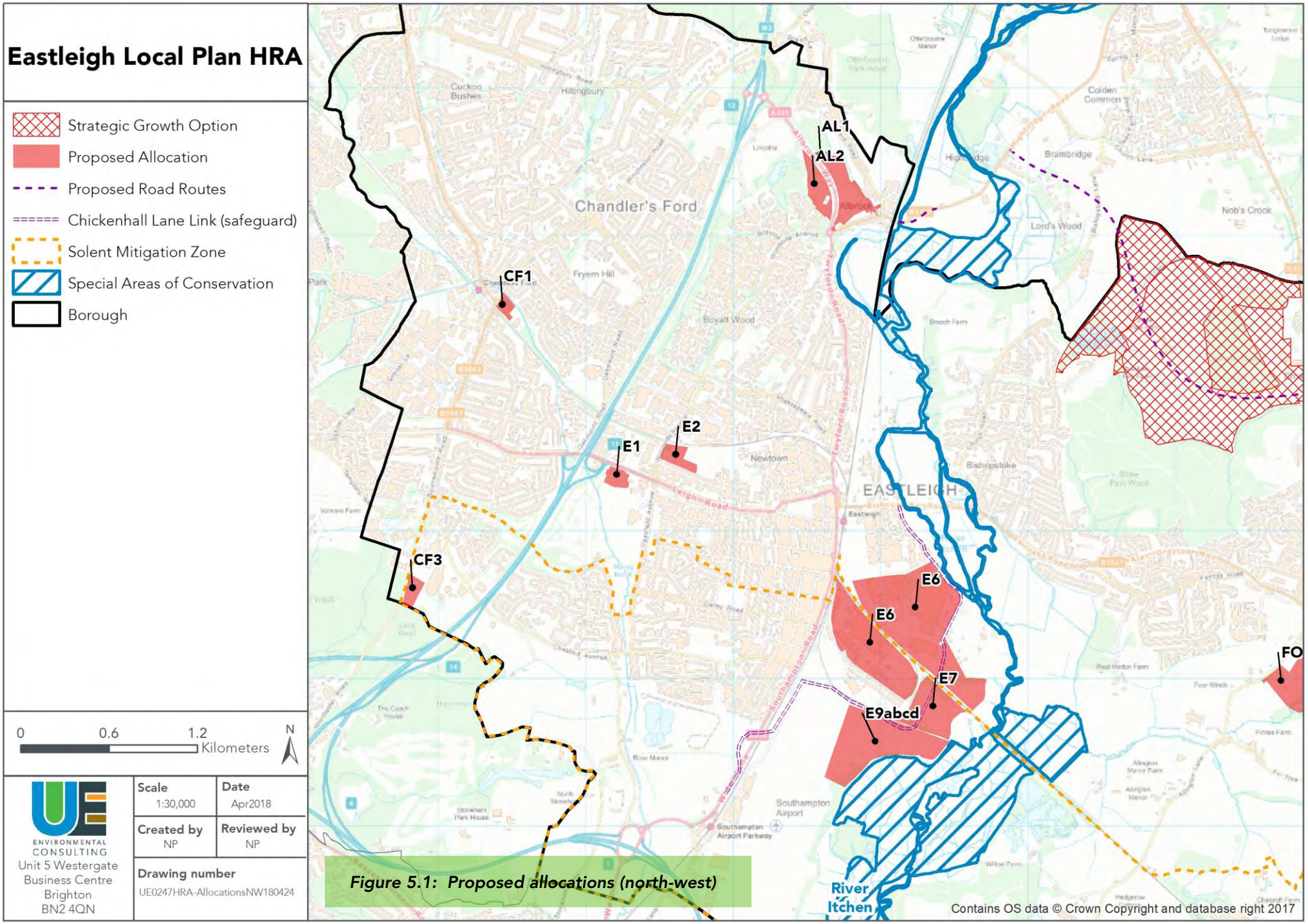

Figure 5.1: Proposed allocations (north-west)

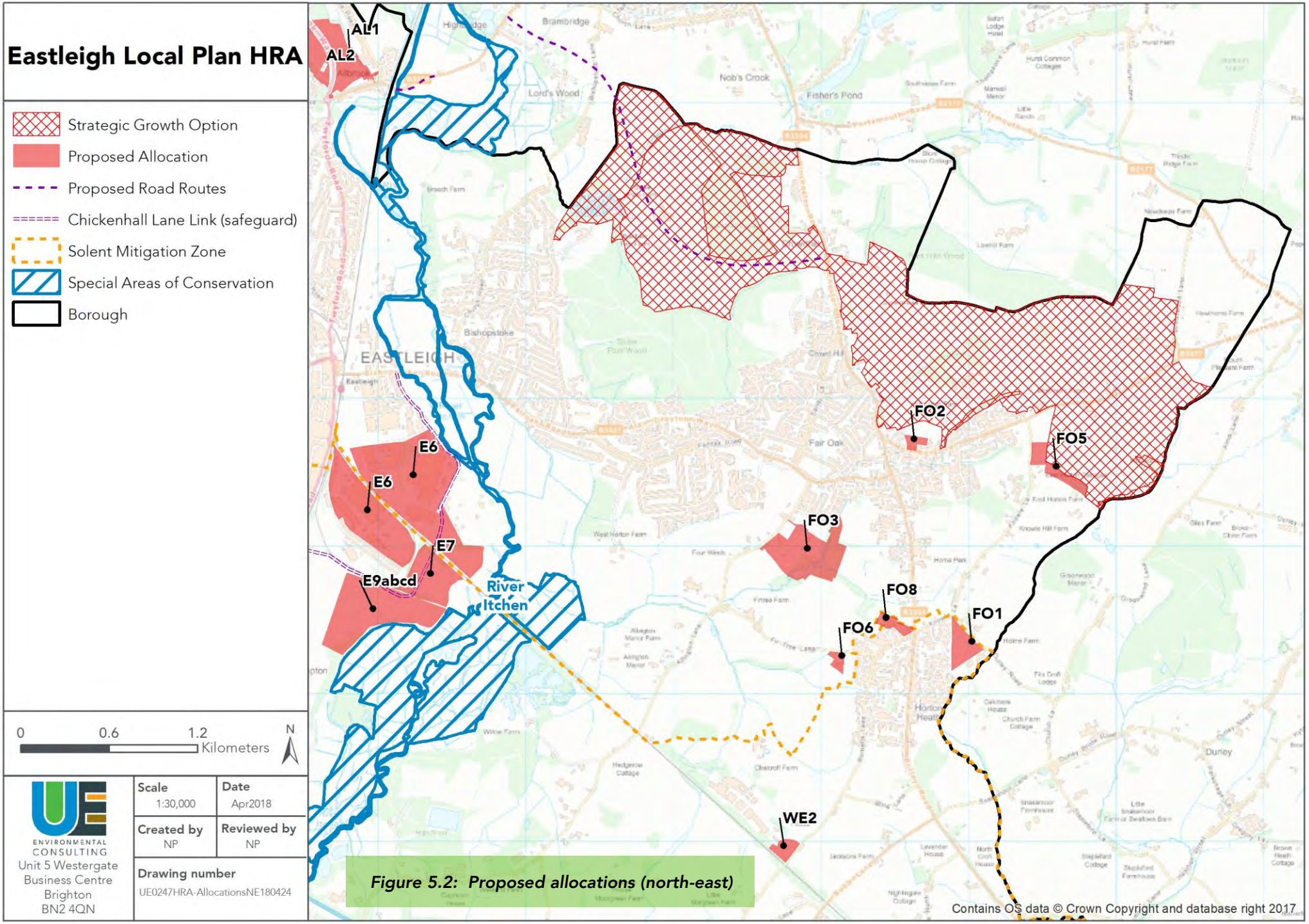

Figure 5.2: Proposed allocations (north-east)

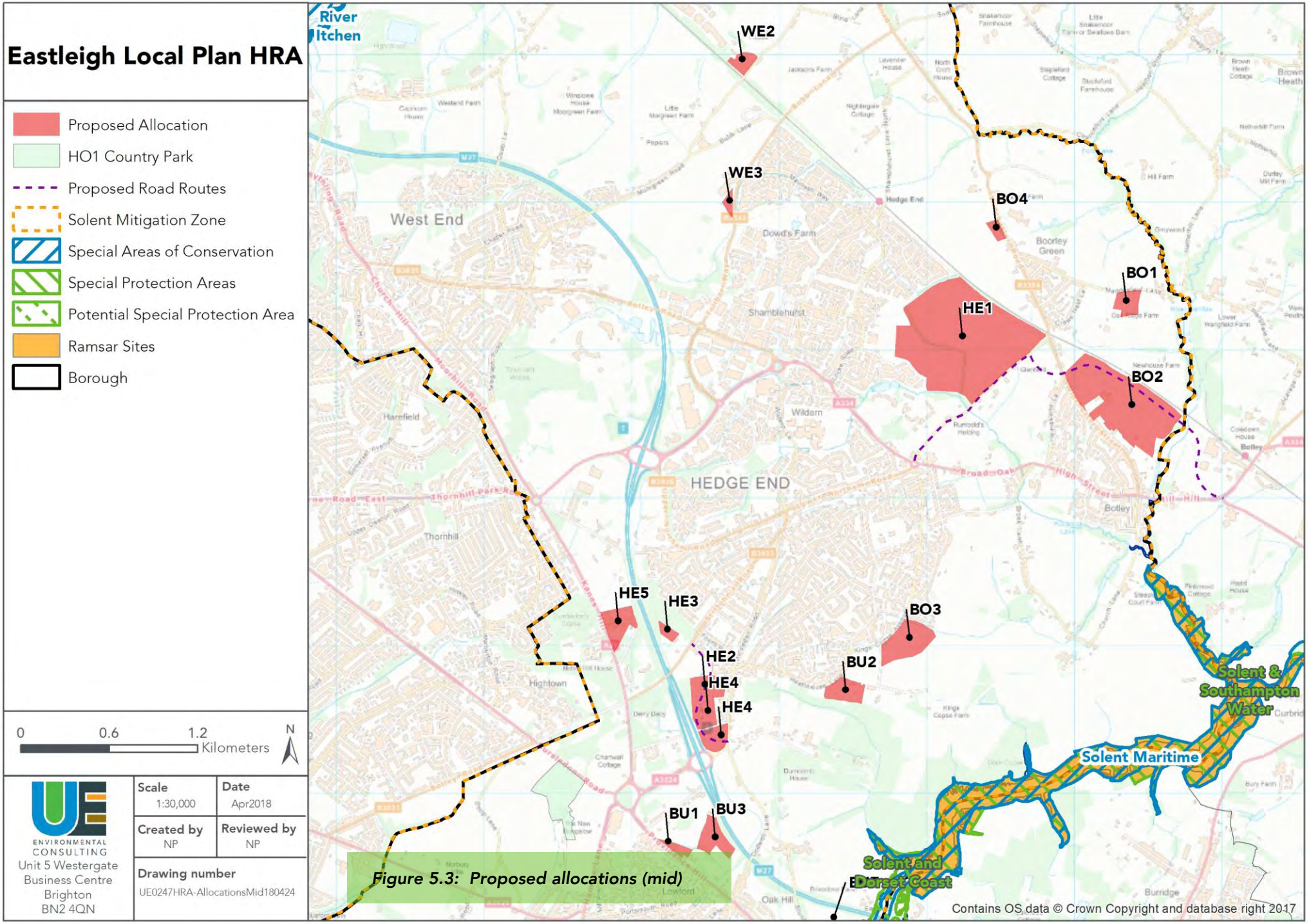

Figure 5.3: Proposed allocations (mid)

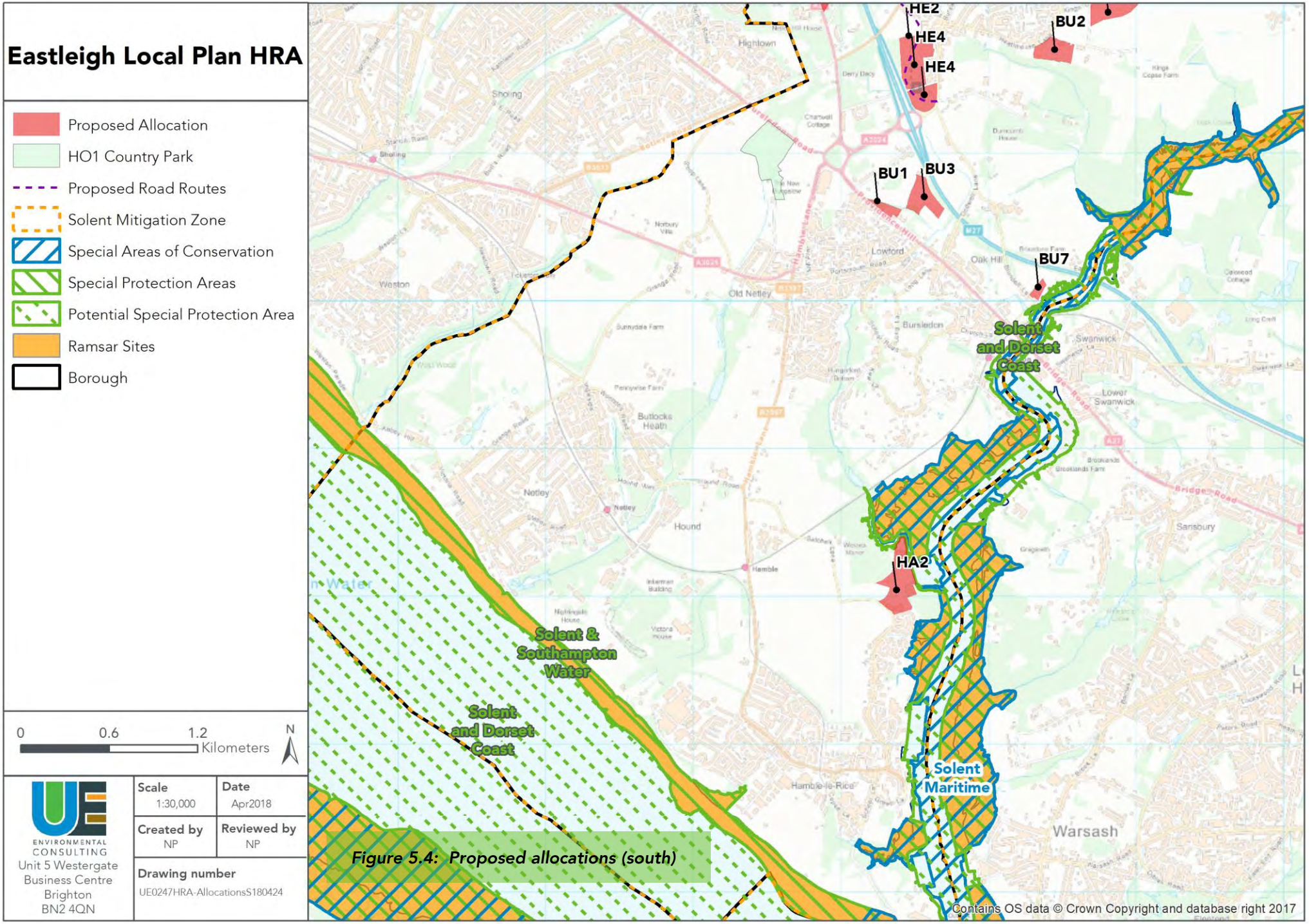

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Figure 5.4: Proposed allocations (south)

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6 Identifying Impact Pathways

6.1 Introduction

6.1.1 This chapter discusses the available evidence relating to the pathways of impacts to European sites, as identified during HRA screening for the Issues & Options Local Plan (AECOM, 2015) and re-assessed during screening for the Submission plan.

6.2 Atmospheric Pollution

6.2.1 This impact pathway relates to the direct and in combination effects of pollution on the River Itchen SAC, Solent Maritime SAC, and Solent and Southampton Water SPA/Ramsar (see Appendix I). As a strategically operating impact it is assumed that all proposed allocations with residential, employment or other significant traffic-generating use will contribute to the effect; as such the screening assessment at Appendix I does not list atmospheric pollution as an LSE for proposed allocations, focusing instead on site specific impacts.

Impact mechanisms

6.2.2 Atmospheric pollution is a widespread issue, with background air quality heavily influenced by large point-source emitters including transboundary sources. Local pollutant sources can affect designated sites, particularly in relation to protected habitats within SACs, and especially from road traffic emissions. The Local Plan cannot feasibly influence causes of background pollution such as large point sources but, through the scale of development proposed, road network and sustainable transport measures, will affect the way in which locally emitted pollutants reach each site.

6.2.3 The main pollutants of interest are the toxifying effects of nitrogen oxides (NO_X), and changes in botanical species composition and structure due to acid deposition and eutrophication by nitrogen deposition. In addition, greater ammonia (NH_3) concentrations in the atmosphere will lead to increased rates of nitrogen deposition. The following brief descriptions draw on information presented through the Air Pollution Information System[15] (APIS).

6.2.4 Acid deposition: caused by NO_X (or sulphur dioxide) reacting with rain/cloudwater to form nitric (or sulphuric) acid, and is caused primarily by energy generation, as well as road traffic and industrial combustion. Both wet and dry acid deposition have been implicated in the damage and destruction of vegetation (heather, mosses, liverworts and lichens are particularly susceptible to cell membrane damage due to excessive pollutant levels) and in the degradation of soils and watercourses (including acidification and reduced microbial activity).

[15] Online at: http://www.apis.ac.uk [Accessed 13/12/17]

6.2.5 Eutrophication by nitrogen deposition: consists of the input of nitrogen from NO_X (and sometimes ammonia) emissions by deposition, and is caused primarily by road traffic, as well as energy generation, industrial combustion and agricultural practices. Nitrogen deposition can cause direct damage to heather, mosses, liverworts and lichens, as well as other plant species, because of their sensitivity to additional atmospheric nitrogen inputs. Deposition can also lead to long term compositional changes in vegetation and reduced species and structural diversity in nitrogen-limited terrestrial habitats. For example a marked decline in heather and an increased dominance of grasses have been observed throughout the Netherlands and also in the East Anglian Brecklands (see for example Bobbink et al (1993) and Pitcairn et al (1991)).

6.2.6 Nitrogen oxides: while plants are able to detoxify and assimilate low exposure to atmospheric concentrations of NO_X, high levels of uptake can lead to detrimental impacts including:

- Inhibition of pigment biosynthesis, leading to reduced rates of photosynthesis;
- Water soaking as NO_2 molecules attach to lipids in membranes, causing plasmolysis (removal of water) and eventually necrosis;
- Inhibition of lipid biosynthesis, leading to reduced rates of regeneration and growth;
- Injury to mitochondria and plastids, essential to internal processing of energy & proteins;
- Decrease in stomatal conductance of air and water vapour; and
- Inhibition of carbon fixation (at least under low light levels).

6.2.7 Emissions from road transport currently make the largest single contribution to atmospheric NO_X in the UK, accounting for 33% in 2010[16], with an estimated 92% of those associated with residential development being contributed by road traffic (Dore *et al*, 2005). Nitrogen emissions from traffic generated by residential and commercial developments will therefore be the focus of this part of the assessment. The scope can be further refined by concentrating on traffic growth on roads within 200m of European sites, as beyond 200m effects of emissions from this source diminish to the equivalent of background levels (Laxen & Wilson (2002)).

6.2.8 A Partnership for Urban South Hampshire (PUSH) research report (AEAT, 2010) notes that the critical load or level for each of these pollutant classes is already exceeded or approaching exceedance at background locations, away from roads across large parts of the sub-region. Nilsson and Grennfelt (1988) define critical loads and levels as "*a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*". Critical loads concern the quantity of pollutants deposited from the air to the ground (for example nitrogen deposition and acid deposition), whilst critical levels concern the gaseous concentration of a pollutant in the air (for example nitrogen oxides).

6.2.9 Guidance from Natural England (pers. comm., 2018a) provides a method for assessing impacts of air pollution on European sites. It is based on a staged process by which sites and locations are initially screened into the assessment if predicted pollution concentrations exceed 1% of the critical load or critical level. This can be considered the screening stage of the Habitats

[16] APIS [accessed online 13/12/17] at: http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm

Regulations Assessment and concludes that in those places where the 1% threshold is breached there is likely to be a significant effect on sensitive European sites within the impact contour.

In combination effects

6.2.10 The following plans/projects may also contribute to road traffic emissions:

- Strategic development at North of Whiteley, Winchester district
- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Welborne Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- South Downs Local Plan (emerging)
- Test Valley Borough Revised Local Plan 2011 – 2029 (adopted 2016)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034
- Hampshire Local Transport Plan (2011-2031)
- Joint Hampshire Minerals and Waste Plan (adopted 2013) (includes Portsmouth, Southampton, New Forest National Park and South Downs National Park)
- Southampton Airport Masterplan

6.2.11 To the extent relevant for assessment purposes, these have been taken into account within traffic and atmospheric pollution modelling undertaken for the EBLP.

Evidence of current or future impacts: River Itchen SAC

6.2.12 The HRA screening report (AECOM, 2015) provided an overview of the potential effects of air pollution on the interest features of the River Itchen SAC and concluded that, for most of these, predicted changes in air quality arising from planned development within Eastleigh Borough will have no likely significant effect, either alone or in combination with other plans and projects. The authors of the current HRA agree with this conclusion. However, for southern damselfly the screening report concluded that likely significant effects might occur due to potential effects of nutrient nitrogen deposition on terrestrial habitats used by the species.

6.2.13 The ecology of the southern damselfly is summarised at section 4.3.2. Its specific habitat requirements are similar in both its heathland and chalk river valley landscapes. These are described by Rushbrook (2017, 2018) as comprising the following:

- Shallow, well oxygenated, base-rich water;
- A constant (perennial) slow to moderate flow of water;

- Channel substrate consisting primarily of silt and detritus;
- Presence of a broad fringe of herbaceous emergent dicotyledon plants along margins;
- Presence of some areas of open water; and
- Largely (but not necessarily completely) unshaded by bankside shrubs and trees.

6.2.14 In order to assess the effects of air pollution on these range of habitat features it is necessary to relate them to the broad habitat types for which there are predictions of the effect of changes in air quality on the APIS website. The closest match broad habitat type is the Fens, Marshes and Swamps habitat. The APIS website provides two Critical Loads for nitrogen deposition within this broad habitat type, as shown in Table 6.1: This draws the important distinction between Valley mires, poor fens and transition mires (EUNIS[17] code D2) and Rich fens (EUNIS Code D4.1).

Table 6.1: Critical loads for N deposition in Fen, Marsh and Swamp

Habitat/ Ecosystem	Eunis Code	Critical Load	Status	Reliability	Indication of exceedance	Reference
Valley mires, poor fens and transition mires	D2	10-15 kg N ha-1 year-1	UNECE 2010 - Noordwijkerhout workshop	Quite reliable	Increase sedges and vascular plants, negative effects on bryophytes.	472
Rich fens	D4.1	15-30 kg N ha-1 year-1	UNECE 2010 - Noordwijkerhout workshop	Expert judgement	Increase in tall graminoids, decrease in bryophytes.	472

6.2.15 The fen habitats within the Itchen Valley used by the southern damselfly do not fall with the D2 EUNIS habitat classification, but are best considered as components of D4.1 Rich fens, for which a Critical Load for nitrogen deposition has been defined at 15-30 kg N/ha/yr. The EUNIS description of D4.1 Rich fens is reproduced in Box 1.

Box 1: EUNIS habitat code and names D4.1 Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks

Wetlands and spring-mires, seasonally or permanently waterlogged, with a soligenous or topogenous base-rich, often calcareous water supply. Peat formation, when it occurs, depends on a permanently high water table. Rich fens may be dominated by small or larger graminoids (*Carex* spp., *Eleocharis* spp., *Juncus* spp., *Molinia caerulea*, *Phragmites australis*, *Schoenus* spp., *Sesleria* spp.) or tall herbs (e.g. *Eupatorium cannabinum*). Where the water is base-rich but nutrient-poor, small sedges usually dominate the mire vegetation, together with a "brown moss" carpet. Hard-water spring mires (D4.1N) often contain tufa cones and other tufa deposits. Excluded is the water body of hard-water springs

17 EUNIS denotes European Union Nature Information System Habitat Classification (https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification)

Box 1: EUNIS habitat code and names D4.1 Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks

(C2.1); calcareous flushes of the alpine zone are a separate category (D4.2). Rich fens are exceptionally endowed with spectacular, specialised, strictly restricted species. They are among the habitats that have undergone the most serious decline. They are essentially extinct in several regions and gravely endangered in much of central and western Europe.

6.2.16 The specific micro-habitat used by the southern damselfly for egg laying is described as a fringe of herbaceous emergent dicotyledon plants. This is likely to be the most vulnerable element of this habitat to nitrogen deposition and nutrient enrichment. Such vegetation is classified by the National Vegetation Classification (NVC; Rodwell (ed.), 1995; Volume 4) as S23 Other Water Margin Vegetation. The NVC describes this vegetation as being characteristically heterogenous, but the most frequent species are Fool's water-cress *Apium nodiflorum*, Water-cress *Rorippa nasturtium-aquaticum* and Brooklime *Veronica beccabunga*. The NVC states; "*The vegetation is most typical of unshaded margins of mesotrophic to eutrophic waters where there is some accumulation of medium to fine textured mineral sediments*." In other words, this is a vegetation type that is associated with habitats with some degree of nutrient enrichment, typically from agricultural runoff. This community of emergent swamp vegetation is therefore considered a component of the Rich Fen broad habitat type (Table 6.1). However, it must be appreciated that this broad habitat type spans a wide spectrum of fen vegetation types ranging from the very nutrient poor sedge dominated fens to the eutrophic fens associated with water margins and nutrient enriched flood plains. In this instance, whereas the habitat used by the southern damselfly falls within the Rich Fen broad habitat type, it is located at the nutrient enriched end of the spectrum of fen vegetation within this habitat.

6.2.17 Although requiring a degree of nutrient enrichment, it is possible that increased nitrogen deposition above a certain level will cause this water margin vegetation community to become more eutrophic and dominated by coarser ruderal plants including stinging nettle *Urtica dioica*, woody nightshade *Solanum dulcamara*, bind-weed *Convolvulus* spp. and greater growth of grasses. This combination of plants would not be suitable as egg laying habitat for southern damselfly and hence there is an identifiable impact pathway between predictions of increased nitrogen deposition associated with road traffic and the specific habitat requirements of the southern damselfly.

Revised screening assessment of air quality impacts on fen habitats

Approach to assessment

6.2.18 Air Quality Consultants (AQC; February 2018) were commissioned to undertake interim air quality modelling of the impacts of the Local Plan in Eastleigh Borough. A single future assessment year of 2036 was used for the following two Local Plan scenarios:

- DCY: With full Local Plan development including 5,000 dwellings at SGO B/C (north of Bishopstoke / north and east of Fair Oak) – Scenario A2.a; and
- DCZ: With full Local Plan development including 6,000 dwellings at SGO B/C – Scenario A2.b.

6.2.19 Scenario DCZ envisages a greater quantum of development at north of Bishopstoke / north and east of Fair Oak over the period to 2036 and presents the worse-case scenario for traffic flows passing close to European sites. Taking a precautionary approach, the results using the DCZ scenario were used in this part of the assessment. The modelling predicted levels of nitrogen deposition and found that the baseline load in the vicinity of Highbridge Farm (B3355 Highbridge Road), Bishopstoke (B3037 Bishopstoke Road) and Itchen Valley Country Park (M27/A27) currently exceeds the critical load of 15kg N/ha/yr. It further predicted that the EBLP 2016-36 could increase deposition rates above the 1% threshold level. Further assessment has therefore been undertaken to assess the impacts of air quality on rich fen habitats within the River Itchen SAC.

6.2.20 Air Quality Consultants (June 2018) were subsequently commissioned to undertake revised air quality modelling of the impacts of the Local Plan in Eastleigh Borough. A single future assessment year of 2036 was used for a worst-case combination of two Local Plan scenarios; DS2_DPC_2036 and DS3_DPP_2036. Both scenarios include the full Local Plan development quanta (including 5,656 dwellings at Bishopstoke / Fair Oak) but with a range of different options for transport interventions – for each road link, the scenario producing the highest traffic flows was selected for the air pollution modelling to ensure a precautionary approach.

6.2.21 The air quality assessment was undertaken in accordance with the latest industry guidance available in the discipline. Levels of air pollution produced by vehicles were predicted using both the government (Defra) model and a sensitivity test (ST). The sensitivity test assumes higher NOx emissions from certain vehicles than have been published by Defra and therefore predicts higher levels of impact than the Defra model, using the consultants' bespoke Calculator Using Realistic Emissions for Diesels (CURED v3A) tool. This was developed to address the potential under-performance of emissions control technology on modern diesel vehicles, leading to a more precautionary assessment. The Council considers the sensitivity test to be sufficiently precautionary for the purposes of appropriate assessment; in particular it considers the autonomous measures included in the sensitivity test to be certain beyond a reasonable scientific doubt, such that they can be relied upon in the context of the CJEU Joined Cases C-293/17 and C-294/17[18]. Notwithstanding this, a further modelling run (Air Quality Consultants, February 2019) was commissioned to assess air quality impacts based on an assumption that there would be no autonomous reductions in background pollution levels. This results in an even more precautionary assessment than the CURED sensitivity test. The Council considers that such an assumption is overly precautionary and unlikely to represent real world conditions, but has undertaken the work for the sake of completeness. Ecological assessment of the results still leads to a conclusion of no adverse effects on site integrity (see Appendix VIII).

6.2.22 AQC produced contour plots using the Defra and ST traffic models for the following three pollutants:

- Nitrogen oxides (NOx) (Annual Mean and 24-hour Mean);
- Nutrient nitrogen deposition; and

[18] Joined Cases C-293/17 and C-294/17, CJEU (2018): *Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and Others.*

- Ammonia.

6.2.23 Pollutant predictions were made for a current base year (2015) and three future year (2036) scenarios:

- 2036 with zero traffic growth: traffic volumes in 2036 are identical to those in 2015 but emissions per vehicle fall in line with national projections;
- 2036 without Local Plan: traffic volumes increase taking account of regional and national projections, but excluding growth associated with the Local Plan; and
- 2036 with Local Plan: adds the traffic associated with Local Plan growth.

6.2.24 These results are compared to take account of in-combination impacts as follows:

A) Local Plan in isolation impacts are determined by comparing the 2036 with Local Plan results against the 2036 without Local Plan results

B) Local Plan in combination impacts are determined by comparing the 2036 with Local Plan results against the 2036 with zero traffic growth results

6.2.25 Impacts were assessed on three European sites in the first instance – River Itchen SAC, Solent Maritime SAC and Solent and Southampton Water Ramsar.

Method of assessment

6.2.26 Defra and the Environment Agency have published guidance[19] to which Natural England also subscribes, that advises where the concentration within the emission footprint (i.e. the Process Contribution, the contribution of the scheme in question) in any part of the European site(s) is less than 1% of the relevant long-term benchmark (critical level or critical load), the emission is not likely to have a significant effect alone or in combination irrespective of the background levels. When the PC does exceed 1% of the critical level/load but the Predicted Environmental Concentration (the sum of the PC and the background concentrations) falls at or below 70% of the critical level/load then it is still possible to conclude without further analysis that no likely significant effect will result. Where the PC exceeds 1% of the critical level/load and the PEC exceeds 70% of the critical level/load this does not necessarily mean that an adverse effect will occur, but does mean further consideration of any potential effect is required. It can be assumed that these thresholds have been set by Environment Agency and Natural England taking the precautionary approach required to conclude no likely significant effect.

Impacts of ammonia

6.2.27 Impacts of ammonia were initially predicted by AQC (February 2018) using a critical level of 1µg/m^3. This was based upon levels for the Fen, Marsh and Swamp habitat type provided in the APIS website. The guidance is reproduced below in Table 6.2. Although 1µg/m^3 can be used as the Critical Level in some ecosystems, the guidance is clear that this should only apply where sensitive lichens and bryophytes are present. In the case of the River Itchen SAC, this group of species are not prominent in the ecosystem which is largely base enriched and alkaline in

19 Defra (2016): Air emissions risk assessment for your environmental permit. Accessed online [18/10/17] at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-insignificant-pcs

character. It was therefore suggested that the 1µg/m^3 was too stringent and the 3µg/m^3 level was used in subsequent (June 2018) modelling.

6.2.28 Ammonia is one of the key pollutants that contribute to nitrogen deposition. However, the APIS website states that risk areas are likely to be *"sites in rural areas with elevated background concentrations. Higher concentrations and dry deposition are found close to point sources e.g. intensive livestock units but also wild animal (e.g. seal and bird colonies)."*

6.2.29 A critical level of 3 µg NH_3 m^{-3} annual mean (uncertainty of 2-4 µg NH_3 m^{-3}) is set for higher plants within Fen, Marsh and Swamp habitats such as those used by southern damselfly. Ammonia may be taken up by plants through leaves, so increasing potential for nitrogen uptake. There is also potential for the alkaline effects of ammonia to change pH, especially within acid wetland habitats. The model of ammonia deposition shows the 1% screening level is exceeded in a number of locations within the River Itchen SAC (dark red patches shown in Figure 6.1). However total ammonia concentrations are only predicted to be above the critical level of 3 µg/m^3 up to approximately 25 m from the M27 (black hatched areas in Figure 6.1). It is concluded that impacts of ammonia on the banks of the River Itchen in this section of the SAC are much more heavily influenced by total nitrogen deposition and changes in river morphology and flow under the motorway bridge so that elevated ammonia levels over this small section of river are not considered likely to be significant in this location. Direct impacts from atmospheric ammonia concentrations are therefore screened out and not considered further.

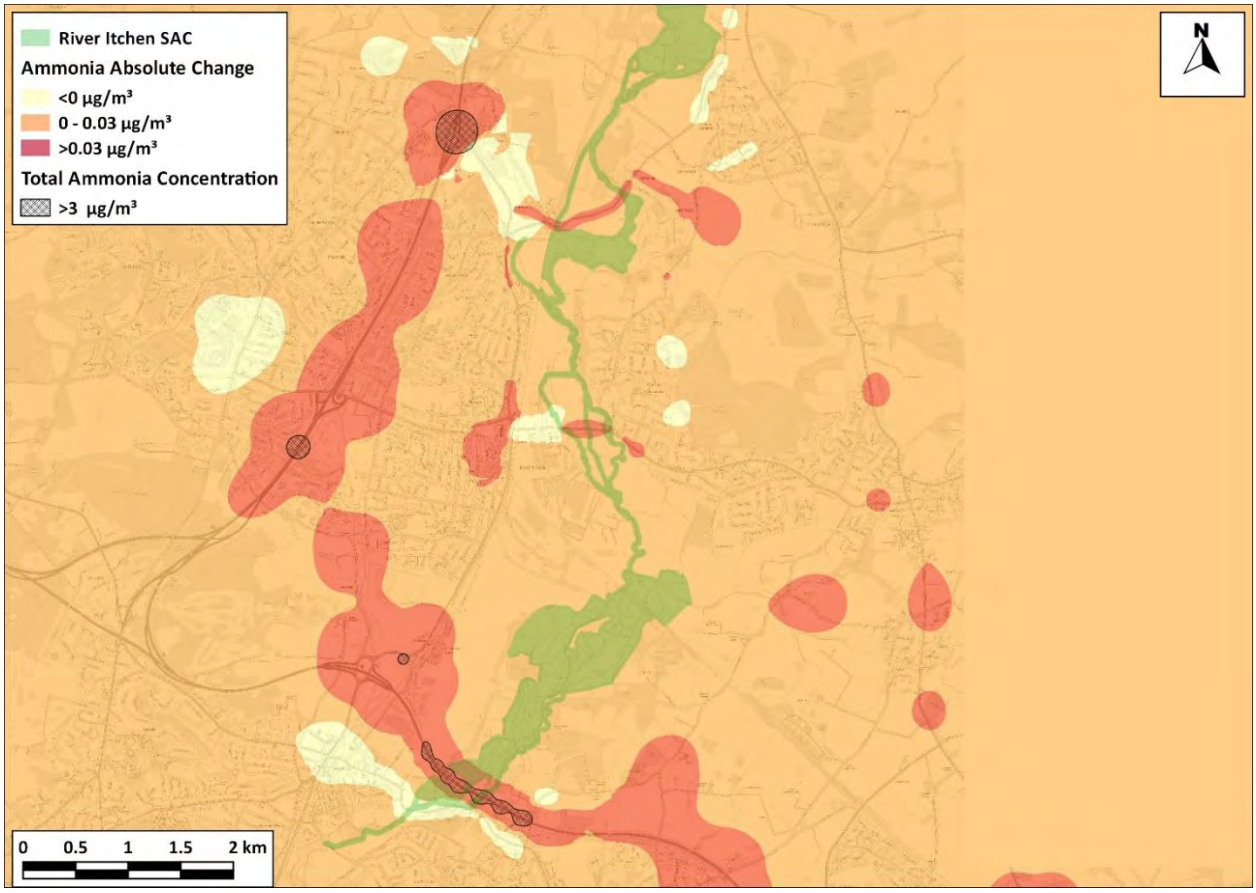


Figure 6.1: Ammonia concentrations resulting from traffic modelling within Eastleigh Borough (Ammonia absolute change)

6.2.30 The greatest impact of ammonia will not be in its gaseous form but in solution through wet deposition. This adds to the overall nitrogen deposition rate which is assessed separately and is measured in terms of kgN/ha/yr. The APIS website states; "*Nitrogen (N) deposition describes the input of reactive nitrogen from the atmosphere to the biosphere both as gases, dry deposition and in precipitation as wet deposition. Enhanced reactive nitrogen deposition is a consequence of global emissions of oxidised nitrogen (NO, HNO_3 and NO_2 – often referred to as NO_y) from fossil fuel combustion (Dignon and Hameed, 1989), and reduced N (NH_x) from agricultural sources.*"

Atmospheric NOx concentrations

6.2.31 The concentration of atmospheric NOx was calculated using both annual mean NOx and 24 hour NOx concentrations. The concentration of atmospheric NOx can have an impact on terrestrial vegetation however, it is not clear how this would affect aquatic and semi-aquatic vegetation. It is likely that deposition of nitrogen will have a greater impact on habitats than atmospheric NOx concentrations, indeed, nitrogen deposition rates are likely to be directly linked to atmospheric NOx concentration. This assessment has therefore only considered nitrogen deposition (NDep) as this is considered the best indicator of ecological impact of the changes in air quality predicted by AQC.

Table 6.2: Critical Levels for Ammonia within Fen, Marsh and Swamp habitats

Habitat/ Ecosystem	Critical Load/ Level	Status	Indication of exceedance	Reference
Higher plants	3 µg NH_3 m^{-3} annual mean (uncertainty of 2-4 µg NH_3 m^{-3})	UNECE, 2007	Direct visible injury; species composition changes. Ecosystems where sensitive lichens and bryophytes are an important part of the ecosystem integrity, the critical level is set at 1 µg NH_3 m^{-3}.	860
Lichens and Bryophytes	1 µg NH_3 m^{-3} annual mean	UNECE, 2007	Loss of sensitive mosses and lichens communities. Communities become dominated by nitrophiles at the expense and virtual loss of acidophytes as bark pH becomes less acidic.	860

Screening assessment: impacts on rich fen habitats within the River Itchen SAC

6.2.32 The worst case scenario model produced by AQC (June 2018) again predicted that the baseline load of nitrogen deposition in the vicinity of Highbridge Farm (B3355 Highbridge Road), Bishopstoke (B3037 Bishopstoke Road) and Itchen Valley Country Park (M27/A27) currently exceeds the critical load of 15kg N/ha/yr. It further predicted that the EBLP 2016-36 could increase deposition rates above the 1% threshold level.

6.2.33 As we have concluded that there are likely to be significant effects from changes in air quality on the habitat of the southern damselfly within the River Itchen SAC, it is necessary to undertake

an Appropriate Assessment to determine whether these will have an adverse effect on the integrity of the site – either alone or in combination. This is presented in section 7.2.

Evidence of current or future impacts: Solent Maritime SAC and Solent & Southampton Water SPA/Ramsar

6.2.34 The HRA screening report (AECOM, 2015) identified the potential for impacts from air pollution to adversely affect the saltmarsh habitats that are features of the Solent Maritime SAC and Solent and Southampton Water Ramsar site. These two sites comprise a mix of coastal and marine habitats listed in the Habitats Directive and Ramsar Convention. Three distinct saltmarsh habitats occur within the SAC, referred to as Atlantic salt meadows, Spartina swards and Salicornia and other annuals colonising sand and mud. The three saltmarsh types often form complex mosaics of broader saltmarsh habitat and for the purposes of this assessment are considered collectively. Saltmarsh is also a Ramsar habitat type and contributes to Criterion 1 of the Solent and Southampton Water Ramsar site. The definition of Ramsar saltmarsh habitat is broader than that of the SAC. Impacts on saltmarsh habitats from air pollution are also listed on the APIS website at the level of broad habitat type so that air quality impacts on all three Annex 1 saltmarsh habitats and the Ramsar saltmarsh habitat type are assessed together at this broad habitat level. The APIS website lists Critical Loads for nitrogen deposition within saltmarsh habitats as 20-30kg N/ha/yr, as shown in Table 6.3:

Table 6.3: Critical loads for N deposition in Coastal Saltmarsh

Habitat/ Ecosystem	Eunis Code	Critical Load	Status	Reliability	Indication of exceedance	Reference
Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53	20-30 kg N ha-1 year-1	UNECE 2010 - Noordwijkerhout workshop	Expert judgemetn	Increase late successional species, increase in productivity, increase in dominance of graminoids.	472

6.2.35 The majority of Solent Maritime SAC qualifying features are not listed on APIS as sensitive to acid deposition, the exception being Perennial vegetation on stony banks and Desmoulin's whorl snail. Perennial vegetation on stony banks is restricted in distribution to a small area in Hamble-Le-Rice, away from the main distributor road network, while Desmoulin's whorl snail is restricted to Fishbourne Channel in Chichester Harbour and has not been recorded since 2005. Acid deposition is not considered further for this SAC. The only feature listed on APIS as sensitive to ammonia is Desmoulin's whorl snail; ammonia is not considered further for Solent Maritime SAC.

6.2.36 Solent and Southampton Water SPA is excluded from this part of the assessment. APIS lists terns using coastal stable dune habitat as vulnerable to N deposition, and common tern using supralittoral sediment as vulnerable to acid deposition. However, there are no breeding terns in the vicinity of Eastleigh and no suitable nesting habitat (dunes or shingle beaches) close to

the road routes of interest. Impacts on intertidal habitats used by other qualifying and assemblage species are first assessed via impacts to the SAC and then, if significant, considered for adverse effects on the SPA.

Revised screening assessment of air quality impacts on saltmarsh habitats

Approach to assessment

6.2.37 Air Quality Consultants (February 2018) were commissioned to undertake interim air quality modelling of the impacts of the Local Plan in Eastleigh Borough. A single future assessment year of 2036 was used for the following two Local Plan scenarios:

- DCY: With full Local Plan development including 5,000 dwellings at SGO B/C (north of Bishopstoke / north and east of Fair Oak) – Scenario A2.a; and
- DCZ: With full Local Plan development including 6,000 dwellings at SGO B/C – Scenario A2.b.

6.2.38 Scenario DCZ envisages a greater quantum of development at north of Bishopstoke / north and east of Fair Oak over the period to 2036 and presents the worse-case scenario for traffic flows passing close to European sites. Taking a precautionary approach, the results using the DCZ scenario were used in this part of the assessment. The modelling predicted levels of nitrogen deposition and found that the baseline load in the vicinity of the M27 currently exceeds the critical load of 20kg N/ha/yr. It further predicted that the EBLP 2016-36 could increase deposition rates above the 1% threshold level. Further assessment has therefore been undertaken to assess the impacts of air quality on saltmarsh habitats within the Solent Maritime SAC and Solent and Southampton Water Ramsar site.

6.2.39 Air Quality Consultants (June 2018) were subsequently commissioned to undertake revised air quality modelling of the impacts of the Local Plan in Eastleigh Borough. A single future assessment year of 2036 was used for a worst-case combination of two Local Plan scenarios; DS2_DPC_2036 and DS3_DPP_2036. Both scenarios include the full Local Plan development quanta (including 5,656 dwellings at Bishopstoke / Fair Oak) but with a range of different options for transport interventions – for each road link, the scenario producing the highest traffic flows was selected for the air pollution modelling.

6.2.40 The approach to atmospheric pollution modelling was the same as for River Itchen SAC, as described at paragraphs 6.2.21 to 6.2.31.

Screening assessment: impacts on saltmarsh habitats within the Solent Maritime SAC and Solent & Southampton Water Ramsar site

6.2.41 The worst case scenario model produced by AQC (June 2018) predicts nitrogen deposition rates above the 1% screening threshold for approximately 750m from the M27 and 130m from the A27. However, the total nitrogen deposition concentrations are predicted to be above the 20 kgN/ha/yr only up to about 65m from the M27 as shown in Figure 6.2 and Figure 6.3.

6.2.42 The results of this modelling were overlain with the SPA/Ramsar boundaries and habitat data to assess the area of impacted saltmarsh habitat[20] as shown in Figure 6.4 and Figure 6.5. Saltmarsh habitats shown in Figure 6.5 include *Halimione spp.*, *Juncus gerardii*, Saltmarsh grass and *Spartina spp.*. No saltmarsh habitat within the SAC or Ramsar site will be within the 65m zone adjacent to the M27 where nitrogen deposition is predicted to exceed 20 kg N/ha/yr. It can therefore be concluded that there will be no likely significant effect from nitrogen deposition on the Solent Maritime SAC or Solent and Southampton Water Ramsar, and these sites can be screened out from further assessment.

Impacts outside of Eastleigh borough

6.2.43 Traffic modelling data for road links close to European site boundaries outside of Eastleigh borough (e.g. M3 crossing of River Itchen SAC at Junction 11 south of Winchester and A3051 close to Solent Maritime SAC at Curbridge) were not available. Air pollution impacts in these locations could not therefore be modelled.

6.2.44 New Sub-Regional Transport Model data were received in August 2018 and March 2019 for three model scenarios at locations outside Eastleigh borough in close proximity to the River Itchen SAC (M3 at Otterbourne and Twyford Down) and Solent Maritime SAC (A3051 Burridge to Curbridge) – these locations are shown on a plan at the end of Appendix V:

- BL_DKF_2015: baseline traffic flows in 2015
- BL_DOP_2036: baseline traffic flows in 2036, including all committed development in Eastleigh Borough and the wider Solent sub-region, but not including EBLP development
- DS3_DPP_2036: traffic flows in 2036, including all committed development in Eastleigh Borough and the wider Solent sub-region, plus EBLP development

6.2.45 A further run of the atmospheric dispersion model using the new traffic data was not commissioned. In its absence, predicted changes resulting from EBLP development were analysed by comparing DS3_DPP_2036 against BL_DOP_2036. Three factors were considered: 24hr annual average daily traffic (AADT) flow for vehicles; 24hr AADT for HGVs; and daily average speed (km/hr). In line with advice from Natural England (pers. comm., 2018a), predicted changes were compared against the Design Manual for Roads and Bridges[21] screening thresholds, namely:

- Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10km/hr or more.

[20] Environment Agency (2004): *Science Group – Technology Solent CASI Survey, Project PM_0202, Final Project Report.*

[21] Highways Agency (2007): *Design Manual for Roads and Bridges: Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 Air Quality (HA207/07).*

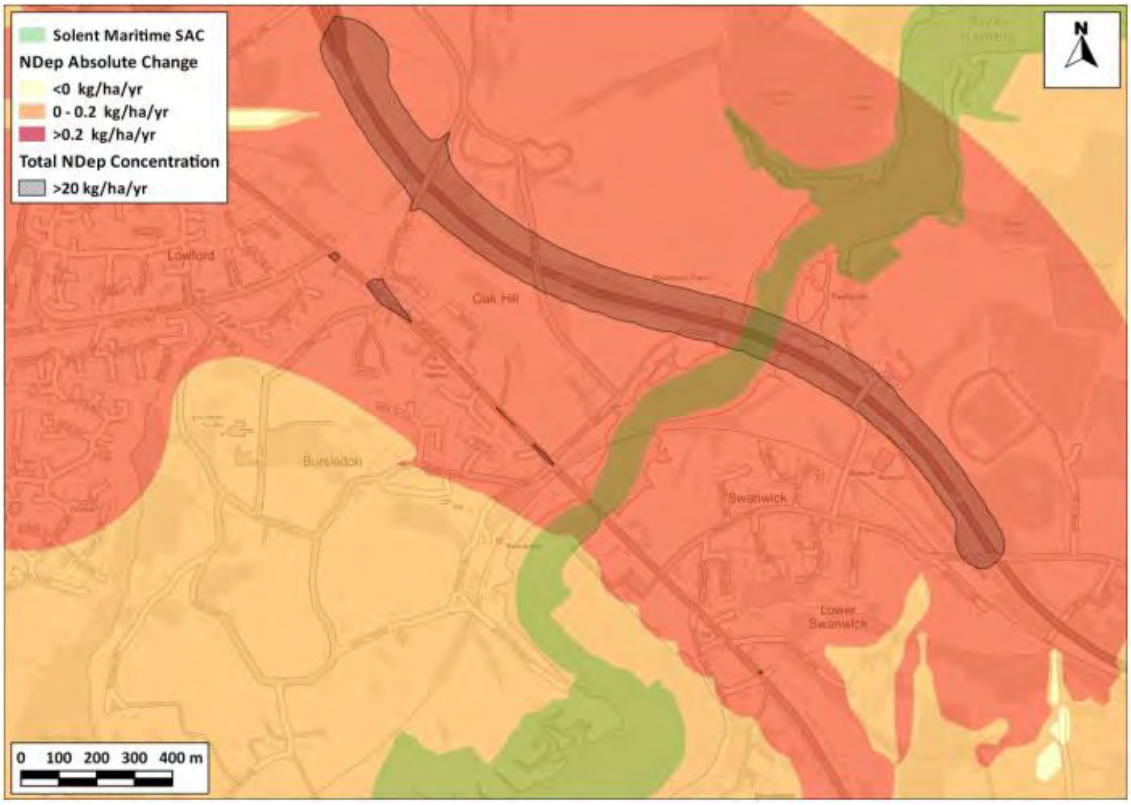


Figure 6.2: Solent Maritime nitrogen deposition, absolute changes in-combination and total nitrogen deposition (Defra model): M27 / A27

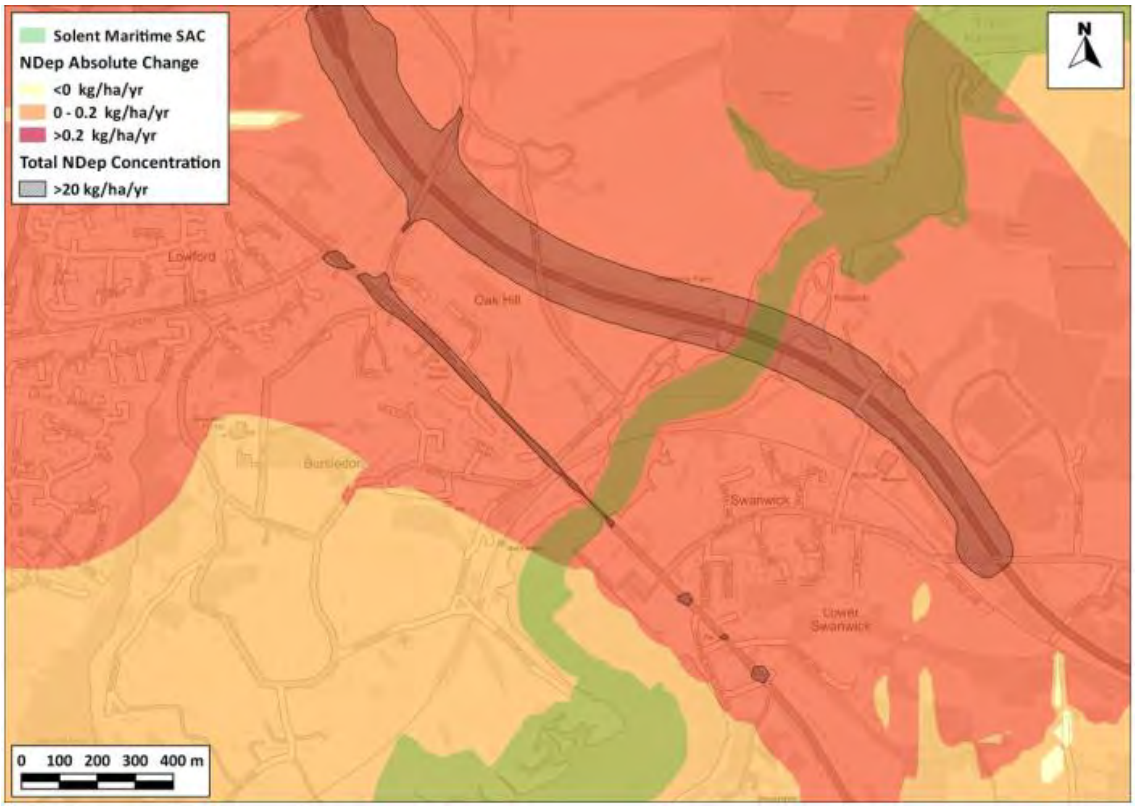


Figure 6.3: Solent Maritime nitrogen deposition, absolute changes in-combination and total nitrogen deposition (sensitivity test): M27 / A27

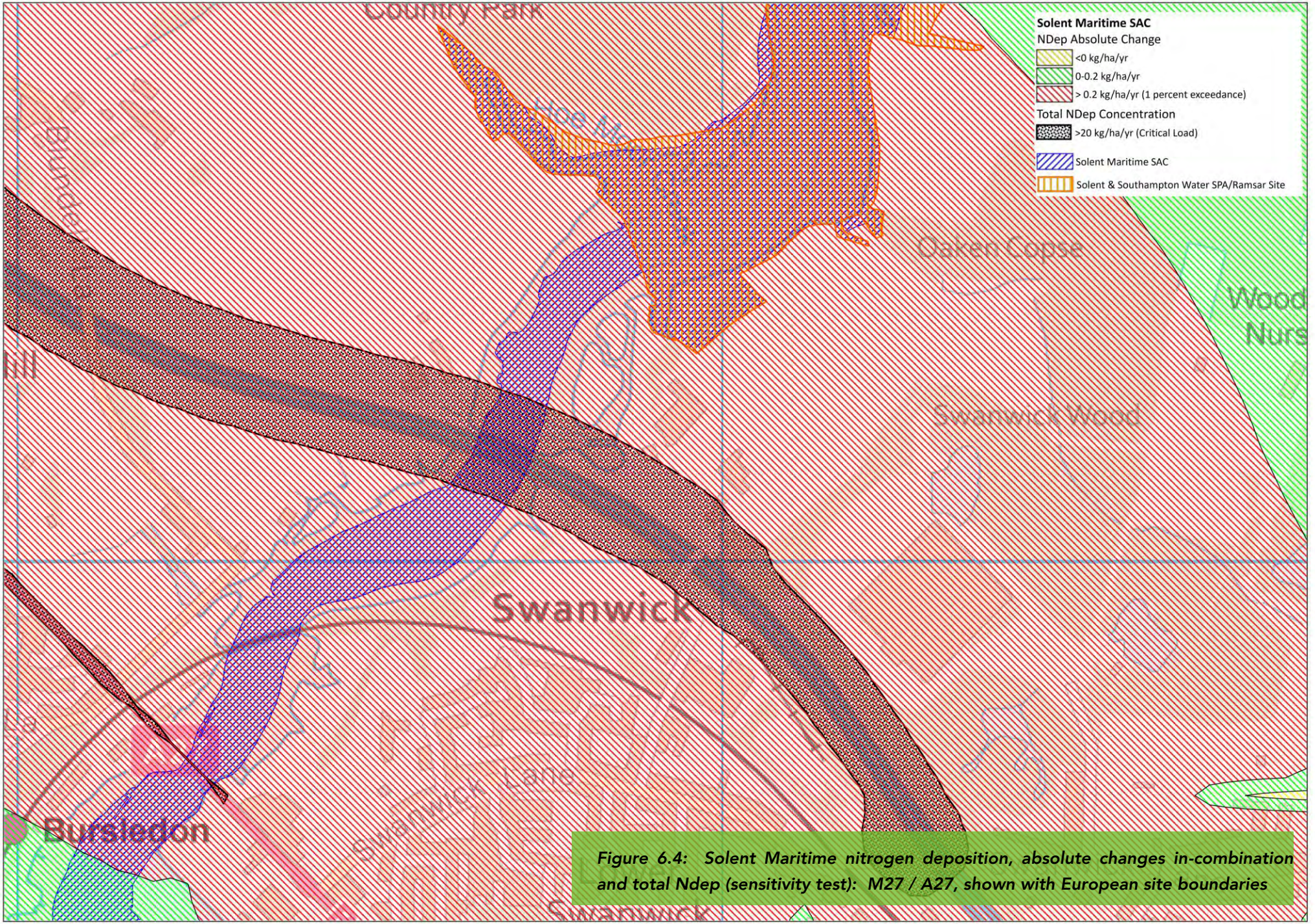


Figure 6.4: Solent Maritime nitrogen deposition, absolute changes in-combination and total Ndep (sensitivity test): M27 / A27, shown with European site boundaries

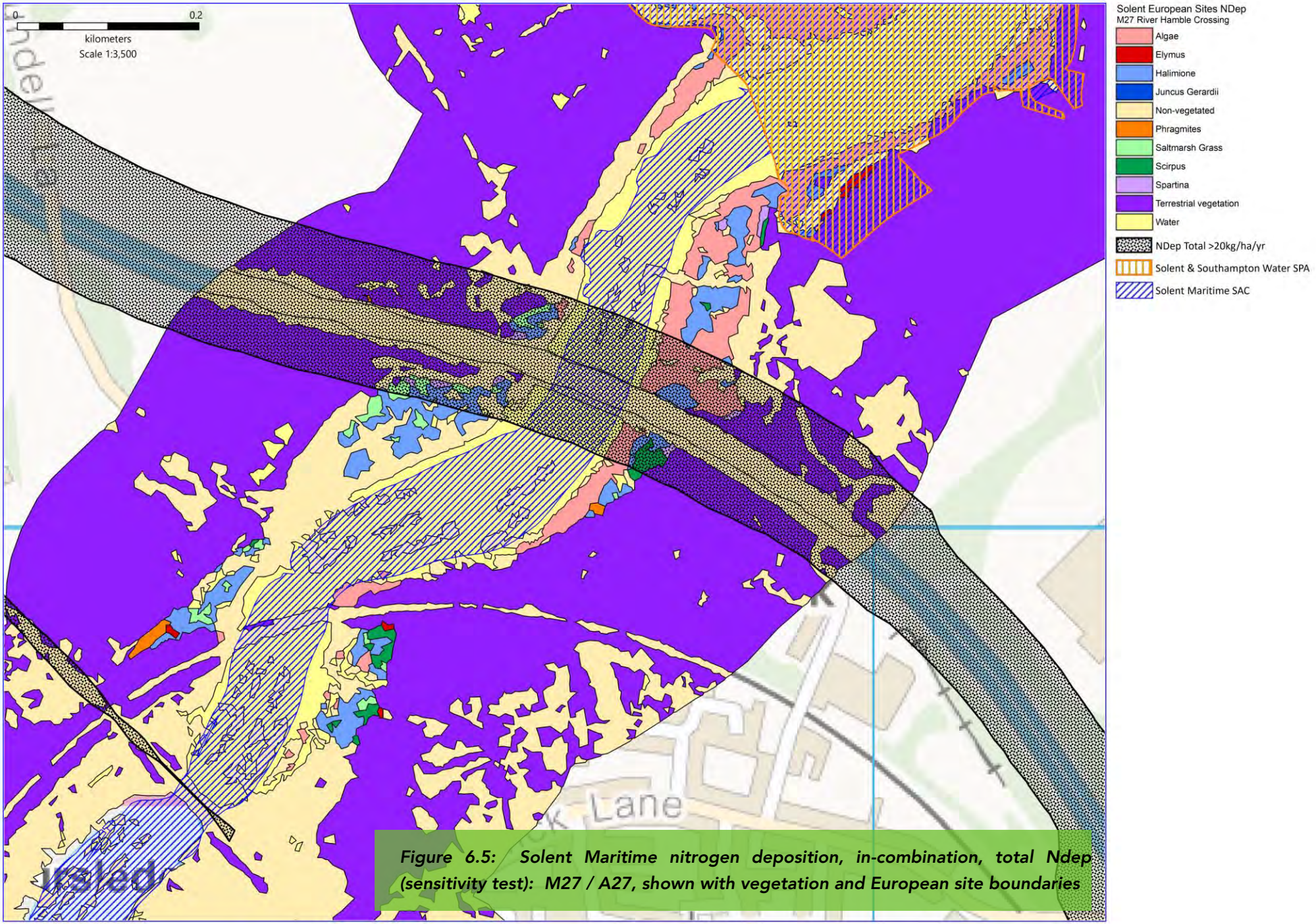


Figure 6.5: Solent Maritime nitrogen deposition, in-combination, total Ndep (sensitivity test): M27 / A27, shown with vegetation and European site boundaries

6.2.46 None of the modelled road links exceeded the screening thresholds, as can be seen in the analysis tables presented at the end of Appendix V. The AADT (vehicles) flow caused in 2036 by EBLP development, when compared to the 2036 baseline, was predicted to increase by 1,086 on the M3 northbound carriageway at Otterbourne, however, this was predicted to be offset by a decrease in southbound traffic of -533, and the modelled road link is not within 200m of an SAC (in this case the River Itchen). Traffic flow increases outside of Eastleigh borough are screened out from the assessment and not considered further.

6.3 Coastal Squeeze

6.3.1 The HRA screening for the Issues & Options Local Plan (AECOM, 2015) considered that the plan did not propose development in such a position that it would cause coastal squeeze or necessitate a change to Shoreline Management Plan policy, and hence concluded that no significant effects were likely to occur. This remains the case for the EBLP 2016-2036 at the Submission stage and the issue is not considered further.

6.4 Disturbance: Strategic Impacts

6.4.1 This impact pathway relates to the direct and in combination effects of disturbance on the River Itchen SAC and Solent and Southampton Water SPA/Ramsar, and the potential for indirect in combination effects on the New Forest SPA (see Appendix I). As a strategically operating impact it is assumed that all proposed allocations with residential use will contribute to the effect; as such the screening assessment at Appendix I does not list disturbance as an LSE for proposed allocations, focusing instead on site specific impacts. The potential for site-specific disturbance effects is considered below (section 6.5).

Impact mechanisms

6.4.2 Population growth associated with residential development brings with it the prospect of additional visitor pressure on European sites. There is particular concern over the capacity of existing open spaces adjacent to or within European sites to accommodate additional visitor pressure resulting from planned residential development, and development and promotion of tourism (particularly along the coast), without adverse effects on European site integrity, particularly those designated for an internationally important bird assemblage.

6.4.3 Impacts associated with disturbance from recreation differ between seasons, species, and individuals. Birds' responses to disturbance can be observed as behavioural or physiological, with possible effects on feeding, breeding and taking flight. Murison *et al.* (2007) noted that birds often react to human disturbance as a form of predation risk. Such a response can include elevated heart rate, heightened defensive behaviour, including evasive measures, and the avoidance of high risk areas (Murison *et al.* (2007), Liley & Sutherland (2007)). High levels of human activity in important nature conservation areas might then change the behaviour of animals to such a degree that conservation priorities become compromised. This may result from reduced breeding success, increased energetic expenditure, predation, or exposure of nests, eggs or young to trampling and the elements (Liley & Sutherland, 2007).

6.4.4 Disturbance can be caused by a wide variety of activities and, generally, both distance from the source of disturbance and the scale of the event will influence the nature of the response. Factors such as habitat, food requirements, breeding behaviour, cold weather, variations in food availability and flock size, will influence birds' abilities to respond to disturbance and hence the scale of the impact (Stillman *et al*, 2009). On the other hand, birds can modify their behaviour to compensate for disturbance, for example by feeding for longer time periods. Some birds can become habituated to particular disturbance events or types of disturbance, and this habituation can develop over short time periods (Stillman *et al*, 2009).

In combination effects

6.4.5 The following plans/projects may also contribute to (strategically-operating) disturbance effects:

- Strategic development at North of Whiteley, Winchester district
- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Welborne Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- South Downs Local Plan (emerging)
- Test Valley Borough Revised Local Plan 2011 – 2029 (adopted 2016)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034

Evidence of current or future impacts: Solent European Sites

6.4.6 At coastal areas it can be helpful to divide impacts into the effects of disturbance on overwintering birds, or on breeding birds. Impacts to wintering birds are centred on interruption to foraging or roosting. Individuals alter their threshold in response to shifts in the basic trade-off between increased perceived predation risk (tolerating disturbance) and the increased starvation risk of not feeding or increased energetic expenditure (avoiding disturbance) (Stillman *et al*, 2009). During the breeding season, impacts on shorebirds arise from increased predation of eggs, as well as trampling and increased thermal stress, when birds flush the nest in response to a disturbance event, leading to reduced breeding success (Stillman *et al*, 2009).

6.4.7 The Solent Disturbance and Mitigation Project was initiated in response to concerns over the impact of disturbance on coastal designated sites and their overwintering bird assemblage. It began in 2008 and in 2009 a Phase 1 report (Literature Review and Interviews) was issued (Stillman *et al*, 2009). Phase 2 was a primary research phase, which issued reports on the results of on-site visitor surveys (Fearnley *et al*, 2010), bird disturbance fieldwork (Liley *et al*, 2011),

household surveys and future visitor modelling (Fearnely *et al*, 2011) and disturbance impact modelling (Stillman *et al*, 2012). Phase 3 outlined an avoidance and mitigation strategy to prevent adverse effects on overwintering bird populations around the Solent (Liley & Tyldesley, 2013).

6.4.8 The researched showed that an estimated 52 million visits are made by households to the Solent coast each year, of which just over half are made by car. The majority of visitors make trips to the coast specifically to see the sea and enjoy the coastal scenery. Dog walking was the most frequently observed activity, with walking, cycling and jogging being other common recreational activities. Most activities involved people staying on the shore/sea wall rather than being on the intertidal areas or in the water. Human activity that took place on the intertidal areas was more likely to result in bird disturbance; on those areas dog walking was particularly common and resulted in a disproportionate amount of the observed bird disturbance.

6.4.9 The EBLP allocates a minimum of 1,387 dwellings to locations within 5.6km of the Solent coastline; see Table 6.4 and Figure 6.6. In the absence of avoidance and/or mitigation measures, this level of residential development is likely to increase the number of regular visitors to the Solent and Southampton Water SPA/Ramsar. The resultant increase in disturbance from people and their dogs is likely to adversely affect overwintering populations dark-bellied Brent goose, black-tailed godwit, ringed plover and teal (by reducing winter survival rates), thereby undermining the integrity of the SPA/Ramsar.

Table 6.4: Proposed allocations falling within 5.6km Solent mitigation zone

Ref	Name	No. dwellings
BO1	Land south of Maddoxford Lane and east of Crows Nest Lane	30
BO2	Land west of Uplands Farm, Botley	300-375
BO3	Land east of Kings Copse Avenue and east of Tanhouse Lane	70
BO4	Land north of Myrtle Cottage, Winchester Road	22
BU1	Land north of Providence Hill	19
BU2	Heath House Farm	38
BU3	Land lying south east of Windmill Lane	50
BU7	Riverside Boatyard, Blundell Lane, Bursledon	N/A
CF3	Land south of the supermarket and east of Bournemouth Road, Chandler's Ford	N/A
E6	Eastleigh River Side	N/A
E7	Development opportunities adjoining Eastleigh River Side	N/A
E9	Southampton Airport	N/A
FO1	West of Durley Road, Fair Oak	73
FO4	Lechlade, Burnetts Lane, Fair Oak	13
FO8	Hammerley Farm, Anson Road, Horton Heath	N/A
HA2	Mercury Marina and Riverside Camping and Caravan Park	N/A
HE1	Land west of Woodhouse Lane, Hedge End	650
HE2	Land at Sundays Hill and Land north of Peewit Hill Close	106

Ref	Name	No. dwellings
HE3	Land at Home Farm, St John's Road	16
HE4	Land off Peewit Hill Close and Dodwell Lane	N/A
HE5	Land at Netley Firs, Kanes Hill, Hedge End	N/A
WE2	Land adjoining the Chalcroft Business Park	N/A
WE3	Land west of Tollbar Way and south of Berrywood Business Park, Hedge End	N/A
DM25	Royal British Legion, Hound (site in unneighbourly use)	10
DM25	Dumbleton Copse / Pinewood Park, Kanes Hill (unneighbourly use)	6

6.4.10 The Phase 3 (Liley & Tyldesley, 2013) report considered the available options for avoiding and mitigating impacts to the overwintering bird assemblage of the Solent European sites, in the context of current planning policy and regulation. It outlined a strategy of projects including 'quick wins' and longer term behavioural change initiatives for reducing the overall adverse effect such that planned new developments can be accommodated. The Solent Recreation Mitigation Partnership (SRMP) was established in 2014 to implement the recommendations of the Phase 3 report. Among its first tasks was the preparation of an interim mitigation strategy and significant progress towards its implementation has already been made. The SRMP recently consulted on and adopted its definitive mitigation strategy[22] to take the project forward, key aspects of which include:

- A team of 5-7 coastal rangers to advise people on how to avoid bird disturbance, liaise with landowners, host school visits, etc;
- Communications, marketing and education initiatives and an officer to implement them;
- Initiatives to encourage responsible dog walking and an officer to implement them;
- Preparation of code of conduct for a variety of coastal activities;
- Site specific projects to better manage visitors and provide secure habitats for the birds;
- Providing new/enhanced greenspaces as an alternative to visiting the coast;
- Implementation and monitoring to be funded by contributions from development which creates net additional dwellings within 5.6 kilometres of the Solent SPAs (a distance which includes approximately two-thirds of Eastleigh borough including Horton Heath, parts of Eastleigh, and all settlements and parishes southwards); and
- A partnership manager to coordinate and manage all of the above.

6.4.11 Most recent local development plans in the area now include a policy providing the mechanism to collect development contributions from proposals likely to lead to disturbance effects, such as EBLP proposed policy DM11. Taking account of this mitigation strategy (but not at the screening stage), Chapter 7 undertakes an assessment of the disturbance effects of the EBLP on the Solent and Southampton Water SPA/Ramsar in view of the sites' conservation objectives.

[22] Solent Recreation Mitigation Partnership (2017): *Solent Recreation Mitigation Strategy*. Accessed online [9/1/18] at: http://www.birdaware.org/CHttpHandler.ashx?id=29372&p=0

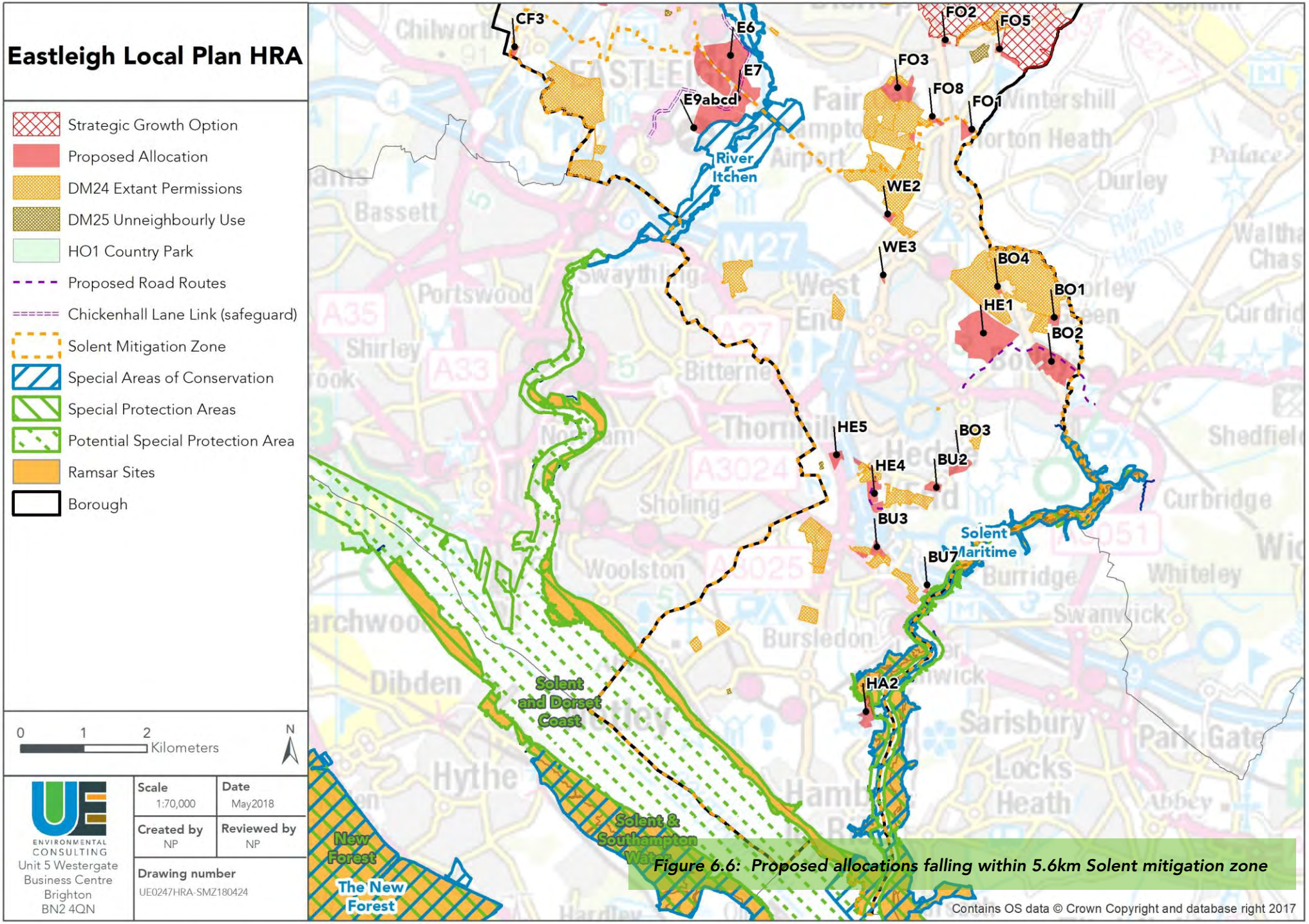


Figure 6.6: Proposed allocations falling within 5.6km Solent mitigation zone

Evidence of current or future impacts: New Forest

6.4.12 At the New Forest SPA, it is the ground and near-ground nesting birds that are particular receptors of negative effects, such as Dartford Warbler, Nightjar and Woodlark. Studies by Langston *et al* (2007), Liley and Clarke (2003), and Murison (2002) investigated the effect of disturbance on Nightjar on heaths in Dorset, finding that breeding success of Nightjar is significantly lower close to paths, and that proximity to housing has a negative relationship with the size of the population (Langston *et al*, 2007). The most common cause of breeding failure for this ground-nesting species was due to daytime predation of eggs when disturbance caused an incubating bird to leave the nest.

6.4.13 Similarly, the study by Murison *et al* (2007) found that for Dartford Warbler on Dorset heathland, disturbance also reduced breeding activity, particularly so in heather-dominated territories. Birds in heavily disturbed areas (eg, close to access points and car parks) delayed the start of their breeding by up to six weeks, preventing multiple broods and so reducing annual productivity. Most of this disturbance was found to come from dog-walkers as a result of dogs being encouraged to run through the vegetation after sticks.

6.4.14 It has been observed that the removal of human disturbance effects could result in an increase of between 13% and 48% in the breeding population of Woodlark over 16 heathland sites (Mallord *et al*. 2007a, Mallord *et al*. 2007b). At sites with recreational access Woodlark was found to be less likely to colonise suitable habitat in areas with greater disturbance. The probability of colonisation was reduced to below 50% with disturbance levels at eight events per hour.

6.4.15 Disturbance effects are not the only impacts of visitor pressure. Others include: arson and wild fires, litter, predation from people and pets, fly-tipping, trampling and soil compaction, and site management problems, each of which could have indirect effects on SPA qualifying features. Sharp *et al* (2008) estimated the number of annual visits to the New Forest to be over 13 million per year, a figure which they predicted to increase by 1.05 million visits by 2026 based on sub-regional development objectives at the time the work was carried out. They estimated that around three quarters (764,000) of this annual total increase would originate from within the first 10km from the Forest. This then reduces to between 10,000 and 50,000 additional visitors from within each 1km band originating between 8 and 18 km from the Forest in any direction. This further declines to approximately 3,000 – 4,000 additional visitors per year beyond a distance of 20km. The New Forest is between c.3.3km and c.21.6km from parts of Eastleigh borough and residential proposals will therefore fall within the sphere of potential influence on the SPA. Although, the New Forest is relatively inaccessible from the southern part of the borough due to the Solent, northern parts of the borough (Eastleigh and Chandler's Ford) are around 12-13km from the New Forest.

6.4.16 The EBLP provides for approximately 14,580 dwellings within c.20km of the New Forest. In the absence of avoidance and/or mitigation measures, this level of residential development is likely to increase the number of regular visitors to the New Forest SPA. The resultant increase in disturbance from people and their dogs is likely to adversely affect breeding populations of nightjar, woodlark and Dartford warbler (by reducing breeding success), thereby undermining the integrity of the SPA/Ramsar.

6.4.17 Local planning authorities surrounding the New Forest have taken a range of approaches to putting mitigation strategies in place. New Forest District Council has been seeking development contributions to mitigation measures for a number of years as currently set out in its *Mitigation for Recreational Impacts on European Sites SPD* (Draft, 2018). Mitigation measures include the provision and enhancement of greenspace in the district, access and visitor management on site, employment of additional ranger resource within the National Park and ongoing monitoring. Test Valley Borough Council also seeks development contributions towards habitat mitigation measures under its Interim Mitigation Framework (2014)[23].

6.4.18 The New Forest National Park Authority has sought development contributions towards habitat mitigation measures from development within the National Park since 2012, and it meets with Natural England, the RSPB and Wildlife Trust to review the mitigation measures annually. As part of the current New Forest Local Plan review, the Authority has published a draft update to the mitigation strategy[24] which sets out a range of measures to protect the SAC/SPA/Ramsar qualifying features from the effects of development, including:

- Access management within the designated sites;
- Alternative recreation sites and routes outside the designated sites;
- Education, awareness and promotion;
- Monitoring and research; and
- In perpetuity funding.

6.4.19 The strategy states that the Authority will work with Natural England and other neighbouring local authorities to develop a strategic and co-ordinated approach to mitigation and preventing adverse effects on the SAC/SPA/Ramsar, which could involve adapting the strategy's mitigation measures and extending the funding mechanism to include mitigation proposals outside of the National Park. To that end, a new partnership has recently been established with the aid of grant funding from the Ministry for Housing, Communities and Local Government. The New Forest International Designation Working Group is formed of officers representing: Eastleigh Borough Council, Natural England, New Forest National Park Authority, New Forest District Council, Southampton City Council, Test Valley Borough Council and Wiltshire Council.

6.4.20 The Working Group has recently commissioned a new study into recreational effects, arising from new development, on the international nature conservation designations in the New Forest. The scope of the study is to: (i) collate up to date information to enable a clearer understanding of the profile of visitors (including local regular users, day visitors and staying tourists) to the New Forest international nature conservation designations, including the reasons for their visits and where they are coming from; (ii) consider the nature and type of potential recreational impacts on the New Forest SPA, SAC and Ramsar species and habitats; (iii) use this information to determine a catchment area where additional population growth would have a significant effect on these designations (and thus where mitigation may be

[23] Test Valley Borough Council (2014): *New Forest SPA Mitigation – Interim Framework.* Accessed online [27/2/18]: https://www.testvalley.gov.uk/planning-and-building/guidance/solent-southampton-water-special-protection-area

[24] New Forest National Park Authority (2018): *Draft Revised Habitat Mitigation Scheme 2018.* Accessed online [27/2/18]: http://www.newforestnpa.gov.uk/downloads/file/1694/draft_revised_habitat_mitigation_scheme_2018

required); and (iv) re-affirm existing mitigation measures or recommend appropriate further options for mitigating the impacts of recreation associated with changing visitor numbers and patterns. This research will be written up by the end of the year and will form the basis for a strategic approach to mitigation from local authorities close to the New Forest. It will update the evidence base to demonstrate the proportion of people visiting, how often people visit, where they have travelled from, the locations they visit and why, their activities and what proportion of these activities take place in the New Forest.

6.4.21 The first part of the research (a telephone survey) ran from November to December 2018 and interviewed 2,000 people including 138 in Eastleigh borough, asking whether they had visited in the past 12 months, how this compared to other greenspaces, how often they visited and the activities undertaken. As would be expected, the emerging findings show that Eastleigh residents are less reliant on the New Forest and make fewer visits than residents living closer by. The draft telephone survey findings indicate that:

- around two thirds of interviewees in Eastleigh borough had visited the New Forest in the past 12 months;
- the most common frequency of visits from Eastleigh borough residents was once a month or less than once a month;
- across the whole survey, the proportion of people who had visited the New Forest in the past year, and their frequency of visits, declined with distance and travel time;
- the proportion of visits to the New Forest as opposed to other greenspaces also declined with distance and travel time;
- for people travelling 10km or more, the most common activity undertaken was walking; and
- part of the reason why people visit the New Forest relates to the intrinsic characteristics of the landscape; however many people from nearby urban areas visit locations outside of the European designated sites, for example the larger villages of Lyndhurst, Burley, Brockenhurst and Lymington.

6.4.22 In addition to its membership of the Working Group, EBLP Policy DM11 includes a commitment that the Council will work with PUSH, Natural England, Environment Agency and other organisations to develop and implement a strategic approach to the protection of European sites from the direct and indirect effect of development including recreational disturbance. The supporting text specifically refers to the Council's intention to continue to work in partnership to deliver mitigation measures where required to protect the New Forest from the impacts of development proposals. While the research project is completed and in advance of a joint strategic mitigation programme being agreed, Eastleigh Borough Council intends to develop an interim approach to mitigating the effects of residential development within the borough. The extent of the mitigation required will be calculated based on the average number of visits generated by new homes and reflecting the estimated proportion of households who visit the New Forest and designated SPA/SAC/Ramsar sites each year.

6.4.23 Within the borough, there is scope to provide SANG (including within the west of Horton Heath and SGO developments, and in the new country park in Bursledon) and implement changes to

existing open spaces and routes. By improving facilities, increasing capacity and delivering a network of routes and spaces, these will be increasingly attractive as an alternative to visiting the New Forest. The Council has identified a number of projects to improve open spaces and deliver footpath improvements as set out in the Infrastructure Delivery Plan and Capital Investment Programme. In addition, Hampshire County Council has identified strategic (and non-strategic) infrastructure projects within the borough and cross-boundary. These include improvements to HCC country parks and routes to these parks within the borough; and improving and connecting existing routes to help deliver a strategic network of walking, cycling and riding routes.

6.4.24 A proportion of the visits to the New Forest will be due to the intrinsic character of the New Forest, its landscape, nature and scale, and therefore cannot be diverted to other locations. Access management measures such as changes to car parks, way-marking and improvements to routes can be used to direct people to non-designated areas within the New Forest. In addition, face to face contact, communications, education and events help to promote responsible recreation while visiting designated areas. Projects are already in place in the New Forest and contributions could be made to extend these further to address extra visits from Eastleigh residents.

6.4.25 Therefore, given the established programmes in place within the New Forest, the proposals to create new open spaces / SANG (including as part of new development) and to improve access within the Borough, and the imminent release of the initial results of the telephone survey, the Council will be in a position to devise an interim strategy to inform the Local Plan examination. This interim strategy is due to be completed by June 2019. Taking account of these commitments (but not at the screening stage), Chapter 7 undertakes an assessment of the disturbance effects of the EBLP on the New Forest SPA in view of the site's conservation objectives.

Recreational impacts on River Itchen SAC

6.4.26 In its representation on the Proposed Submission plan, Natural England raised concerns over the potential recreational impacts from development upon the River Itchen SAC.

Potential impact mechanisms

6.4.27 High levels of recreation use can lead to trampling and erosion of river banks and marginal vegetation. This can lead to widening of river channels and consequent changes to river hydrology and result in the release of sediment and plant nutrients into the water course. These factors have the potential to cause damage to the interest features of the river, in particular siltation damages spawning habitat for a number of fish species for which the SAC is designated (Atlantic salmon and Brook lamprey). Silt deposition and nutrient enrichment can also damage both the invertebrate fauna and botanical composition of the Floating *Ranunculus* vegetation and hence the ecological structure and function of the habitat. There is consequently a theoretical pathway by which increased recreational use of the River Itchen could cause damage to the SAC.

6.4.28 Otters are known to be sensitive to dogs, in particular during the daytime when resting in their holts or laying up sites and most importantly within sites used for breeding (natal sites). Otters are known to move extensively along the Itchen Valley through both urban and rural areas. However, they are mostly active at night and are therefore rarely in direct contact with people and dogs during the day. There are a number of important refugia used by otters within the River Itchen SAC both for daytime laying up and for breeding. These tend to be dense areas of wet woodland, scrub and reedbeds where there is little or no public access. Otters also disperse from the Itchen Valley into neighbouring river catchments including the Hamble and the Test. Increased development and, potentially, recreational use could inhibit these movements or lead to greater threats of road traffic casualties.

Consideration of likely significant effects

6.4.29 There is approximately 19km of main river within the River Itchen SAC in Eastleigh Borough. Most of this is on private land and is inaccessible to the public. Public rights of way border one bank of 2.9km of main river channels in Eastleigh Borough (7.5% of main river channel in the SAC). The opportunity for recreational impacts to the river banks through erosion and siltation are therefore limited. Most of the accessible river bank is along the artificially constructed banks of the former canal known as the Itchen Navigation. This runs along the side of the Itchen flood plain and is elevated above it within constructed river banks. These are generally more robust and resilient to trampling and erosion than natural soft sediment river banks within the flood plain. However, there are localised sections of bank where dogs have access to the Navigation where marginal fen and swamp vegetation is damaged by recreational activity. In addition, some sections of the Navigation path can become muddy and difficult to access so increasing the risk of sediment erosion into the SAC.

6.4.30 There has been no assessment of the likely increase in recreational use of the public rights of way along the SAC river channels from the level of proposed housing in Eastleigh, however, an approximate estimate can be calculated by comparing the current population of Eastleigh with the increase in population derived from proposed development in the Local Plan. The 2011 Census gives a population for Eastleigh Borough of 125,900 people. The Local Plan proposes 14,580 dwellings in the period 2016-2036. Assuming an occupancy rate of 2.4 people per house would give a population increase for the Borough of almost 35,000 people or an increase in population of 28%.

6.4.31 Between 2007 and 2012 the Hampshire & Isle of Wight Wildlife Trust led a heritage lottery funded project aimed at preserving the Itchen Navigation and enhancing it for wildlife. This included significant expenditure on restoration of river banks and provision of improved footpaths. The work of this project has continued with the support of the Wildlife Trust through the Friends of the Itchen Navigation (FIN). This volunteer group is involved in the continued maintenance of the Navigation and its associated footpaths. This has become an important component of the Green Infrastructure of the Borough.

6.4.32 An increase in local population of 28% may result in an increase in recreation use of the River Itchen by a similar amount. However, within Eastleigh Borough this will be confined to 7.5% of the main river water courses within the SAC. . Given the construction of the banks of the Itchen Navigation it is unlikely that the river will be able to widen appreciably as a result of recreational

use. Trampling and erosion of the canal path could result in localised sediment transfer to the Itchen Navigation but to an extent, this is self-regulating, as fewer people will walk along the difficult to traverse muddy sections of canal bank.

6.4.33 The Itchen Navigation Project and FIN have significantly reduced the impact of bankside erosion on the River Itchen SAC and continue to do so. Given the limited extent of the potential impact and the projects in place to manage this impact, it is considered that increased recreation use is not likely to cause a significant effect on the SAC from bank erosion. However, it is considered important that continued funding is available to support the FIN and the green infrastructure and ecosystem services that are provided by the Itchen Navigation.

6.4.34 Otters are most vulnerable to recreation impacts if there is disturbance to their holts, lying up sites and breeding sites. These tend to be undisturbed locations with limited or no public access. The potential increase in recreation use of the existing public rights of way network and open access areas such as the Itchen Valley Country Park is not considered likely to have a significant impact on these sensitive but inaccessible locations.

6.4.35 Overall it is considered that increases in recreation use of the River Itchen arising from the Local Plan policies is not likely to have a significant effect on the designated features of the SAC.

6.5 Disturbance: Site Specific Impacts (Noise and Vibration)

6.5.1 This impact pathway relates to the direct and in combination effects of noise and vibration on River Itchen SAC and Solent and Southampton Water SPA/Ramsar (see Appendix I).

Impact mechanisms: River Itchen

6.5.2 The River Itchen is designated for several species of fish and the European otter, all of which will be more or less sensitive to noise and vibration through the water column, and in the case of the otter in close proximity to holts and other terrestrial habitat. The HRA screening for the Issues & Options Local Plan (AECOM, 2015) established distances from the SAC over which construction projects could be likely to significantly affect qualifying species based on the species' sensitivity to noise and vibration.

Atlantic salmon

6.5.3 In addition to direct trauma, a significant risk associated with underwater noise generated by piling is the creation of an acoustic barrier to fish migration. Acoustic barriers/deterrents have the potential to impede fish as they migrate up and down the estuary. Any factor that limits the ability of fish to reach spawning grounds will potentially have a catastrophic effect on recruitment for a given species in that year and thus maintenance of the population (AECOM, 2015).

6.5.4 The metric most commonly used for the assessment of the behavioural and audiological effects of noise on animals is that of 'decibels above the hearing threshold' or dB_{ht}. This is species-specific, requiring knowledge of the hearing threshold of the species in question, and has been most widely investigated for marine species. The Atlantic salmon has relatively poor hearing

with peak sensitivity at 160Hz. For marine species, it is becoming accepted practice in the UK to consider that between 0-50dB$_{ht}$ (*Species*) there is a low likelihood of disturbance. The Environment Agency criteria for acceptability of in-water levels for Atlantic salmon requires that not more than 50% of the cross sectional area of a watercourse should be exposed to noise levels greater than 50dB$_{ht}$ (*Salmo salar*) (i.e. 50 decibels above the hearing threshold of the Atlantic salmon) to ensure that continued use of the watercourse by migrating salmon is possible (AECOM, 2015).

6.5.5 Postlethwaite (2010) [28] suggested that noise levels may exceed the 50dB$_{ht}$ (*Salmo salar*) threshold for some construction activities (e.g. piling operations) taking place up to 20m (in the case of vibropiling) or up to 70m (in the case of impact piling) from the edge of the watercourse. Given the relatively narrow width of the river in some locations, it is possible that vibration within the river will travel the full width.

6.5.6 The Environment Agency has expressed concern over the potential risks to incubating salmon eggs from vibration. It would hence be prudent for a preconstruction habitat survey to be undertaken by a fisheries biologist for sites close to the SAC to determine the likelihood of salmon spawning occurring in the relevant stretch of the River Itchen SAC and the Barton River in particular. If the likelihood was low, or the anticipated levels of vibration were also low (through the use of non-percussive methods of piling for example) then the timing of the works would probably not be affected from this consideration. If the likelihood of the presence of salmon eggs and vibration were both high, then timing of the works would need to be restricted.

Otter

6.5.7 Otters have very acute high frequency hearing sensitivity (16kHz) but much poorer hearing sensitivity than humans at frequencies below 4kHz; this may explain why they appear to tolerate what, to humans, are perceived as 'noisy' environments (AECOM, 2015). Chanin (2003) stated that otters will rest under roads, in industrial buildings, close to quarries and at other sites close to high levels of human activity. These observations indicate that otters are very flexible in their use of resting sites and do not necessarily avoid disturbance in terms of noise or proximity to human activity. However, activities close to either the River Itchen SAC itself or to one of the many tributaries of the Itchen that may be used by otters as corridors or links to the neighbouring catchments could constrain their distribution and dispersal. Of particular importance are the links to the Hamble along the Bow Lake Stream and overland between the headwaters of the Allington Lane Stream and the Hamble catchment around Horton Heath. Equally the Monks Brook and Tadburn Stream are thought to provide important links to the Test catchment to the west.

6.5.8 Postlethwaite (2010) suggested that a sound pressure level below 50dB$_{ht}$ (*Lutra lutra*) would probably result in a low likelihood of disturbance for otters as it does for humans and many marine species. The report further identifies that most construction activities involving ground penetration or noise would not result in disturbance (i.e. noise levels above 50dB$_{ht}$ (*Lutra lutra*))

[28] Postlethwaite B. February 2010. Noise Quality Assessment Eastleigh River Side Project. Unpublished report by Bureau Veritas on behalf of Eastleigh Borough Council. Cited in AECOM (2015), p.17.

if undertaken over 30m from the watercourse but that some activities (e.g. piling) may disturb up to 80m away. The zone of influence of construction noise on potential otter disturbance could even extend to 100m from individual construction tasks if these are of a highly percussive nature (e.g. driven/impact piling). To be precautionary for the purposes of this HRA any development site which could involve piling within 100m of the River Itchen SAC or tributaries known/likely to be used by otters is screened in for the devising of site-specific measures at the planning application stage.

Impact mechanisms: Solent & Southampton Water

6.5.9 Development whose construction processes emit a level of noise which could change the distribution of qualifying species within a European site or important supporting area, displacing the species from otherwise suitable habitats, could thereby reduce individual survival rates and risk a population reduction. This could be due to the proximity of the development site to the European site / supporting area, or the absence of existing topographic features, structures or vegetation which may serve to sufficiently attenuate the noise, or a combination of both.

6.5.10 Very loud (defined as greater than 70dB) and percussive noises have the potential to disturb birds, increasing time spent alert and in flight, and reducing the time available to feed. Peak levels of sound are most likely to occur from the impact of pneumatic drilling and concrete breaking during site preparation and piling during construction. These activities can have an impact on bird species at a distance of up to 300m. This figure has been used as a worst-case scenario and is based on published research and studies by the Environment Agency for the Humber Estuary Tidal Defences scheme, the Environmental Statement for which states that: "*Sudden noise in the region of 80dB appears to elicit a flight response in waders to 250m from the source, with levels below this to approximately 70dB causing flight or anxiety behaviour in some species.*'' (Environmental Statement for the Humber Estuary Tidal Defences: Urgent works, Paull to Kilnsea and Whitton to Pyewipe, cited in Biodiversity by Design, 2008, p.79).

In combination effects

6.5.11 The following plans/projects may also contribute to noise and vibration within the River Itchen SAC and Solent & Southampton Water SPA/Ramsar:

- Extant planning permissions in Eastleigh borough which are referred to but not proposed by the EBLP;
- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034

- North Solent Shoreline Management Plan (2010) and related coastal strategies
- Hampshire Local Transport Plan (2011-2031)
- Joint Hampshire Minerals and Waste Plan (adopted 2013) (includes Portsmouth, Southampton, New Forest National Park and South Downs National Park)

Evidence of current or future impacts

6.5.12 Table 6.5 below lists the proposed allocations within the EBLP which fall within the relevant screening distances for River Itchen SAC and Solent and Southampton Water SPA/Ramsar. Also listed are extant planning permissions in Eastleigh borough which are referred to (policy DM24) but not proposed by the EBLP and which may act in combination.

Table 6.5: Proposed allocations falling with noise & vibration zones of influence

Site	**≤70m Itchen SAC**	**≤100m Itchen SAC***	**≤300m Solent SPA**
Qualifying feature:	*Fish*	*European otter*	*Waders/wildfowl*
S5 Strategic Growth Option	No	Yes	No
S6 Bishopstoke-Fair Oak link road ^	Yes	Yes	No
S12 Transport infrastructure ^	Yes	Yes	No
DM25 Common Road Industrial Estate	No	Yes	No
DM25 Scotland Close, Fair Oak	No	Yes	No
AL1 Land east of Allbrook Way	No	Yes	No
BO2 West of Uplands Farm, Botley	No	Yes	No
BO3 East of Kings Copse Avenue	No	Yes	No
BU1 Land north of Providence Hill	No	Yes	No
BU2 Heath House Farm	No	Yes	No
BU3 South east of Windmill Lane	No	Yes	No
BU7 Riverside Boatyard	No	Yes	No
CF1 Central Precinct, Chandler's Ford	No	Yes	No
CF2 Steele Close, Chandler's Ford	No	Yes	No
E1 Civic Offices, Eastleigh	No	Yes	No
E6 Eastleigh River Side	Yes	Yes	No
E7 Eastleigh River Side adjacent land	Yes	Yes	No
E9abcd Southampton Airport	Yes	Yes	No
E10 Land south of M27 Junction 5	Yes	Yes	No
E11 Lakeside Country Park (west)	Yes	Yes	No
FO1 West of Durley Road, Fair Oak	No	Yes	No
FO2 Land north of Mortimers Lane	No	Yes	No
FO3 East of Allington Lane	No	Yes	No
FO5 Land East of Knowle Lane	No	Yes	No
FO6 Foxholes Farm, Fair Oak	No	Yes	No
FO8 Hammerley Farm, Horton Heath	No	Yes	No

Site	≤70m Itchen SAC	≤100m Itchen SAC*	≤300m Solent SPA
HA2 Mercury Marina	No	Yes	Yes
HE1 West of Woodhouse Lane	No	Yes	No
HE2 Sunday's Hill / Pewett Hill Close	No	Yes	No
HE4 Peewit Hill Close / Dodwell Ln	No	Yes	No
WE3 Tollbar Way / Berrywood Park	No	Yes	No
Extant planning permissions (DM24)			
Land at Bishopstoke Cemetery, Stoke Common Road	No	Yes	No
Hardings Lane/Crowdhill, Fair Oak	No	Yes	No
Pembers Hill Farm, Fair Oak	No	Yes	No
St Swithuns Church, Allington Lane	No	Yes	No
Land north & east of Boorley Green	No	Yes	No
Land north of Hedge End station	No	Yes	No
Land east of Dodwell Lane & north of Pylands Lane	No	Yes	No
Land south of Ford Road & west of Dodwell Lane	No	Yes	No
Land north of Bridge Rd & west of Blundell Lane	No	Yes	No
Land at Providence Hill	No	Yes	No
Land r/o Orchard Lodge, Windmill Lane	No	Yes	No
Land at Berry Farm, Hamble Lane	No	Yes	No
Land north of Cranbury Gardens	No	Yes	No
Land at Jurd Way, west of Hamble Lane	No	Yes	No
Land south of Bursledon Road	No	Yes	No
14 Hobb Lane	No	Yes	No
North of Botley Road, West End	No	Yes	No
Land at Hatch Farm, north of Barbe Baker Avenue, West End	No	Yes	No
Land at Firtree Lane Horton Heath	No	Yes	No
Chestnut Avenue, Eastleigh	No	Yes	No
59-61 Brownhill Road, Chandler's Ford	No	Yes	No
Land at Fair Oak Road Bishopstoke	No	Yes	No
Draper Tools Ltd, Hursley Road, Chandler's Ford	No	Yes	No
The Mount Hospital Church Road Bishopstoke	Yes	Yes	No
Penarth House, Otterbourne Hill	No	Yes	No
North of Grange Rd, Netley Abbey	No	Yes	No

Site	≤70m Itchen SAC	≤100m Itchen SAC*	≤300m Solent SPA
Maddoxford Lane, Boorley Green	No	Yes	No
Crow's Nest Lane, Boorley Green	No	Yes	No
Land west and south of Horton Heath, Burnetts Lane	No	Yes	No
Land south of Long Garden Cottage	No	Yes	No

* Or within 100m of headwaters & tributaries known/likely to be used by otter, including when moving between catchments

^ Including noise/vibration impacts of the S6 proposed new B3355 Highbridge Road bridge crossing of the River Itchen SAC, and S12 proposals for junction improvements along Bishopstoke Road

6.5.13 The proposals listed in Table 6.5 are taken forward for assessment in view of the River Itchen SAC and Solent and Southampton Water SPA/Ramsar conservation objectives.

6.6 Hydrological Impacts: Strategic Growth Option

6.6.1 This impact pathway relates to the direct, indirect and in combination effects of changes in hydrological flow and quality on River Itchen SAC and Solent Maritime SAC (see Appendix I), including via impacts on the tributaries and headwaters.

Impact mechanisms

6.6.2 The Strategic Growth Option (SGO) north of Bishopstoke and north and east of Fair Oak, delivering approximately 5,200 new dwellings (3,350 within the plan period), requires consideration in relation to a number of hydrological and ecological constraints within the north of the borough that need to be protected within the area and considered when determining housing capacity. In particular, the location of the development and the North Bishopstoke Bypass are within close proximity to the River Itchen SAC designated for its aquatic vegetation and its fish, southern damselfly and otter populations. Impacts to qualifying habitats within the Solent Maritime SAC are perhaps less likely as a result of the SGO other than via potential pollution of the River Hamble and its tributaries, however, other smaller scale development allocations in the south of the borough may also act in combination (see section 6.9).

6.6.3 Headwaters and headwater streams are present throughout the proposed SGO associated with the Lower Itchen and Bow Lake, major tributaries of the River Itchen, and Ford Lake, a major tributary of the River Hamble designated as part of the Solent Maritime SAC and Solent & Southampton Water SPA/Ramsar along much of its length. Headwater springs and headwaters fed by surface flows are present and there is a risk that development will impact on the hydrological functions of the headwaters and associated streams and degrade the River Itchen's and River Hamble's water quality further down the catchments.

6.6.4 Tributaries of the River Itchen, Bow Lake and the Lower Itchen, as well as a number of smaller streams are present within the area proposed for the North Bishopstoke bypass required to serve the proposed development; see Figure 6.7. The proposed road routes cross these streams and changes in hydrology could have an impact on the water quality and flows within the catchment and cause a significant impact on the River Itchen SAC, especially when viewed in-combination with the other sites allocated within the Local Plan . Similarly Ford Lake, a major

tributary of the River Hamble, runs through the east of the SGO. Changes in hydrology could have an impact on the water quality and flows within this catchment and cause a significant impact on the Solent complex, especially when viewed in-combination with the sites allocated within the Local Plan discharging into the Hamble catchment.

6.6.5 To establish the value of the headwaters and associated streams to the designated sites, Eastleigh Borough Council has undertaken two targeted surveys. The aim of the surveys was to investigate the botanical and invertebrate interest of the headwaters. The botanical survey showed that some of the headwaters had been damaged by agricultural drainage, however many of the headwaters and their streams were of excellent quality still containing a good ancient wet woodland flora.

6.6.6 The invertebrate survey showed that the headwaters are not particularly biodiverse in respect of invertebrates, with the headwater springs and streams scoring either average or poor. However it is thought that the headwaters are likely to be important to the functioning of the River Itchen and the survival of flora and fauna species further downstream.

6.6.7 In respect of the Hamble all headwaters of Ford Lake were found to be dry however it was acknowledged that this situation is likely to alter during the winter months. No species associated with the European designation for either River were found in the headwater ecosystem in either the botanical or invertebrate survey, however, otters are thought to use the headwater streams and Bow Lake and the Lower Itchen are important for their migratory fish communities.

6.6.8 To examine the likely extent of hydrological impacts associated with the SGO, the Council commissioned the *Eastleigh Hydrological Sensitivity Study* (JBA Consulting, February 2018). The main report and technical appendices were extensively reviewed by a hydrogeologist member of the HRA team, and identified the following main impact pathways to be considered in the assessment.

Barriers to surface water and groundwater movement

6.6.9 Changes to the hydrological flow regime with the catchment are likely to be caused by:

- Impassable objects within the current surface water (above ground/overland) flow path e.g. buildings, structures, road network, and bridges.
- Impassable objects within the current ground water (underground) flow path e.g. buildings footprints and foundation, services and bridges.

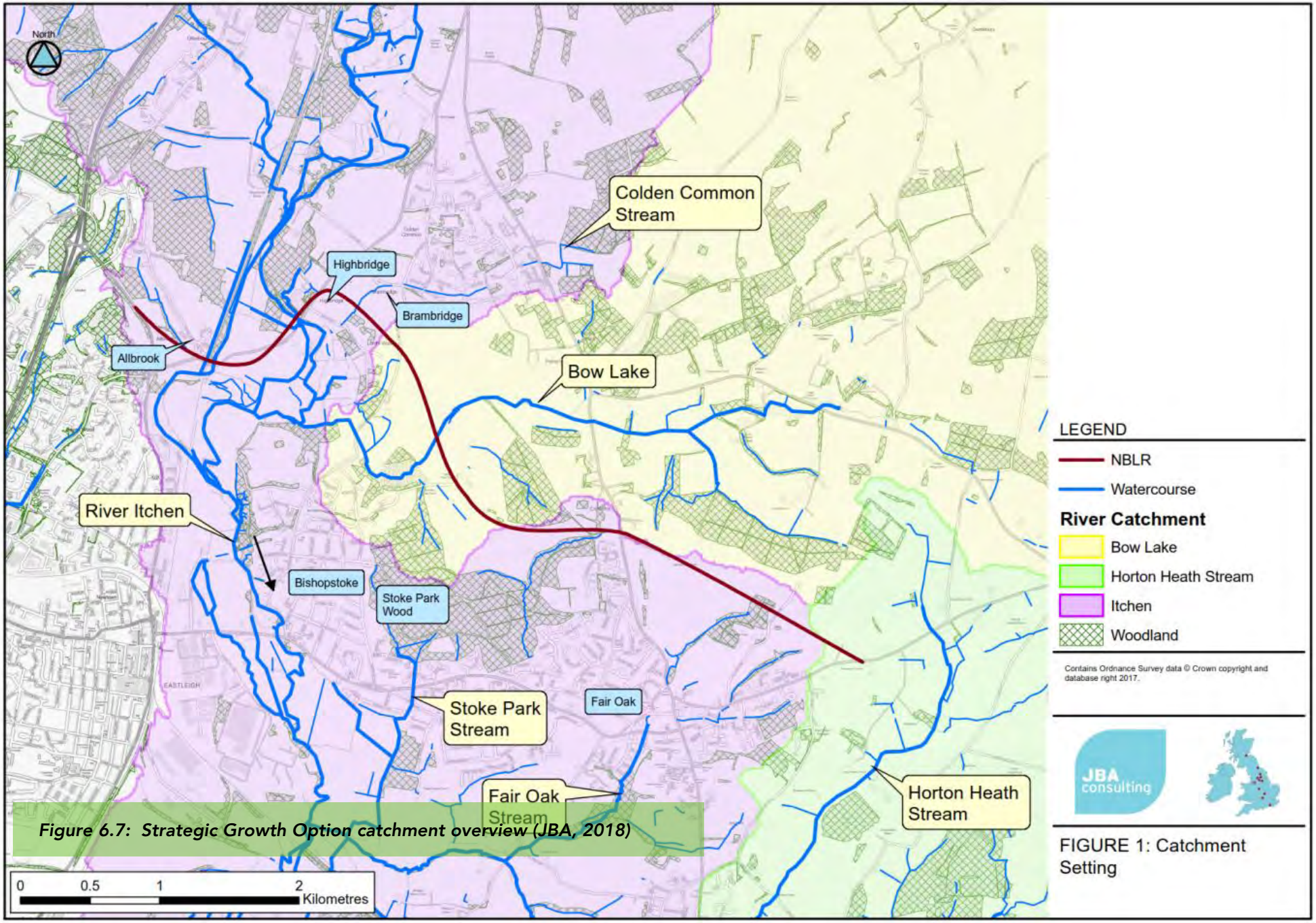


Figure 6.7: Strategic Growth Option catchment overview (JBA, 2018)

- Changes in topography which impact the current fall and flow pathways and rates for surface water.
- Increase in groundwater flooding and groundwater build up where deep structures are constructed which impede natural flow paths, such as bridges.
- Increase in surface water runoff rates where areas of hardstanding are increased through proposed development.
- Increased flow from headwaters associated with changes in surface water runoff from proposed development. Possible increased/reduced volume, leading to increased erosion downstream or reduction in mobilisation of fine sediments within channels.
- Reduction in groundwater filtration and subsequent groundwater recharge due to increased area of building footprint and hardstanding.
- Degradation of groundwater quality due to altered flow pathways (applicable on sites where contaminants may be present).

Water quality and diffuse pollution

6.6.10 A number of current land uses have been identified that pose an existing risk to water quality and may be resulting in areas of diffuse pollution. In addition further potential risks/areas have been identified as part of proposed future development within the plan.

6.6.11 The borough contains areas of high quality agricultural land (Grade 1-3) particularly in the southern part of borough. The plan discusses the aim to bring more of this land into beneficial use with opportunities for food production considered to be of increasing importance, including proposed farming, community farming, allotments and home growing. Agricultural land can lead to diffuse pollution by way of fertiliser run off, livestock manure, silage effluent and soil erosion from ploughed fields. As such there is the potential that current runoff is resulting in a risk to surrounding areas and ecological receptors. In addition an increase in the use of agricultural land may lead to an increase in diffuse pollution, which would need to be considered further with appropriate mitigation/monitoring applied and in line with the recent DEFRA Soil Management Plan[29] to address causes of pollution from agricultural land.

6.6.12 The discharge and runoff from urban drainage, engineering works such as road improvement schemes, contaminated land and other industrial and domestic sources also results in pollution of groundwater and surface water. This can result in an overall deterioration of water quality locally as well as on a more wide spread scale, which in turn is likely to impact the ecology within designated sites and surrounding areas. Where likely significant impacts are identified, mitigation measures will be required to be incorporated into current and proposed developments to reduce/remove combination effects with improvements incorporated into maintenance and upgrades.

[29] Defra (2018): *Rules for farmers and land managers to prevent water pollution: What you must do to manage manure, fertiliser and soil to prevent runoff, erosion and leaching.* Accessed online [10/4/18] at: https://www.gov.uk/guidance/rules-for-farmers-and-land-managers-to-prevent-water-pollution

6.6.13 The increase in urban and developed areas can result in an increase in suspended solids within surface water as a result of run off from development works and soil erosion within urban areas which can have an impact on the quality of the water bodies. In addition increased suspended solids can also result in changes to the flow path for the runoff as sediment can become deposited altering the natural flow paths. Where additional sediment is deposited within the river system this can impact upon migratory and spawning fish and feeding patterns. Where likely significant impacts are identified, mitigation measures will be required to be incorporated within proposed development in order to reduce the creation and mobilisation of suspended solids, a key element being the preparation of Construction Environment Management Plans to determine how drainage will be managed during the construction works where soils are being moved around site at which time here is a high risk of mobilising soils into suspension.

6.6.14 Changes in nutrient, organic or chemical loading can result in eutrophication, which can be harmful to the species which may be present or protected within the designated sites. This again links back to the requirement to minimise the migration of suspended solids within the river networks and to ensure that suitable investigations are undertaken to assess the contaminative status of the site at an early stage in order to determine if there is an increased risk of chemical loading associated with sites due to previous land uses. Where likely significant impacts are identified, project proposers will be required to ensure appropriate remediation works are carried out.

6.6.15 Changes in flow paths and an increase in hardstanding as a result of future developments may also result in increased surface water flooding, as such increased storage capacity should be allocated within proposed development in order to offset this with the use of sustainable urban drainage schemes and green infrastructure incorporated wherever possible.

In combination effects

6.6.16 The following plans/projects may also contribute to hydrological impacts:

- Extant planning permissions in Eastleigh borough which are referred to but not proposed by the EBLP;
- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034
- North Solent Shoreline Management Plan (2010) and related coastal strategies
- Joint Hampshire Minerals and Waste Plan (adopted 2013) (includes Portsmouth, Southampton, New Forest National Park and South Downs National Park)

Evidence of current or future impacts

6.6.17 The River Itchen is fed by three major tributaries in its upper reaches (north of Eastleigh Borough), the Candover Steam, River Alre and the Cheriton Stream. The headwaters assessment undertaken by JBA (February 2018) has highlighted that a large majority of the headwater streams within the Borough that join the main chalk fed river channel are located within areas of lower permeability deposits (London Clay) and as such surface water flows, runoff and direct discharges are the key in forming the primary flow to the upper tributaries within the Borough. These tributaries then join with the lower River Itchen tributaries which cross the Whitecliff Sand Member and then the Wittering Formation prior to joining the main chalk fed river channel.

6.6.18 The Lower Itchen Catchment has been noted to have a strong groundwater fed element, but again this is noted to come from further up the catchment. The key element associated with the Lower Itchen Catchment is noted to be the contribution of surface water, with the eastern part of the area draining into the Upper Hamble Catchment (Solent Maritime SAC). Bow Lake watercourse is located in the north of the study area draining to the Lower Itchen, while the upper Hamble Catchment and drains to the south. Both the River Itchen SAC and River Hamble flow south and drain into the Solent & Southampton Water SPA/Ramsar or the Solent Maritime SAC.

6.6.19 The report concluded that the risk to the surface water component of the River Itchen is highly sensitive, with the impact to surface water within the Bow Lake and Headwaters, River Itchen tributaries and Headwaters and Horton Health Stream and Headwaters to be moderate. The impact to groundwater where chalk base flow is present is also considered to be high together with associated abstraction of groundwater. It is also noted that development resulting in an impact to the headwaters could lead to increased surface water flows and subsequent erosion downgradient, which may have negative impacts on the River Itchen SAC.

6.6.20 Whilst sensitivity to development in these areas was noted to be high to moderate, a range of appropriate mitigation measures have been defined as detailed within Submission Local Plan and within JBA SuDs strategy (March 2018) which would continue to be protective of the River Itchen SAC and associated tributaries. Given that a large proportion of the flow with the upper reaches of the River Hamble and River Itchen is surface water driven, there is also an opportunity to enhance the quality of surface water flows resulting from new development areas, to help to improve the overall water quality of surface water entering the tributaries and River Itchen SAC. However the flow is likely to require an element of channelling so that it continues to discharge to the tributaries of the River Itchen and River Hamble, and may also require measures to control peak flow to prevent erosion downgradient and possible flooding during storm periods. Mitigation measures should include design of road routes and crossings to ensure they do not alter the fluvial form of the river or impede transport within the river and they should be assessed further once the design for such structures is known.

Hydrological Impacts

6.6.21 The proposed strategic expansion of Fair Oak and Bishopstoke to the north/north-east with related development in Allbrook village can be spilt into two main areas. The eastern area

appears to represent a less sensitive location with respect to hydrological impacts as it is noted to be located away from the River Itchen SAC and associated braided channel and water meadows, however, mitigation measures should still be applied to ensure that appropriate buffer zones (Figure 6.8) interconnect with respect to habitats.

6.6.22 The western area is noted to contain the River Itchen SAC, with the Bow Lake stream proposed to be crossed as part of the development plan. This water body is identified by the Environment Agency as having a number of water quality issues, which subsequently result in a source of sediment and pollutants within the River Itchen SAC. The future scale of additional impact from development within this area without appropriate mitigation measures is considered to be high. As such development should not only include mitigation but provide improvements as well.

6.6.23 The JBA (2018) Flood Estimate Report which has been undertaken to derive peak flow estimates and hydrographs via modelling for Horton Heath Stream (Ford Lake) a tributary to the River Hamble in order to assess the headwater streams, demonstrates that the Horton Heath Stream and its tributaries are underlain by impermeable underlying strata. This correlates with the geology data which indicated the catchment is underlain by the London Clay Formation comprising soils which exhibit a slow permeability, supporting the assessment of primarily overland flow in these areas.

6.6.24 The Hydrological Assessment of the Itchen Headwater tributaries for application in hydraulic modelling (peak flow estimates on headwater stream within the River Itchen Catchment) undertaken by JBA (2018) has highlighted the high permeability of the Bow Lake Catchment due to chalk underlying most of the catchment, with headwaters underlain by London Clay in contrast to the rest of the catchment. This therefore determines the behaviour or the headwaters in response to heavy rainfall events, however, these are estimated due to the ungauged nature of these tributaries.

6.6.25 The Environment Agency provided details of abstraction licences within the vicinity of the project area. There are six groundwater licences, all for agriculture. Grid references indicate that the majority of the licences are north/north east beyond the project area, and fall within the Chalk. There is one which may lie between Fisher's Pond and Stoke Park Farm, used for fisheries. Nonetheless, given its location on the London Clay, it is likely that the abstraction in fact penetrates the deeper Chalk. As such, it is not considered that these abstractions are part of any hydrological sensitivity within the project area. The project area does not lie within any Source Protection Zones, which all lie to the north east, predominantly within the Chalk. Nonetheless, as the boundary between the London Clay and the Lambeth Group and Chalk is approached, the London Clay will become thinner and provide less protection to these underlying strata.

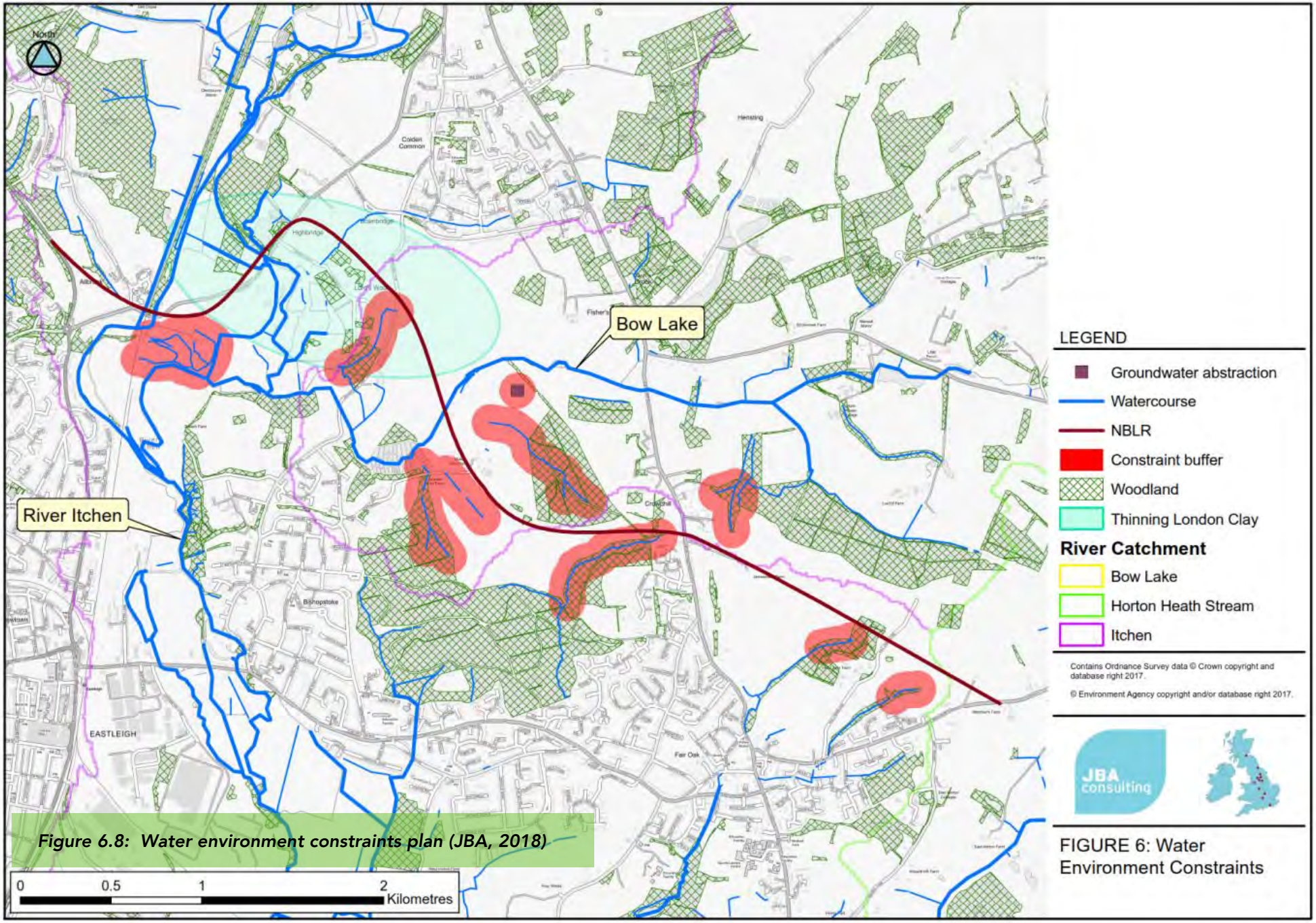


Figure 6.8: Water environment constraints plan (JBA, 2018)

6.6.26 The Hydrological Sensitivity Study undertaken by JBA (2018) to provide a holistic picture of water flow within the River Itchen catchment tributaries and hydrological sensitivities within the north of the borough aimed to assess the processes that are important to the headwaters and associated streams and whether they are surface water, groundwater or spring fed or a combination of all three. This is intended to address the main issues raised by the EA in relation to the proposed north of Bishopstoke line Road (NBLR):

- Crossing the floodplain and associated floodplain storage compensation;
- Impacts on conveyance and flow route of flood and surface water;
- Potential surface water disposal method such as SuDS; and
- Water quality and pollution prevention methods.

6.6.27 Elevations across the catchment were noted to vary from -10m AOD in the south to 62m AOD in the central part and -20m in the north close to the Itchen. The land uses were noted to comprise a mixture of residential development, Forestry Commission managed woodland and in the north a mixture of arable and grazing with isolated areas of woodland. In addition a series of ponds were present at Stoke Common, utilised as a fish farm.

6.6.28 The site walkover undertaken by JBA coincided with a sustained period of dry weather, in addition the nearest gauging station was noted to be at Highbridge and Allbrook. As noted previously the lower Itchen tributaries are noted to have headwaters primarily on London Clay outcrops. Regional groundwater levels across varying sources have previously demonstrated the groundwater to be between 2m below ground level and 24m bgl, as such anecdotal evidence suggest large fluctuations >10m occur in the Fair Oak area due to run off from the London clay recharging the Whitecliff sands and causing a temporary rise in groundwater.

6.6.29 Modelling of the upper tributaries has assumed an interaction exists between the River Itchen and the floodplain. The results show some change in maximum extent and levels in the vicinity of the downstream boundaries modelling, however upstream, limited changes were observed. However the modelling has not included bridges and other structures and as such could lead to an underestimation of flood extent/depth where a structure causes a significant afflux. The modelling has identified that the floodplains for the streams are limited, with data suggesting confined floodplains in the smaller headwater valleys.

6.6.30 The hydrological assessment undertaken by JBA Consulting (Geomorphology and Ecology Assessment v1.10, 2018) presents advice in relation to the alignment of the proposed North of Bishopstoke Link Road (NBLR) which crosses several watercourse including Bow Lake, Colden Common streams and the River Itchen SAC which constitute ecological and hydrological constraints to the development. JBA assessed the preferred option for the route in order to demonstrate that existing hydrological flow and stream systems can maintain their current function.

6.6.31 Whilst the overall River Itchen values indicate strong groundwater component this is derived from the chalk aquifer further up gradient. However surface water plays a much greater role in the lower headwater in the study area, most of which are on the London Clay, although the

sand member formations may supply some perched groundwater to the headwater streams and wet woodland. Given the low or absent flows within the headwater streams during parts of the year these waters are considered unlikely to make a significant contribution to the hydrological conditions required by the River Itchen SAC. However the primary headwater streams provide functions of retention of sediment water and organic matter, nutrient reduction and wildlife corridors. As such it is considered that the risk of development in the vicinity of the headwater is low subject to the proposed mitigation and design measures.

6.6.32 With respect to the proposed route option selected for the NBLR this has been selected to:

- Minimise the number of river crossings required;
- Utilise, upgrade or replace existing structures where suitable and if environmental improvements can be made, prior to new constructions.

6.6.33 The assessment has considered the potential sediment and morphological impacts considering both local and wider impacts. Possible hydromorphic processes were assessed including potential modifications e.g. weirs, hard bank protection, bridges and culvers within the channel and floodplain.

6.6.34 The proposed area of the NBLR is noted to extend ~6km from northwest to south east traversing a number of tributaries and streams. Most of the small tributaries of the River Itchen arise within the vicinity of Stoke Park Wood and flow south through Bishopstoke to join the River Itchen north of the Railway ditch, with the small tributaries further east in Fair Oak also discharging via the same route to the main river Itchen stretch via Quobleigh Pond. The tributaries in the very east of the area flow into Horton Heath Stream which joins the River Hamble just south of Bishops Waltham. No sinks are mapped in the area so it is assumed that full connectivity exists.

6.6.35 Loss of headwater streams can impact on water quality and ecology downstream and often react to seasonal changes in flow and groundwater levels and therefore do not have a permanent flow. Twenty headwater locations were identified for consideration by JBA. Overall it is noted that most headwater streams arise within an area of London Clay Deposits with some over the Whitecliff Sand Member. A number of sites which flow into Bow Lake flow entirely over London Clay including the confluence of Bow Lake itself to the point of its confluence with the River Itchen. During the site visit most of the headwater sites were noted to have no flowing water but the gully base remained damp, likely to be retained run off or perched water within the more permeable Wittering Formation supplying the headwaters. Those habitats which are deemed to have a greater groundwater dependence tend to be those within wet woodland, however groundwater dependence would be attributed to low permeability deposits where rainfall-runoff is retained in gullies. It is noted that none of the SAC qualifying flora and fauna are observed within the headwaters or the lower Itchen Tributaries.

Potential Impacts associated with River Channel

6.6.36 The JBA report has highlighted a potential risk from the construction of the proposed North of Bishopstoke Link Road (NBLR) due to the new bridge crossing over the River Itchen SAC and SSSI or impacts on the immediate surrounds of the designated sites. However the construction

of the road is considered to be an essential element in relation to the proposed development strategy. At this stage detailed design has not been undertaken for the proposed road construction. The detailed design stage should only allow designs that will reduce or control the associated risks.

6.6.37 Currently the proposal has identified the following potential impacts and constraints in relation to the proposed road alignment, which will be subject to further scrutiny during detailed design for the proposed road construction:

- Bridge crossings have the potential to influence local river conditions e.g. channel width constricting or widening, steepness of banks, size of bed sediments and velocity/sheer stress of water upstream and downstream of crossing point;
- Channelling widening up and downstream may lead to reduction in velocity and an increase in fine sediment deposition and altered grain size distribution;
- Changes in flow velocity can lead to bank erosion in vicinity of structure e.g. modifying channel morphology due to increase velocity and turbulent flows, scour and bed degradation, and potential to modify the riffle pool spacing observed by JBA on site;
- Roads and bridges across functional floodplains can alter flow paths, changing timing of flood pulses and altering responses to the river during the flood event. Potential risk upstream due to lack of capacity beneath the structure, blocking flow;
- Due to the impacts on channel dimensions and flow conditions bridge crossing can fragment aquatic habitats and negatively impact stream morphology;
- Water quality of watercourses receiving the new road drainage could be adversely impacted by the routine runoff and the emergency spillages;
- The development could block off existing overland surface water pathways conveying water to streams and also alter the natural runoff chemistry; and
- Natural infiltration of surface water into ground feeding the shallow perched water across the assessment area could be significantly reduced.

6.6.38 This impact pathway is carried forward for assessment in view of the River Itchen SAC conservation objectives.

6.7 Land outside European Site Boundaries: Solent European Sites

6.7.1 This impact pathway relates to direct and in combination effects on land which is functionally connected to Solent and Southampton Water SPA/Ramsar (see Appendix I).

Impact mechanisms

6.7.2 Whereas the Solent Recreation Mitigation Partnership seeks to manage impacts to overwintering birds within the SPA/Ramsars, the *Solent Waders and Brent Goose Strategy* (SWBGS Steering Group, interim report May 2019) aims to avoid impacts to qualifying species using land outside of the designated sites which have a functional role in supporting waders and Dark-bellied Brent goose at high-water. The Strategy promotes the protection of areas

regularly used by these species, or which may become regularly used in the future, from development and increased recreational use through the planning system.

6.7.3 Dark-bellied Brent goose feeds mainly on beds of eelgrass and other vegetation in the intertidal zone. At high tide, and especially later in the season when intertidal vegetation has either died-back or become depleted through grazing, the birds make use of grasslands and arable fields within 5km of roost areas (Stroud *et al.*, 2016) to supplement their diet. In the south Hampshire area the availability of alternative feeding sites for Brent geese are at a premium due to a heavily urbanised landscape, while sites close to the coast which remain undeveloped are often subject to high visitor pressure, especially amenity grasslands, parkland and playing fields.

6.7.4 The Solent's intertidal habitats, its mudflats, shingle and saltmarsh provide vital feeding and roosting grounds for wading birds. Waders are adapted to feeding in wetlands, adopting a variety of tactics to feed on invertebrates such as worms and molluscs, and in some cases fish that occupy the mudflats of estuarine areas. The pattern of movement of wading bird communities is dependent on time of day, tidal water movements and weather conditions. Most species feed at low tide and roost at high tide. Natural roosting sites include saltmarsh areas, shingle banks and coastal grasslands but waders are also known to roost on built structures such as boats, wharfs, jetties and piers. Roosting sites tend to be close to the coast, often within 100m from mean high water, have good visibility and are usually situated away from sources of disturbance, such as housing and industry (King, 2010).

6.7.5 The EBLP could have a negative effect on Brent geese and waders overwintering in the Solent due to development in the coastal zone resulting in losses of areas of functionally connected land used by the species for feeding or roosting at high tide. Loss of functionally connected land to development of any kind could, unless mitigated, reduce the overall extent of habitats which support the Brent goose and wader populations within the SPA/Ramsar. Residential development may be of greater concern where it is of a scale or location which could increase disturbance to adjacent areas of supporting habitat, thereby reducing the suitability of land left undeveloped as well.

6.7.6 The Solent Waders and Brent Goose Strategy (SWBGS Steering Group, interim report May 2019) aims to protect the network of non-designated terrestrial wader and Brent goose sites that support the SPA. It classifies sites as Core Areas, Primary Support Areas, Secondary Support Areas, Low Use sites and Candidate sites. A framework for guidance on mitigation and off-setting requirements for each classification is proposed to achieve the long-term protection of the wider Brent goose and wader network of sites.

In combination effects

6.7.7 The following plans/projects may also contribute to impacts to land outside European Site Boundaries (Solent European Sites):

- Extant planning permissions in Eastleigh borough which are referred to but not proposed by the EBLP;
- Fareham Borough Development Sites and Policies Plan (adopted 2015)

- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- PUSH Spatial Position Statement 2016-2034

Evidence of current or future impacts

6.7.8 The only site proposed for allocation within the EBLP close to a Brent goose / wader site is HA2 Mercury Marina and Riverside Camping and Caravan Park. There are no extant planning permissions in Eastleigh borough (policy DM24) which overlap with a Brent goose / wader site.

6.7.9 HA2 partially overlaps with the northern extremity of Brent goose / wader site E13 (Figure 6.9), a Low Use site with a maximum count of 26 birds over 19 recorded sightings of species including curlew, grey plover, lapwing, oystercatcher, redshank and dark-bellied Brent goose. The overlap extends to c.0.083ha but E13 extends another c.670m south and has a total area of c.12ha. Aerial photography shows the northern third of E13, broadly coinciding with Mercury Marina Saltmarsh SINC, to be dominated by deciduous woodland which is unsuitable for feeding Brent goose or roosting waders. The EBLP is therefore unlikely to result in significant effects on the Solent and Southampton Water SPA/Ramsar either alone or in combination with other plans and projects. Impacts to land outside European Site Boundaries (Solent European Sites) can be screened-out of the HRA process without relying on mitigation measures.

6.8 Impacts on Otter outside European Site Boundaries

6.8.1 This impact pathway relates to direct effects on otter using foraging and dispersal routes in relation to the River Itchen SAC (see Appendix I).

Impact mechanisms

6.8.2 The European otter *Lutra lutra* was made extinct in the Itchen Valley by the middle of the 19th century following years of persecution. Otters returned to the Valley during the late 1970s and early 1980s supported with reintroductions in the 1990s. The Itchen Valley now supports a viable otter population but this is subject to a number of pressures. Otters are largely nocturnal spending the day in secure holts. Typically these are provided by holes under riverside trees but can also be above ground in areas of thick undisturbed vegetation such as reed beds and dense wet woodland and scrub.

6.8.3 Otters will travel many kilometres along the river and its tributaries each night passing through the centre of urban areas such as Winchester and Eastleigh. They are particularly vulnerable to road traffic accidents where roads and motorways cross rivers. Otters are also vulnerable to certain types of disturbance, especially to their natal holts used for breeding. Although regular daily otter movements are normally within the catchment of their home river, otters also disperse to and from the Itchen Valley to neighbouring river catchments, in particular to the Test and New Forest to the west and to the Hamble and Meon to the east. Otters also move to the coast, particularly during the winter months and may move between river catchments using the coastline.

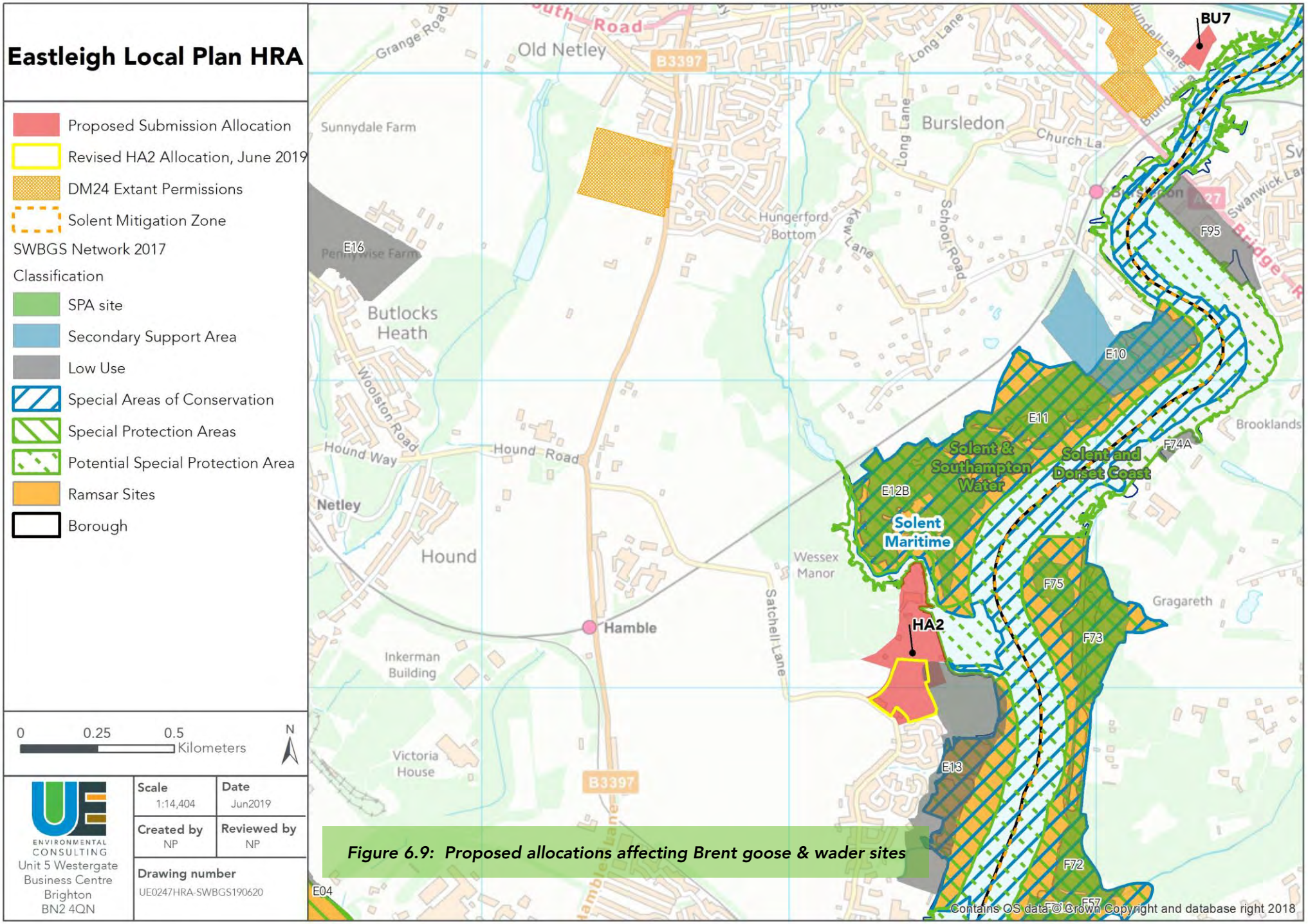


Figure 6.9: Proposed allocations affecting Brent goose & wader sites

6.8.4 Of particular importance are the links to the Hamble along the Bow Lake Stream and overland between the headwaters of the Allington Lane Stream and the Hamble catchment around Horton Heath, as shown on Figure 6.10. Equally the Monks Brook and Tadburn Stream are thought to provide important links to the Test catchment to the west.

In combination effects

6.8.5 The following plans/projects may also contribute to impacts on the River Itchen otter population:

- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034

Evidence of current or future impacts

6.8.6 The worst otter road accident blackspots in Hampshire are where the A303 crosses the Anton (a tributary of the River Test) at Andover and the A31 crossing of the River Avon at Ringwood. There have been only two otter road deaths near Eastleigh in recent years (pers. comm. 2018b). Both were about 300m outside of the Borough, in the Bow Lake Stream catchment. One was on the B3354 near Fishers Pond the other was on the B2177 further up the Bow Lake catchment, where there are a series of fish ponds.

6.8.7 Although these dead otters were just outside of the Borough boundary they were on roads that will carry more traffic as a result of planned housing development in the Local Plan. A potential increase in road traffic accidents involving otters arising from an increase in vehicle movements in Eastleigh is considered by the Environment Agency to constitute a likely significant effect. The effect is unlikely to be discernible from individual development allocations, other than the SGO, but could be significant in combination with other proposals in the EBLP; as such the screening assessment at Appendix I lists impacts to otter outside of the European site boundary under strategic policies but not individual site allocations. The proposed new bridge crossing over the SAC at B3355 Highbridge Road, depending on its design, could also increase mortality risk to otters moving along this stretch of the river. This impact pathway is carried forward for assessment in view of the River Itchen SAC conservation objectives.

6.9 Non-native Species and Site-specific Hydrological Impacts

6.9.1 These impact pathways relate to the direct and in combination effects of non-native species and construction-related water quality impacts on the River Itchen SAC and Solent Maritime SAC (see Appendix I).

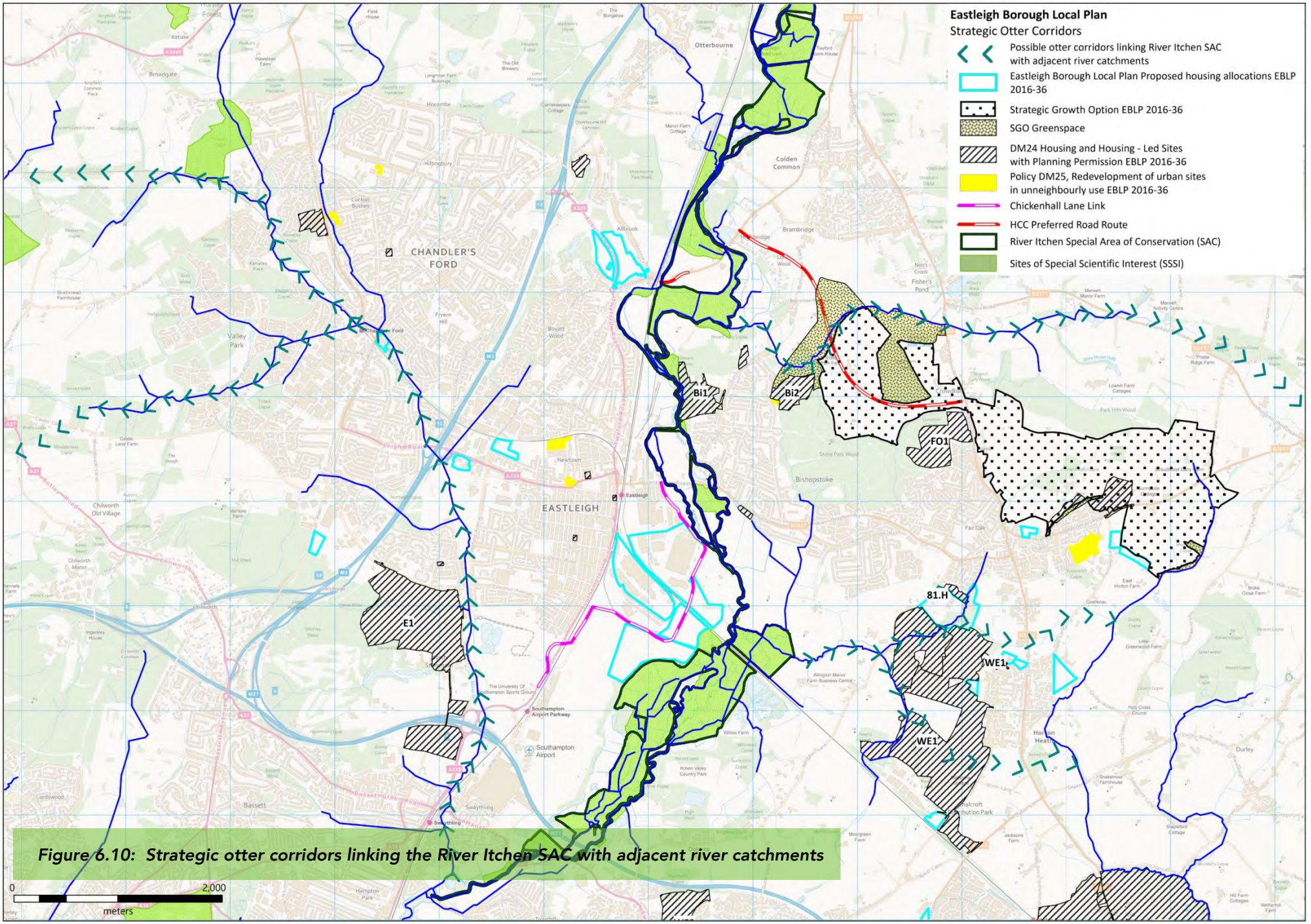


Figure 6.10: Strategic otter corridors linking the River Itchen SAC with adjacent river catchments

Impact mechanisms: non-native species

6.9.2 A frequent concern in habitat management is the control of unwanted plant species, such as non-native species that out-compete native vegetation. This is primarily an issue relating to protected habitats due to the ability of non-native species to alter habitat composition, leading to impaired species diversity. In extreme circumstances invasive species can change habitat structure, water chemistry and invertebrate diversity/abundance, and can also increase flood risk by choking drainage channels with excess vegetation.

6.9.3 Invasive plants are introduced species that can thrive in areas beyond their natural range of dispersal. These plants are characteristically adaptable, aggressive, and have a high reproductive capacity, a vigour which combines with a lack of natural graziers to lead to outbreak populations. Nationally, examples include Japanese knotweed *Fallopia japonica,* giant hogweed *Heracleum mantegazzianum,* Himalayan balsam *Impatiens glandulifera,* floating pennywort *Hydrocotyle ranunculoides* and creeping water primrose *Ludwigia peploides*.

6.9.4 Non-native species can be introduced via naturally dispersed seeds and spores, via the aquatic environment, as escapees from domestic and ornamental gardens, ponds and aquaria, and direct introduction via transportation networks, poor biosecurity measures, and through the dumping of garden waste. Residential developments in close proximity to river and stream corridors can significantly increase the risk of non-native species being introduced, particularly non-native plant species resulting from garden waste, soil/rhizomes and seed dispersal.

6.9.5 Non-native faunal species are also a concern; signal crayfish *Pacifastacus leniusculus* is driving native crayfish towards extinction through the spread of crayfish plague and competition for resources (refuges in particular). Signal crayfish grow faster, are more fecund, more aggressive and are tolerant of a wider range of conditions than the white-clawed crayfish, and therefore out-compete the native species[30]. They eat more than white-clawed crayfish, feeding on fish and amphibian eggs, tadpoles, juvenile fish, aquatic invertebrates, detritus and aquatic vegetation and so may reduce populations of native species and affect food webs. Signal crayfish was introduced to be farmed for food, but escaped and spread rapidly through water courses and across land; as such it is less likely to result from developments proposed by the EBLP.

Impact mechanisms: site-specific hydrological impacts

6.9.6 This pathway is defined as impacts from construction activities on sites potentially containing contaminants whose mobilisation during remediation, demolition or construction could result in pollution of a qualifying habitat or habitat of a qualifying species, thereby limiting the function of the habitat or altering the supporting processes on which it relies. This could occur by introducing pollutants to an aquatic environment that is hydrologically connected with the designated habitat. Impacts could also occur as a result of a pollution incident during construction on a site which is hydrologically connected with a qualifying habitat or habitat of a qualifying species, regardless of whether the allocation site is thought to be contaminated.

[30] GB Non-native Species Secretariat: Signal Crayfish, *Pacifastacus leniusculus*. Accessed online [9/5/18] at: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2498

6.9.7 The discharge and runoff from urban drainage, engineering works such as road improvement schemes (e.g. the new Allbrook Hill-Bishopstoke-Fair Oak link road, including the new bridge over the Itchen at B3355 Highbridge Road), contaminated land and other industrial and domestic sources also results in pollution of groundwater and surface water. This can result in an overall deterioration of water quality locally as well as on a more wide spread scale, which in turn is likely to impact the ecology within designated sites and surrounding areas.

6.9.8 During the operational phase, the increase in developed areas can result in an increase in suspended solids within surface water and impact upon water quality in receiving waters. Depending on their composition, suspended solids can lead to changes in nutrient, organic or chemical loading. In addition increased suspended solids can alter the flow path for the runoff as sediment becomes deposited altering natural flow paths. Where additional sediment is deposited within the river system this can impact upon migratory and spawning fish and feeding patterns.

In combination effects

6.9.9 The following plans/projects may also contribute to the introduction of non-native species to the River Itchen SAC and Solent Maritime SAC:

- Extant planning permissions in Eastleigh borough which are referred to but not proposed by the EBLP;
- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034

Evidence of current or future impacts

6.9.10 Natural England's latest condition assessments[31] for River Itchen SSSI make specific mention of invasive species and water pollution for management units in unfavourable condition, including:

- Unit 79 (Twyford): With the correct management a more diverse swamp community could be restored. Management should include scrub clearance, thinning of non-native trees and removal of [invasive] orange balsam.
- Unit 99 (Bishopstoke): Failed on cover of negative and invasive species (nettles and Himalayan balsam).

[31]Natural England: Designated Sites View: Condition of SSSI Units for Site River Itchen - 2000227 SSSI [accessed online 9/5/18]: https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S2000227&ReportTitle=River%20Itchen%20-%202000227%20SSSI

- Unit 105 (Old Alresford): Water quality: No data for BOD (Biochemical Oxygen Demand) but as meets target downstream, inferred compliance. Passes for DO (Dissolved Oxygen). Passes for un-ionised and total ammonia. Fails on Total Reactive Phosphate (growing season and annual mean). No data for Trophic Diatom Index (indicator of nutrient enrichment). No data on other pollutants. Some Diffuse Water Pollution Plan actions under way, together with recent changes to watercress farms and fish farm operations via EA permitting, although many actions still to be implemented.
- Unit 106 (Itchen Stoke-Itchen Abbas): Non-native invasive species – monkey flower (Mimulus) and orange balsam found in River Habitat Survey transect, the latter is increasing in distribution... Water quality: No data for BOD (Biochemical Oxygen Demand) but as meets it downstream, inferred compliance. Marginal failure for DO (Dissolved Oxygen). Passes for un-ionised and total ammonia. Fails on Total Reactive Phosphorous (growing season and annual mean). No data for Trophic Diatom Index (indicator of nutrient enrichment). Fails on other pollutants due to presence of tributyl tin – although source of this is unknown, and more likely in lower reaches.
- Unit 107 (Easton-Eastleigh): Non-native invasive species – monkey flower (Mimulus) and orange balsam found in River Habitat Survey transect, the latter is increasing in distribution... Water quality: Passes for BOD (Biochemical Oxygen Demand), DO (Dissolved Oxygen), un-ionised and total ammonia. Fails on Total Reactive Phosphorous (growing season and annual mean). Fails on Trophic Diatom Index (indicator of nutrient enrichment).
- Unit 142 (Alresford-Itchen Stoke): Non-native invasive species – monkey flower (Mimulus) found in River Habitat Survey transect, but orange balsam also known from this reach and distribution likely to be increasing as so far unmonitored... Possible signal crayfish sightings, posing further risk to native crayfish population... Water quality: No data for BOD (Biochemical Oxygen Demand) but as meets target downstream, inferred compliance. Passes for DO (Dissolved Oxygen), un-ionised and total ammonia. Fails on Total Reactive Phosphorous (growing season and annual mean). No data for Trophic Diatom Index (indicator of nutrient enrichment).
- Unit 143 (New Cheriton-Ovington): Water quality: No data for BOD (Biochemical Oxygen Demand) but as meets it downstream, inferred compliance. Marginal failure for DO (Dissolved Oxygen), reasons currently unknown. Passes for un-ionised and total ammonia. Fails on Total Reactive Phosphorous (growing season and annual mean). No data for Trophic Diatom Index (indicator of nutrient enrichment). No data on other pollutants.

6.9.11 Natural England's supplementary advice[32] for Solent Maritime SAC makes specific mention of invasive species and water pollution in relation to the following features and attributes:

- Structure and function (vegetation – undesirable species): Annual vegetation of drift lines and Perennial vegetation of stony banks: The 2013 survey of vegetation across the

[32] Natural England: Designated Sites View: Solent Maritime SAC supplementary advice [accessed online 9/5/18]: https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK0030059&SiteName=solent&SiteNameDisplay=Solent+Maritime+SAC&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

Solent shoreline (King *et al*. 2014) did not identify any significant stands of undesirable species within the Solent Maritime SAC. The report concludes that invasive non-native species do not appear to be having a significant effect on the vegetation communities of the Solent shingle stands surveyed, though beach rose *Rosa rugosa* was noted as expanding on some sites. Annuals or short-lived perennials such as *Conyza*, *Oenothera* and red valerian *Centranthus ruber* were present especially on more urban sites, but it is not clear whether they are having an adverse effect on the native vegetation communities.

- Structure (non-native species and pathogens): Intertidal and subtidal habitats: The 2012 Cefas report found the Solent area to have a high likelihood of introduction for all species via the five main pathways (commercial shipping, recreational boating, aquaculture, live seafood trade and natural dispersal; Pearce et al., 2012). The large volume of shipping in the Solent means it is susceptible to the introduction of non-native species from ballast water or anchor lines. Much of the available data is from harbours and marinas. Species known to be within the SAC include the American hardshell clam *Mercenaria mercenari*, solitary sea squirt *Styela clava*, soft clam *Mya arenaria*, Pacific oyster *Crassostrea gigas* and slipper limpet *Crepidula fornicata*, all of which now dominate some native communities on the Hampshire coast. Portuguese oyster *Crassostrea gigas* have been sporadically encountered as well as small amounts of Japanese wireweed *Sargassum muticum.*
- Supporting habitat (vegetation composition - invasive non-native plants): Desmoulin's whorl snail: Desmoulin's whorl snails are potentially or actually at risk from non-native invasive plants. Such plants are considered a major threat to habitat due to their rapid growth and dominance over native species, and the difficulty of controlling them. Species of concern include Japanese knotweed, Himalayan balsam and giant hogweed. These riparian plants may directly alter the composition of Desmoulin's whorl snail habitat by replacing preferred species and increasing shading.
- Supporting processes (water quality – contaminants): Intertidal and subtidal habitats: High levels of the priority hazardous substance tributyl tin and its compounds are present in the Southampton Water Water Framework Directive waterbody. There is no evidence available for aqueous contaminant levels in the Western Yar, Lymington or Newtown River estuaries.
- Supporting processes (water quality – dissolved oxygen): Intertidal and subtidal habitats: For Dissolved Oxygen this site has been classified as having High Ecological Status under the Water Framework Directive for at least 5 of the years since 2009.
- Supporting processes (water quality –nutrients): Intertidal and subtidal habitats: The site has been assessed as at risk of eutrophication, leading to opportunistic macroalgae and phytoplankton blooms which can smother the sediment, preventing aeration and causing anoxia (lack of oxygen). This can impact sensitive fish, epifauna and infauna communities.
- Supporting processes (water quality –turbidity): Intertidal and subtidal habitats: In coastal environments turbidity levels can rise and fall rapidly as a result of biological (eg plankton blooms), physical (eg storm events) or human (eg coastal development) factors. Prolonged changes in turbidity may influence the amount of light reaching the seabed,

affecting the primary production and nutrient levels of the habitat's associated communities. Suspended sediment concentrations in the Solent have a high variability dependent on location, tidal state, storminess and freshwater flows into the estuaries. Both modelled and sampled data demonstrate a high level of variability.

- Supporting processes (water quality): Saltmarsh, dunes and vegetated shingle: Poor water quality and inadequate quantities of water can adversely affect the structure and function of these habitat types. Water quality should be restored to mean winter dissolved inorganic nitrogen levels at which biological indicators of eutrophication do not affect the integrity of the site and its features.

6.9.12 Although several of the invasive non-native species affecting Solent Maritime SAC are marine invertebrates, and therefore unlikely to be attributable to the types of development proposed by the EBLP, botanical invasives could potentially impact upon Desmoulin's whorl snail. Mobilised contaminants and increased turbidity in run-off from construction sites could contribute to existing negative effects within the Solent Maritime SAC; nutrient levels are less likely to be affected by construction (but may be affected via waste water treatment discharges; see section 6.10.18).

6.9.13 Non-native signal crayfish and invasive species of flora are already contributing to the unfavourable condition of at least five River Itchen SSSI management units which occur within the SAC. Poor water quality also affects at least five River Itchen SSSI units within the SAC although this is primarily due to total reactive phosphate concentrations which are more likely to result from agricultural practices and effluent discharge than from contaminated development sites or pollution incidents during construction.

6.9.14 Table 6.6 below lists proposed allocations within the EBLP which fall within 100m of watercourses draining into each SAC (or the SAC itself); this distance is considered sufficiently precautionary to include all sites where there is a realistic possibility of a likely significant effect while excluding sites that are so far from the internationally important wildlife site that (given the limited risk and scale of non-native species and pollution associated with housing and general commercial development) an effect, while not impossible, is unlikely[33]. Also listed are extant planning permissions in Eastleigh borough which are referred to (policy DM24) but not proposed by the EBLP and which may act in combination.

Table 6.6: Proposed allocations hydrologically connected with River Itchen SAC / Solent Maritime SAC

Site	≤100m Itchen SAC*	≤100m Solent SAC*
S5 Strategic Growth Option	Yes	Yes
S6 Bishopstoke-Fair Oak link road‡	Yes	Yes
S12 Transport infrastructure	Yes	Yes^
DM25 Scotland Close, Fair Oak	Yes	No
AL1 Land east of Allbrook Way	Yes	No
BO2 West of Uplands Farm, Botley	No	Yes

[33] This does not mean that pollution control would not be required as a general principle when working near watercourses.

Site	≤100m Itchen SAC*	≤100m Solent SAC*
BO3 East of Kings Copse Avenue	No	Yes
BO5 Botley bypass	No	Yes^
BU1 Land north of Providence Hill	No	Yes
BU2 Heath House Farm	No	Yes
BU3 South east of Windmill Lane	No	Yes
BU7 Riverside Boatyard	No	Yes
E6 Eastleigh River Side	Yes	No
E7 Eastleigh River Side adjacent land	Yes	No
E9abcd Southampton Airport (employment allocation)	Yes	No
FO1 West of Durley Road, Fair Oak	No	Yes
FO2 Land north of Mortimers Lane	Yes	No
FO3 East of Allington Lane	Yes	No
FO5 Land East of Knowle Lane	No	Yes
FO6 Foxholes Farm, Fair Oak	Yes	No
FO8 Hammerley Farm, Horton Heath	Yes	No
HA2 Mercury Marina	No	Yes
HE1 West of Woodhouse Lane	No	Yes
HE2 Sunday's Hill / Pewett Hill Close	No	Yes
HE4 Peewit Hill Close / Dodwell Ln	No	Yes
WE3 Tollbar Way / Berrywood Park	No	Yes
Extant planning permissions (DM24)		
Land at Bishopstoke Cemetery, Stoke Common Road	Yes	No
Hardings Lane/Crowdhill, Fair Oak	Yes	No
Pembers Hill Farm, Fair Oak	Yes	No
St Swithuns Church, Allington Lane	Yes	No
Land north & east of Boorley Green	No	Yes
Land north of Hedge End station	No	Yes
Land east of Dodwell Lane & north of Pylands Lane	No	Yes
Land south of Ford Road & west of Dodwell Lane	No	Yes
Land north of Bridge Rd & west of Blundell Lane	No	Yes
Land at Providence Hill	No	Yes
Land r/o Orchard Lodge, Windmill Lane	No	Yes
14 Hobb Lane	No	Yes
North of Botley Road, West End	No	Yes
Land at Hatch Farm, Barbe Baker Avenue, West End	Yes	No
Land at Firtree Lane Horton Heath	Yes	No
Land at Fair Oak Road Bishopstoke	Yes	No
The Mount Hospital Church Road Bishopstoke	Yes	No
Maddoxford Lane, Boorley Green	No	Yes

Site	≤100m Itchen SAC*	≤100m Solent SAC*
Crow's Nest Lane, Boorley Green	No	Yes
Land west and south of Horton Heath, Burnetts Lane	Yes	No
Land south of Long Garden Cottage	No	Yes

* Or within 100m of headwaters & tributaries draining into the SAC

‡ Including pollution impacts of the proposed new B3355 Highbridge Road bridge crossing of the River Itchen SAC

^ BO5 Botley bypass is >100m from Solent Maritime SAC but is included because it will involve a new bridge over the Hamble. S12 Transport infrastructure is included for the same reason and because the Sunday's Hill bypass crosses Hungerford stream, which drains into the SAC

N.B. Sites within 100m of Monks brook are excluded from the above table because the watercourse drains into the lower (tidal) Itchen downstream of the SAC

6.9.15 The proposals listed in Table 6.6 are taken forward for assessment in view of the River Itchen SAC and Solent Maritime SAC conservation objectives.

6.10 Water Abstraction

6.10.1 This impact pathway relates to the direct and in combination effects of water abstraction on River Itchen SAC (see Appendix I). As a strategically operating impact it is assumed that all proposed allocations with residential use will contribute to the effect; as such the screening assessment at Appendix I does not list water abstraction as an LSE for proposed allocations, focusing instead on site specific impacts.

Impact mechanisms

6.10.2 Eastleigh borough lies with Southern Water's Hampshire South Water Resource Zone (WRZ). This section draws upon the PUSH Integrated Water Management Study (IWMS; Amec Foster Wheeler, 2018) in understanding the sources of water supply and constraints in meeting demand.

6.10.3 Southern Water has forecast 'baseline' demand and supply across its supply network for the period 2015 to 2025 in Water Resource Management Plan (WRMP; Southern Water, 2014). The supply demand balance calculations consider "the difference between the supplies available (water sources) and anticipated demands (water use) over each year of the planning period for a given planning scenario" (Southern Water, 2014). The WRMP includes the results of the baseline supply demand balances calculations for each individual WRZ. These calculations were based on current (2014) include allowances for:

- Housing and population growth;
- Industrial and commercial demand for water;
- The effects of climate change; and
- The impact of new legislation.

6.10.4 The results denote whether an individual WRZ is going to have a surplus or deficit in water resource availability over the planning period. To examine the potential water constraints (and

pressure that new developments and population increases can exert on water resources) it is necessary to consider the wider area from which resources are drawn. For the PUSH area, Southern Water's resources are contained within the geographical area except where there are pre-agreed water transfers. There are no transfers between Southern Water's Western Sources area and its Central and Eastern Sources, so the review of the Western Sources baseline and final planning option scenario calculations can be considered separately from the rest of Southern Water's WRZ. It should be noted that there is uncertainty associated with the 2014 WRMP given that potential options to secure a supply demand balance in Hampshire South are to be confirmed.

Understanding supply in the Western Sources

6.10.5 In the Western Sources area, water is abstracted from both groundwater and surface water (river) sources. The bulk of the groundwater sources are located in the Chalk aquifer which underlies much of Hampshire and the Isle of Wight. The transmission and storage of groundwater in the Chalk aquifer is mainly a function of the distribution and continuity of fissures, which leads to uncertainty in how these sources may react in times of very low groundwater levels. These sources are often highly reliant on winter rainfall recharge. There are three river sources in the Western Sources; the Test and Itchen surface water abstractions which lie in Hampshire South WRZ and the Eastern Yar in the Isle of Wight WRZ.

6.10.6 There is no water currently sourced from bulk imports from other water companies and there are no raw-water reservoirs in the Western Sources area. The significant proportion of river abstractions in the Hampshire South and Isle of Wight WRZ means that the Western Sources are most susceptible to the "minimum resource period", known as the Dry Year Minimum Deployable Output period, and to the Dry Year Critical Period (i.e. peak demand period). As a result, when discussing both the baseline and final planning calculations for each of the zones, both the Dry Year Minimum Deployable Output (MDO) and Dry Year Critical Period (CP) are considered.

Hampshire South

6.10.7 Water in the Hampshire South WRZ is sourced from 37% groundwater sources which abstract from the Chalk aquifer, and 63% from river sources. Southern Water currently abstract 66.55Ml/d from two surface water sources and thus the remaining groundwater abstraction is ~39.08Ml/d. The surface water abstractions are from the River Test and River Itchen. The Hampshire South WRZ is the largest in the company's supply area with dry year demands typically around 150Ml/d, which includes an inter-zonal bulk export to the Isle of Wight WRZ (Cross-Solent main) which has a capacity of 12Ml/d. The WRZ supplies around 615,000 people, with no bulk imports in the baseline scenario.

In combination effects

6.10.8 The following plans/projects may also contribute to water demand with consequent effects on the River Itchen SAC:

- Fareham Borough Development Sites and Policies Plan (adopted 2015)

- Fareham Borough Welborne Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- South Downs Local Plan (emerging)
- Test Valley Borough Revised Local Plan 2011 – 2029 (adopted 2016)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034

Evidence of current or future impacts

6.10.9 When considering baseline scenario calculations it is important to note that:

- Southern Water's WRMP (2014) outlines that a Sustainability Reduction on the River Itchen has been proposed and will be implemented from 2018. The sustainability reduction will "reduce, under certain flow conditions, the amount of water that Southern Water can abstract from its Lower Itchen sources" restricting the amount of water that can be abstracted in the months of June to September each year from 2018; and
- During AMP5, the Lower Test National Environment Programme (NEP) investigation was completed. The investigation concluded that an increase in abstraction from the current deployable output of 105Ml/d to the licensed quantity of 136Ml/d would not have a detrimental effect on the environment. This increase was not included as part of the baseline calculations as Southern Water's correspondence with the EA concluded that "The baseline deployable output… should remain as 105Ml/d in the draft WRMP unless you have evidence to reassess the deployment output for this source" (Southern Water, 2014 p.73).

6.10.10 The baseline which includes the Itchen Sustainability Reduction, and retains the current Lower River Test abstraction quantity (105Ml/d) also includes considerations for climate change, the impact of new legislation and the following:

- There is expected to be an increase in population from 625,470 to 739,680;
- There is expected to be an increase in the number of properties from 265,410 to 321,930;
- There is expected to be an increase in industrial and commercial demand for water.

6.10.11 The baseline supply demand forecast presented in the 2014 WRMP starts the 25 year planning period with a surplus, and includes a significant volume of water which is transferred through the cross-Solent main to support the Isle of Wight WRZ. Under the baseline scenario the full implementation of the sustainability reduction for the River Itchen will lead to immediate deployable output reductions so that the Hampshire South WRZ has a large-scale deficit and can no longer support the Isle of Wight WRZ. A significant deficit also occurs in the Isle of Wight

WRZ. It should be noted that sustainability reductions at the River Itchen are planned to only occur during severe droughts, when Southern Water would have recourse to drought emergency measures until alternative supplies have been secured. The baseline supply demand calculations presented in Southern Water's WRMP14 are shown in Figure 6.11 and Figure 6.12.

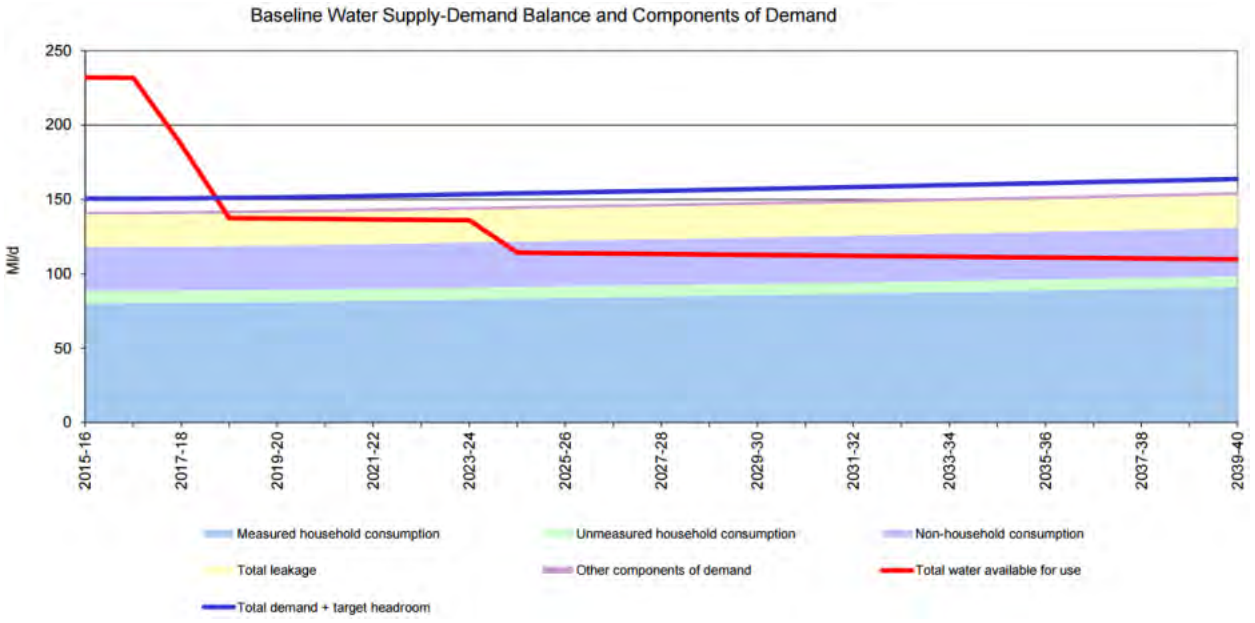


Figure 6.11: Hampshire South Baseline Supply Demand Balance Dry Year Minimum Deployable Output (MDO)

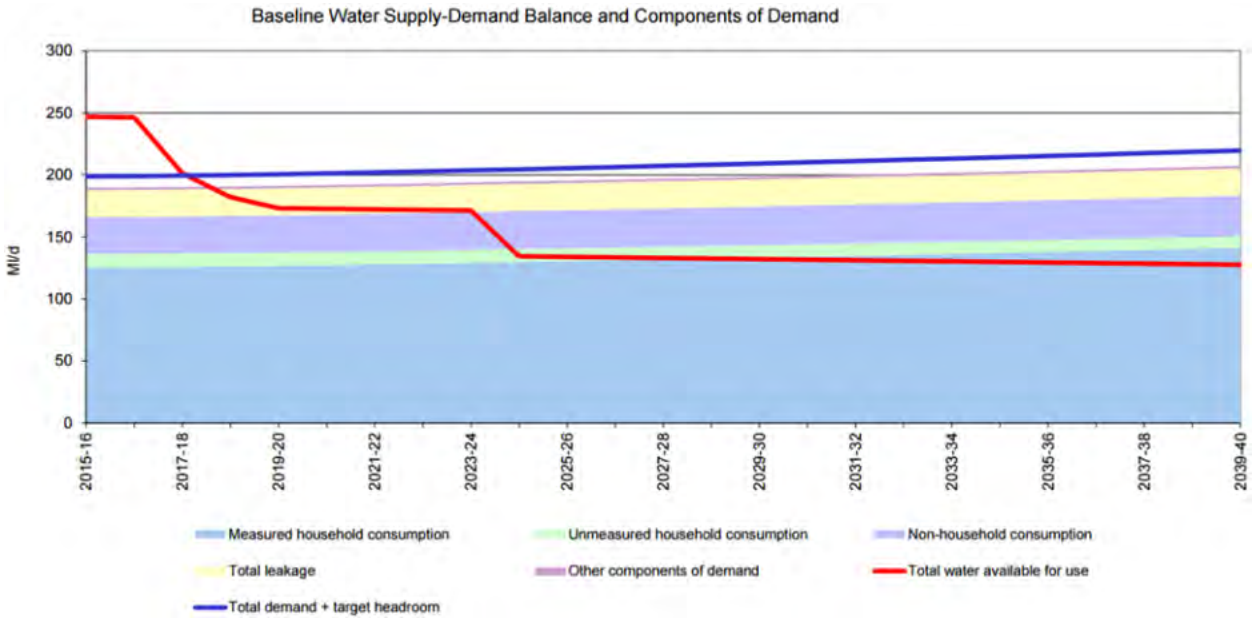


Figure 6.12: Hampshire South Baseline Supply Demand Balance Dry Year Critical Period Planning Scenario (PDO)

6.10.12 The baseline supply demand calculations presented by Southern Water WRMP14 have shown deficits in both of the water resource zones encompassed with the PUSH area. Additionally

there is a very small deficit in the Western Sources Hampshire Kingsclere WRZ towards the end of the planning period. The baseline WRMP14 calculations considered:

- Completion of universal metering programme undertaken by end of AMP5;
- Continuation of baseline water efficiency activity throughout the planning period;
- Maintain leakage at agreed Ofwat target (unless leakage reduction is selected as least cost);
- Stochastic approach to calculation of deployable outputs from 2019/20;
- Inclusion of climate change impacts on supply and demand;
- Continuation of bulk supply to commercial customer in Hampshire South throughout planning period;
- Continuation of small existing bulk export to Wessex Water from Hampshire Andover through planning period; and
- Use of existing cross-Solent main to supply the Isle of Wight (from Hampshire South).

6.10.13 The Hampshire South and Isle of Wight WRZ's are at risk of large supply deficits (baseline forecasts). As part of the WRMP calculations a solution is necessary to meet the deficits in each planning scenario and for each year of the 25-year planning period simultaneously. Southern Water provided details in the WRMP14 of the options to be actioned to remove this supply deficit throughout the planning period. Further discussions with Southern Water (Amec Foster Wheeler, 2018) have allowed a further understanding on the development of these schemes, and an initial scope on future schemes likely to be considered in the future WRMP19.

Hampshire South

6.10.14 The baseline supply demand calculations showed a significant deficit for the planning period. The Hampshire South Water Resource Zone has three primary schemes planned in order to meet the demand of its customers over the WRMP period.

- Portsmouth Water Transfer Scheme: Referred to as the "T-HSO-3 bulk supplies from PWC" in WRMP14, the proposal had been to maintain the 10 Ml/d bulk transfer from Portsmouth Water to Hampshire South until 2024. Further negotiations were intended to see this increase to a bulk transfer of 15 Ml/d from August 2017. However, recent information from the EA has indicated that, since WRMP14, Southern Water has reported a 16% reduction in demand based on metering programme results, which is equivalent to 27ml/day. This suggests that there is unlikely to be a measurable deficit in water resources in Hampshire South.

6.10.15 There are two schemes which are currently proposed for when abstraction from the Lower Itchen is curtailed. These include:

- Testwood Abstraction Scheme: A network link between the River Test at Testwood and the Lower Itchen at Otterbourne. This raw water transfer will be permitted when the Itchen Sustainability Reduction is in place and will allow abstraction, treatment and pumping to the Lower Itchen water treatment works. of the transfer is dependent on proposed changes to the Testwood abstraction licence. Should any conditions be added

to the Testwood licence, then Southern Water would need to find additional sources to cover any shortfall. It is likely that there will be a time limit to the licence (2027). This scheme is referred to as the "HSL3+HST2 Conjunctive use" in the WRMP14.

- The Candover Valley Scheme: Referred to as the "JO3a MDO groundwater scheme for river augmentation", the WRMP had planned on adopting or acquiring the groundwater river support scheme in the Candover Valley and using the additional upstream discharges to reduce the likelihood of the River Itchen Sustainability Reduction being enforced. This scheme is currently on hold pending changes to the Candover licence.

6.10.16 If either of these options are not granted Southern Water will need to continue to investigate additional potential measures. These had been outlined in the WRMP14 and so it is likely that, for the Hampshire South WRZ, Southern Water will consider an effluent reuse scheme located within the zone, or an investigation into the construction of a desalination plant on the Isle of Wight to reduce or eliminate the need for the current bulk transfer scheme. At the time of writing, effluent reuse is currently the preferred option by Southern Water to meet a shortfall in demand, and is being investigated as part of the WRMP19. Another option currently being investigated is the increased use of bulk transfers into the area – Southern Water is currently investigating the feasibility and viability of transfers from Bournemouth Water, Portsmouth Water, Thames Water and/ or Wessex Water as part of the development of the WRMP19.

6.10.17 Smaller schemes include:

- Continued investigation into leakage management and demand management, although given Southern Water's good current track record, the benefits from these schemes may be limited.
- Continuing to investigate any potential catchment management schemes to offset deployable output reductions (particularly relating to nitrate pollution) or to identify whether there may need to be improvement in the treatment of these sources. This will continue until 2025 as outlined in the current WRMP14.
- Further demand management schemes include a trial community reward scheme for reduced water consumption at Alresford near the Candover Valley.

6.10.18 Together the schemes are shown to rectify the deficit in Hampshire WRZ as shown in the final planning supply-demand calculations presented in Southern Water's WRMP14 (Figure 6.13 and Figure 6.14).

6.10.19 It is clear from the forecast supply-demand balance and WRMP14 that the resource situation in this area is constrained by environmental water availability and that, with growth forecast, if there were no interventions security of supply would be at risk. The forecast takes into account that approximately 54,571 new properties will be built in Hampshire South WRZ by the end of the planning period in 2040. As of the WRMP14 Southern Water had fulfilled their requirements to meet future water demand, but it is evident that, with uncertainty surrounding the Testwood to Otterbourne transfer scheme and the Candover Valley scheme, alternatives will need to be considered. Southern Water has suggested that Effluent Reuse, Desalination and External Transfers are the most likely sources of additional water to be considered in the WRMP19 and to meet future demand.

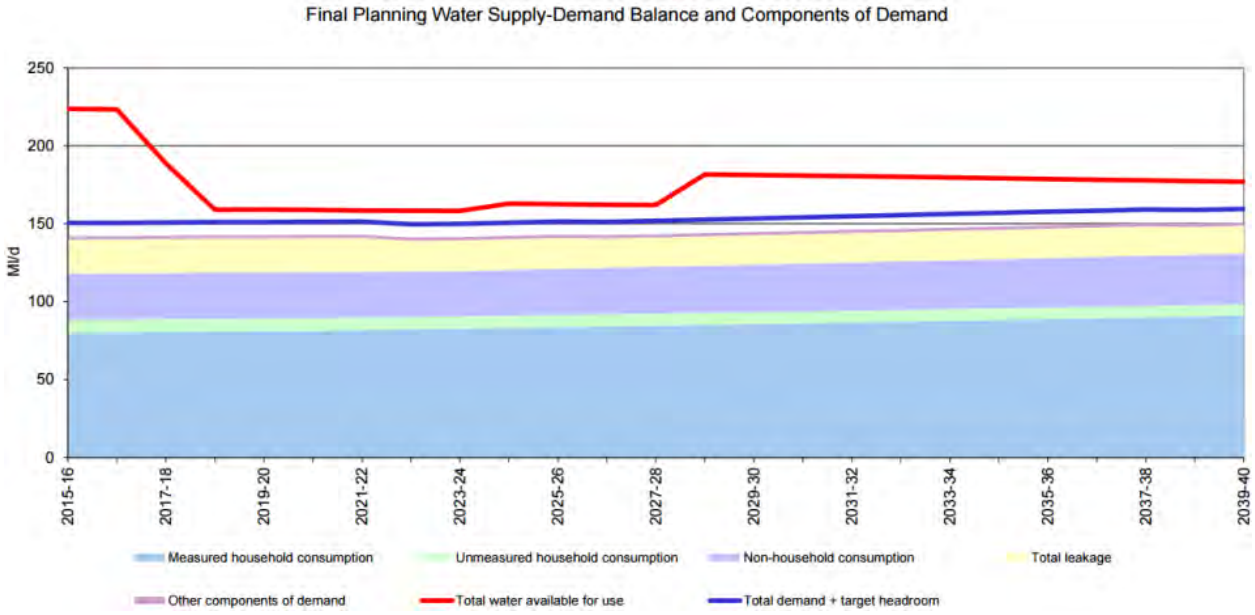


Figure 6.13: Hampshire South Final Planning Supply Demand Balance Dry Year Minimum Deployable Output (MDO)

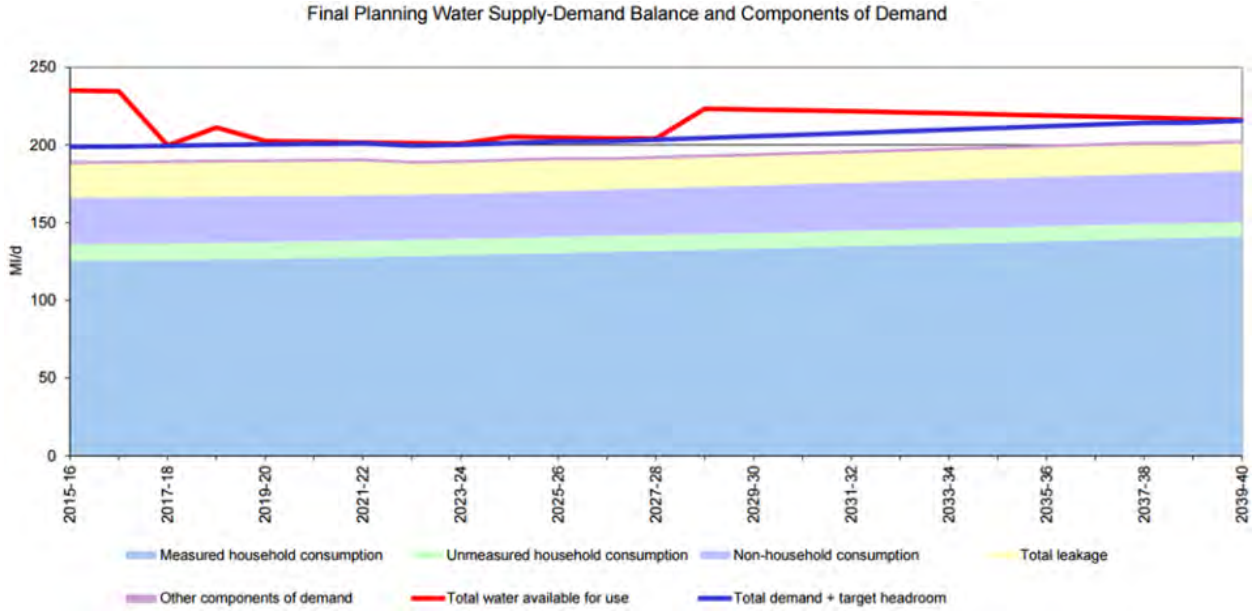


Figure 6.14: Hampshire South Final Planning Supply Demand Supply Demand Balance Dry Year Critical Period Planning Scenario (PDO)

Public Inquiry

6.10.20 Following publication of its WRMP14 Southern Water appealed against abstraction licence changes proposed by the Environment Agency. The changes were proposed in order to avoid ecological damage within the River Test and Itchen but Southern Water was concerned that the changes would limit its ability to undertake its statutory duties with respect to water supply particularly in periods of drought.

6.10.21 Southern Water and the Agency have since come to an agreement about the approach that should be taken to enable Southern Water to abstract greater quantities of water from

the River Test, the Candover boreholes and the River Itchen than would be authorised under the Agency's proposed licence changes during drought conditions and force majeure scenarios. There are four key features of the agreement between Southern Water and the Agency[34]:

- Abstraction during drought conditions will be authorised by a drought permit or drought order;
- The Agency will work with Southern Water and Natural England to agree the ecological monitoring, mitigation and compensation measures that need to be in place in order to authorise a Test Surface Water Drought Permit/Order, Candover Drought Order or Itchen Drought Order;
- The Agency will agree with Southern Water the process by which to determine the appropriate sequence of drought actions to minimise the risks of environmental impact during drought from implementation of the Interim Test, Candover and Itchen Abstraction scheme;
- Abstraction from the Test during a non-drought force majeure event should be authorised by a force majeure condition in the Test Surface Water licence.

6.10.22 The agreement – although draft and subject to further work on drought orders, ecological monitoring and mitigation – will enable sustainability reductions to protect the River Itchen SAC to be implemented while ensuring that Southern Water can meet its statutory duties. The outcome of the inquiry will still be subject to Secretary of State approval but it is anticipated that the agreement will provide certainty that planned growth in Eastleigh borough, in combination with growth elsewhere in south Hampshire, can be delivered without adverse effects on the SAC. Taking account of the continuing uncertainty, this impact pathway is taken forward for assessment in view of the River Itchen SAC conservation objectives.

6.11 Water Pollution

6.11.1 This impact pathway relates to the direct and in combination effects on the River Itchen SAC and Solent Maritime SAC, and the potential for indirect in combination effects on the Solent and Southampton Water SPA/Ramsar, resulting from deteriorating water quality due to waste water treatment discharges, combined with the impacts of background diffuse pollution (agricultural and urban surface water run-off). As a strategically operating impact it is assumed that all proposed allocations with residential use will contribute to the effect; as such the screening assessment at Appendix I does not list water quality as an LSE for proposed allocations, focusing instead on site specific impacts.

[34] Joint statement from the Environment Agency and Southern Water Services Ltd, 26 March 2018: Proposed Changes to Four Abstraction Licences held by Southern Water Authorising Abstraction from the Rivers Itchen and Test, and One Abstraction Licence held by Environment Agency Affecting the Candover Stream. Accessed online [10/5/18] at: http://www.hwa.uk.com/site/wp-content/uploads/2017/12/EA-and-SWS-joint-statement-26-March-2018-final-1.pdf

Impact mechanisms

6.11.2 Eastleigh borough is served by Southern Water's Chickenhall, Portswood and Peel Common Waste Water Treatment Works (WWTW) catchments. This section draws upon the PUSH Integrated Water Management Study (IWMS; Amec Foster Wheeler, 2018) in understanding WWTW capacity constraints, the ability of receiving waters to accept additional discharges without adverse effects and the nature of required changes to discharge permits or treatment infrastructure.

6.11.3 The IWMS collates data on projected growth in the number of households resulting from the EBLP and other Local Plans in the south Hampshire area, together with estimates of river flow, river quality, and WWTW effluent flow and quality. For river and effluent quality the main focus was on phosphate, ammonia, Biological Oxygen Demand (BOD, a proxy for Dissolved Oxygen in rivers) and nitrate.

Phosphate

6.11.4 Phosphate can be organic (critical in DNA/RNA and energy production) and inorganic (in minerals). Phosphate contributes to the eutrophication of receiving waters, and it is acknowledged that phosphate is more generally the problem nutrient for freshwaters. Hence additional inputs of phosphate are a principal concern in relation to the River Itchen SAC where excess phosphate may result in overgrowth by epiphytic filamentous algae that compete directly with vascular plants for light and nutrients, possibly leading to loss of nutrient-sensitive species, and reduced species composition, extent and condition of riverine plant communities. Furthermore, the assessment of air quality impacts on southern damselfly in the Itchen valley examined the role of nutrients in maintaining suitable habitat conditions for the species. This concluded that phosphate is likely to be the limiting nutrient in preventing marginal aquatic vegetation communities becoming dominated by coarser ruderal plants which are unsuitable for egg laying (see paragraphs 6.2.16 to 6.2.17 and 7.2.27 to 7.2.29).

Nitrate

6.11.5 Ammonia is a form of nitrogen which aquatic plants can absorb into proteins, amino acids, and other molecules. Nitrate is the stable end product of complete nitrification (which involves the conversion of ammonia into nitrite and ultimately nitrate). Both nitrate and phosphate can contribute to the eutrophication of receiving waters, but in saline coastal waters it is acknowledged that nitrate is more generally the problem nutrient, phosphate having a lesser role. Nutrient enrichment and in particular nitrogen (N) pollution arising from wastewater discharges has been implicated in the development of dense macroalgal mats occurring in the intertidal zone, which increases biological oxygen demand (BOD) and reduces dissolved oxygen content. This in turn reduces the diversity and abundance of intertidal invertebrates (wader prey) and the productivity of sea-grass beds (Brent goose forage). The major sources of nitrogen to the Solent European marine sites are from:

- Coastal background seawater from the English Channel;
- Direct rivers and streams discharging into the sites;
- Indirect rivers and streams discharging elsewhere in the Solent; and

- Effluent discharges permitted by the EA.

6.11.6 The 23 WWTW serving south Hampshire discharge into 15 Water Framework Directive (WFD) waterbodies. Of these, the Environment Agency has assessed 13 waterbodies as having less than Good ecological status in its South East River Basin Management Plan (Environment Agency, 2016). The main elements found to be at less than Good were phosphate, dissolved inorganic nitrogen, fish, macrophytes and phytobenthos. Table 6.7 lists the WWTW serving Eastleigh borough, together with the ecological status of receiving waters.

Table 6.7: WFD classifications for river, transitional and coastal water bodies (2015 Cycle) (Source: Amec Foster Wheeler, 2018): Eastleigh borough

WWTW	Receiving watercourse	WFD catchment	WFD waterbody	Waterbody status	Reason
Chickenhall	River Itchen	Itchen	Itchen	Good	n/a
Portswood	River Itchen Estuary	Southampton Water	Southampton Water	Moderate	Dissolved inorganic nitrogen; tributyltin compounds
Peel Common	The Solent	Solent	Solent	Moderate	Angiosperms; dissolved inorganic nitrogen; mitigation measures assessment

In combination effects

6.11.7 The following plans/projects may also contribute to water pollution with consequent effects on the River Itchen SAC, Solent Maritime SAC, and Solent and Southampton Water SPA/Ramsar:

- Fareham Borough Development Sites and Policies Plan (adopted 2015)
- Fareham Borough Welborne Plan (adopted 2015)
- Fareham Borough Local Plan Review 2016-2036 (emerging)
- Southampton Core Strategy Partial Review (adopted 2015)
- Southampton City Centre Action Plan (adopted 2015)
- South Downs Local Plan (emerging)
- Test Valley Borough Revised Local Plan 2011 – 2029 (adopted 2016)
- Winchester District Local Plan Part 1 - Joint Core Strategy (adopted 2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (adopted 2013)
- PUSH Spatial Position Statement 2016-2034

Evidence of current or future impacts

Freshwater habitats: River Itchen SAC

6.11.8 Despite the River Itchen's Good WFD status, there is evidence of high nutrient nitrogen in the water flow (Amec Foster Wheeler, 2018). Additionally, there are concerns with regard to the quantity of water flow in the River Itchen; as water quantity interacts with water quality, it is

important to consider both in relation to impacts on the SAC. Natural England's supplementary advice[35] for River Itchen SAC makes specific mention of water quality in relation to the following features and attributes:

- Supporting processes (water quality –nutrients): Elevated nutrient levels interfere with competitive interactions between higher plant species and between higher plants and algae, leading to dominance by attached forms of algae and a loss of characteristic plant species (which may include lower plants such as mosses and liverworts). Through changes to plant growth and plant community composition and structure they also affect the wider food web, altering the balance between species with different feeding and behavioural strategies. The respiration of artificially large growths of benthic or floating algae may generate large diurnal sags in dissolved oxygen and poor substrate conditions (increased siltation) for fish and invertebrate species. The management focus is typically on phosphorus in rivers, on the assumption that it can be more easily controlled at levels that limit the growth of plant species. However, nitrogen may also be important in river eutrophication and ideally co-limitation would be the management aim. The River Itchen often suffers from growth of filamentous algae, believed to be caused by excessive levels of phosphate from a variety of sources. Nutrient targets for the River Itchen should reflect natural/ background concentrations and limit enrichment to levels at which adverse effects on characteristic biodiversity are unlikely. Phosphorus targets vary from individual SSSI units and are as follows:
    - For unit 143 the phosphorus target is 20µg/l soluble reactive phosphorous (SRP).
    - For unit 142 the phosphorous target is 40µg/l SRP.
    - For unit 105 the phosphorous target is 20µg/l SRP.
    - For unit 106-107 the phosphorous target is 20µg/l SRP.
    - For unit 108 the phosphorous target is 50µg/l SRP.
- Supporting processes (water quality –organic pollution): Organic pollution effects the biota in a number of ways, including direct toxicity (from ammonia and nitrite), reduced dissolved oxygen levels (from microbial breakdown of organic material), and nutrient enrichment. Reducing organic pollution levels reduces toxic effects but unmasks enrichment effects. Controlling the continuous input of low levels of organic material is critical to controlling the enrichment effect… A Diffuse Water Pollution Plan identifies numerous issues with water quality, from point sources from Waste Water Treatment Works to road runoff. The Plan is a critical document to achieve favourable condition. Pollution causes excessive algal growth, smothering macrophytes, and increased BOD, decreasing oxygen availability for spawning gravels used by salmon and trout.
- Supporting habitat structure/function (nutrient status): Phosphate concentration is generally less than 0.025 mg l-1 in most watercourses occupied by the southern damselfly in England. General target to restore phosphate concentrations to below this level, but specific targets also set for individual management units (see above).

[35] Natural England (2019): *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: River Itchen Special Area of Conservation.* 19 March 2019 [accessed online 17/06/19]: http://publications.naturalengland.org.uk/publication/5130124110331904?category=6528471664689152

Saline habitats: Solent European Sites

6.11.9 The Solent and Southampton Water were both assessed as of Moderate ecological status. Natural England's supplementary advice[36] for Solent Maritime SAC makes specific mention of water quality in relation to the following features and attributes, which could have knock-on effects for wintering bird assemblages within the SPA/Ramsar:

- Supporting processes (water quality – contaminants): Intertidal and subtidal habitats: High levels of the priority hazardous substance tributyl tin and its compounds are present in the Southampton Water Water Framework Directive waterbody. There is no evidence available for aqueous contaminant levels in the Western Yar, Lymington or Newtown River estuaries. The target is to reduce aqueous contaminants to levels equating to High / Good WFD Status, avoiding deterioration from existing levels.
- Supporting processes (water quality –nutrients): Intertidal and subtidal habitats: The site has been assessed as at risk of eutrophication, leading to opportunistic macroalgae and phytoplankton blooms which can smother the sediment, preventing aeration and causing anoxia (lack of oxygen). This can impact sensitive fish, epifauna and infauna communities. The target is to restore water quality to mean winter dissolved inorganic nitrogen levels.
- Supporting processes (water quality): Saltmarsh, dunes and vegetated shingle: Poor water quality and inadequate quantities of water can adversely affect the structure and function of these habitat types. Water quality should be restored to mean winter dissolved inorganic nitrogen levels at which biological indicators of eutrophication do not affect the integrity of the site and its features.
- Supporting processes (water quantity/quality): Desmoulin's whorl snail: can be vulnerable to the effects of poor water quality. Elevated levels of nitrates and phosphates could change the vegetation community on which the snail relies.

6.11.10 All WWTW are permitted to discharge a set volume of treated effluent based on the population size they serve. This is generally referred to as the Dry Weather Flow (DWF), which is the base flow going to a WWTW of raw sewage with a small amount of groundwater infiltration and with no surface water drainage inputs. The DWF is used to help determine the quality of effluent required to protect the water environment and can also be used as an indicator of when a WWTW is reaching its volumetric design capacity and requires an upgrade. An initial assessment of the current volumes of treated effluent discharged by the main WWTW (Amec Foster Wheeler, 2018) indicated that five were already discharging volumes in excess of the permits and a further three had less than 10% spare capacity; these were mostly located on the Isle of Wight but also include Peel Common WWTW which serves Eastleigh (<10% capacity).

6.11.11 The IWMS used projected future housing numbers to calculate increases in effluent discharges based on assumed occupancy rates for the new housing, added to the current volume of treated effluent discharged from the relevant WWTW. The occupancy rates and flow estimates were based on a worst case scenario. The impact of this increase in treated sewage effluent on

[36] Natural England: Designated Sites View: Solent Maritime SAC supplementary advice [accessed online 9/5/18]: https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK0030059&SiteName=solent&SiteNameDisplay=Solent+Maritime+SAC&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

the receiving watercourses and coastal waters was then modelled and the results assessed against the current condition of the receiving waters. Where a potentially significant deterioration was identified, indicative permit standards were calculated to prevent the deterioration[37].

South Hampshire assessment

6.11.12 This assessment of impacts on water quality, WWTW and sewer capacity considered 20 WWTW and their associated sewer networks. Some are likely to need upgrading by 2020 in order to ensure that future housing growth in the PUSH area will not have a detrimental impact on water quality. In addition, there are currently gaps in the evidence base that require further investigation, monitoring and potentially action, to ensure future growth is compliant with the Habitats and Water Framework Directives. This includes the potential for cumulative impacts within WFD catchments receiving discharges from more than one WWTW, such as Southampton Water and Portsmouth Harbour.

6.11.13 Four WWTW will require improvements to reduce ammonia, and eleven to reduce phosphate. Although no WWTW were identified as requiring improvements to reduce nitrate (N) loading from their discharges due to direct impacts from future house growth, it should be noted that at least four WWTW will require standstill for N once their existing permitted flow limit is reached. Permitted flow limits will also need to be reviewed for another six WWTW in 2022, to assess if standstill for N is required at these locations. In addition following the assessment of potential cumulative impacts including diffuse sources, the IWMS identifies where catchment measures to reduce diffuse pollution should be implemented in order to ensure the water body and designated area can achieve their objectives based on the current condition of the area irrespective of housing growth; these include Southampton Water and Portsmouth Harbour.

Eastleigh borough assessment

6.11.14 The growth areas in the Eastleigh borough are predicted to drain to the Chickenhall Eastleigh, Peel Common or Portswood WWTW; see Figure 6.15. The water quality assessments indicated that there are no significant constraints to prevent future housing growth related to Chickenhall Eastleigh or Portswood, although they will require upgrades to their sewer networks; see Table 6.8. However, phosphate concentrations are problematic within the River Itchen SAC to which Chickenhall WWTW is a major contributor.

6.11.15 Although overall no significant impact or deterioration is predicted due to future housing growth, the Peel Common WWTW may require capacity improvements by 2025, which will be subject to review in 2022. The possible need for an improved N discharge limit will also be reviewed in 2022. Sewer capacity upgrades are also likely to be required. The catchment is affected by nitrate pollution and catchment level nitrate measures are required now.

[37] N.B. An exceedance of a flow permit is not in itself an issue as the sewerage undertaker could apply to the Environment Agency for a new flow permit. This may be permitted where it is matched by an equivalent improvement in the quality of the water being discharged, thus protecting the receiving waters (i.e. overall there would be load standstill to the receiving waters).

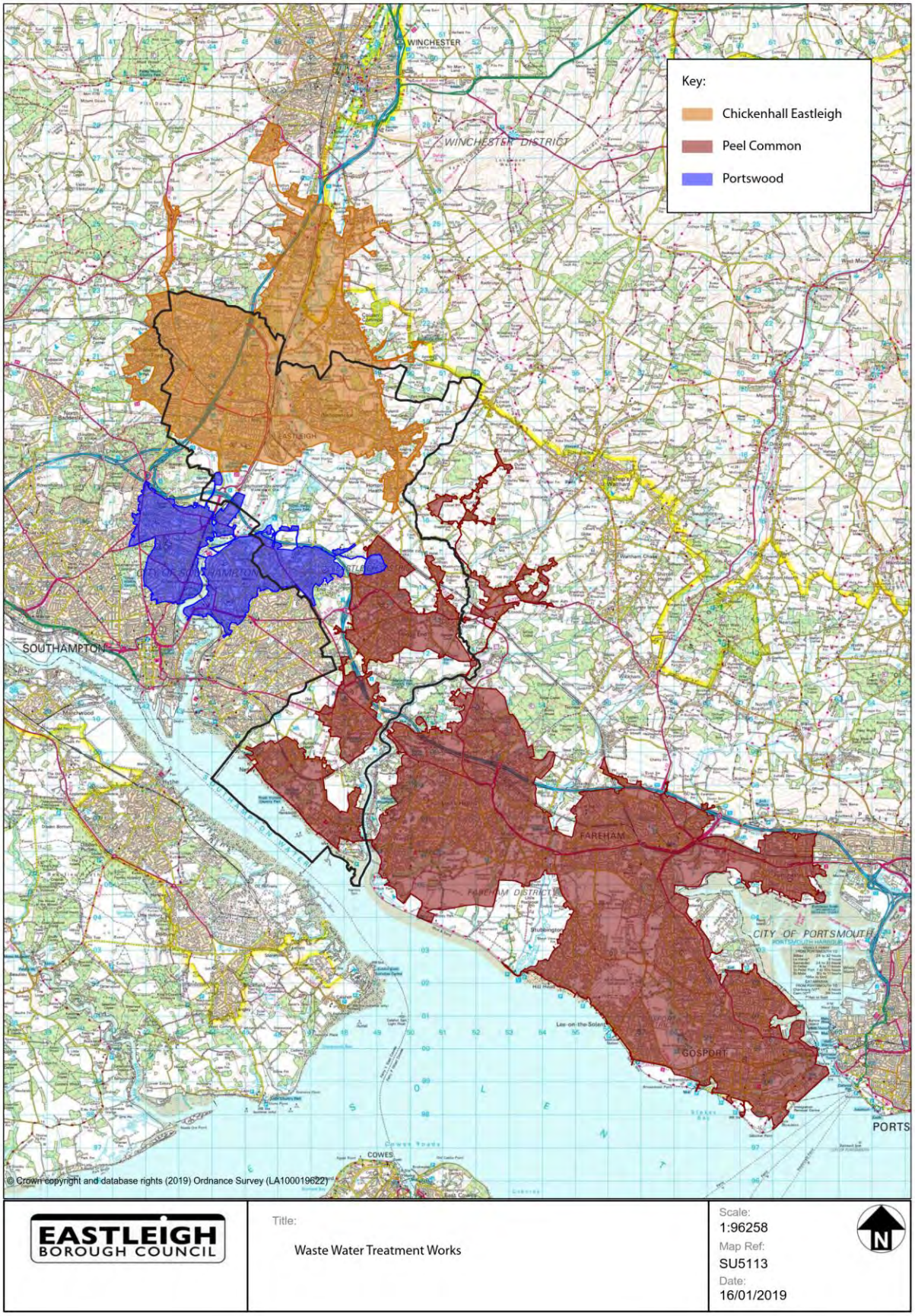


Figure 6.15: Wastewater treatment catchments in Eastleigh borough

6.11.16 To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development would require mitigation.

Table 6.8: Summary of growth pressures on WWTW serving Eastleigh borough (Source: Amec Foster Wheeler, 2018)

WWTW	Measured flow 2013-15 (m3/day)	Consented flow (m3/day)	DWF exceedance predicted	Mitigation for N	Sewer capacity required	Freshwater mitigation required
Portswood	16133	27700	No	No	Yes	n/a
Chickenhall	23067	32000	No	No	Yes	Tightening of P permit
Peel Common	55180	59683	Reaches capacity in 2025 (currently <10%)	Review in 2022	Yes	n/a

6.11.17 River Itchen main river channel (SSSI unit 108) into which Chickenhall discharges is in unfavourable no change condition due to the SAC river feature including water quality failures of revised common standards monitoring (rCSMG) targets. For unit 108 the agreed interim goal is the same as the long term target which is 50micrograms/litre upstream of Chickenhall with an interim goal of 74µg/l P downstream of Chickenhall. The dominant source of P in the lower Itchen is Chickenhall (with Harestock also a very significant contribution). This interim target took account of the current over performance of Chickenhall against the P permit specifications and P concentrations are improving. Phosphate stripping to 1µg/l came into effect in 2009/2010, however, rCSMG targets are not currently being achieved. Additional P limits have been placed on industry further up in catchment (cress and fish farms). This is contributing to improving P concentrations in the waterbody and the measures need more time. However, at permitted values the Chickenhall contribution to P would result in failure of both the rCSMG interim and long term targets alone (without other sources). Growth within the permit headroom significantly risks achievement of the interim progress goal. For this reason Natural England has recommended that the permit headroom is reduced to TAL (technically achievable limit) with a stretch target for phosphorous.

Nutrient neutrality

6.11.18 In light of the ongoing uncertainty in relation to the ability of the PUSH region to accommodate future housing growth without having a detrimental effect upon the water environment, Natural England had until recently advised that larger development (in excess of 200-300 dwellings), including all EIA development, should calculate a nutrient budget and achieve nutrient neutrality. This was reflected in the mitigation strategy presented in the October 2018 HRA Report. However, Natural England has recently changed its position in response to recent case law including the CJEU judgements on *People over Wind* (see paragraph 2.4.3) and the case known as the Dutch case[38]. As a result Natural England now advises that short term interim

[38] Joined Cases C-293/17 and C-294/17, CJEU (2018): *Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and Others.*

measures are necessary to meet legal compliance, including a reduced threshold for nutrient neutrality to cover smaller developments resulting in any net increase in dwellings or overnight accommodation uses.

Nitrogen budget

6.11.19 To address Natural England's latest advice a nitrogen budget has been calculated for the EBLP using the Natural England working draft methodology published in August 2018[39]; Natural England has recently advised that it is considering changes to the methodology and these will be addressed in the HRA when they are available. A detailed explanation of how the methodology has been applied to the EBLP is presented in Appendix VII. The results indicate that the total nitrogen budget for Eastleigh Borough is 15,434.74 kg/TN/yr; see Table 6.9. A positive figure indicates a surplus of nitrogen resulting from development proposed in the EBLP and therefore mitigation will be required to achieve nutrient neutrality and avoid any impact to internationally designated sites in the Solent. A breakdown between the different categories of proposed development sites is set out in Table 6.9. More than half of the nitrogen surplus is attributable to the SGO development.

Table 6.9: Eastleigh Borough Local Plan nitrogen budget

Development Site Category	Nitrogen Budget (kg/TN/yr)
Residential (excluding SGO & windfall)	2,167.12
SGO	8,917.86
West of Horton Heath	262.951,782.06
Overnight tourism	31.10
Open space, recreation	32.92
Large employment sites	50.31
Windfall sites	2,453.38
Overall N budget	***15,434.74***
Positive figure indicates surplus N and hence mitigation is required. Negative figure indicates a deficit and so no mitigation required.	

Phosphates

6.11.20 During a meeting with Natural England in February 2019 the HRA authors queried whether a nutrient budgeting exercise should also be undertaken in relation to phosphates, principally in relation to potential impacts on freshwater habitats and qualifying features in the River Itchen.

6.11.21 Natural England[40] advised that Farmscoper modelling commissioned from ADAS for the Poole Harbour catchment found that agricultural source control measures focused on reducing N had a much bigger percentage reduction effect on agricultural diffuse P (-13% and -27% respectively). This aligns with other academic modelling work and also scientific observation

[39] Natural England (2018): *Methodology to calculate the nitrogen budget for development in the Solent and achieve nitrogen neutrality*. Working Draft August 2018.

[40] Pers. Comm. (2019): Email correspondence within the Sustainable Development Lead Advisor, Dorset, Hampshire and Isle of Wight Area Team, Natural England; 25/2/19.

that country actions to reduce agricultural diffuse eutrophication are having much more success at reducing P than in reducing N. This suggests a focus of action on reducing N source losses from farming to address nitrogen enrichment in the Solent sites will coincidentally deliver a high degree of agricultural diffuse P reduction on the River Itchen SAC. In the upper Itchen other sources of P including cress farming, fish farming, and non-mains drainage were the dominant sources of P however at the bottom of the River Itchen agricultural diffuse and the Waste water treatment works are the dominant sources. Therefore development offsetting of N from agriculture will also deliver offsetting of the relatively (compared to other catchments) limited amounts of agricultural P – although this will vary depending on geology type and distance and there are some additional agricultural measures that can be deployed to reduce P that have little effect on reducing N. In addition, actions to address flooding and action on misconnections and other urban sources are successful at reducing urban diffuse P contributions.

6.11.22 Taking account of the continuing uncertainty, this impact pathway is taken forward for assessment in view of the River Itchen SAC, Solent Maritime SAC and Solent and Southampton Water SPA/Ramsar conservation objectives.

6.12 Bridging the River Itchen SAC

6.12.1 This impact pathway relates to the direct and indirect effects of creating a new bridge crossing of the River Itchen SAC on the B3355 Highbridge Road (see Appendix I).

Current condition

6.12.2 The current B3355 Highbridge Road bridge crosses the Itchen Canal or Navigation on the western side of the River Itchen flood plain. The Itchen Navigation carries a swift flow of high quality chalk river water and is included within the River Itchen SAC for its representation of the Annex I Floating Ranunculus habitat type, as well as providing habitat for several of the Annex II species for which the Itchen has been designated a SAC. The Itchen Navigation is perched above the flood plain for much of its course and is retained within a heavily engineered channel, often with artificial bank revetments and vertical reinforcements limiting the development of a natural river margin.

6.12.3 Upstream of the current road bridge, the Navigation cascades down a series of weirs between brick retaining walls as shown in Figure 6.16. The banks of the channel support dense scrub and secondary woodland composed of hawthorn *Carataegus monogyna*, bramble *Rubus fruticosus agg.*, grey willow *Salix cinerea* and some ash *Fraxinus excelsior*. Downstream of the bridge, the Navigation is flanked by the surfaced public footpath on the left (east) bank and flows under a canopy of scrub and secondary woodland over-hung with ivy *Hedera helix* (Figure 6.17 and Figure 6.18). The vegetated areas of the left bank are dominated by a dense mat of ivy and clumps of stinging *nettle Urtica dioica*, whilst the right (west) bank has dense stands of hemlock water-dropwort *Oenanthe crocata* and further patches of stinging nettle. Despite the levels of shading, the river channel downstream of the bridge has a good aquatic macrophyte flora dominated by water crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*.

Impact mechanisms

6.12.4 The banks and margins of the Itchen Navigation support recent secondary woodland and scrub and shaded tall ruderal vegetation of low nature conservation value. Any requirement to remove or cut back this vegetation would not have an adverse effect on the River Itchen SAC, but would need to be undertaken in accordance with normal guidance for clearance of vegetation to avoid nesting birds and other protected species.

6.12.5 The aquatic habitat of the Itchen Navigation is of high nature conservation importance and it will be necessary to ensure working methods are adopted that prevent pollution of the water course including deposition of silt and sediment; see also section 6.9.

6.12.6 The Itchen Navigation is used by migratory fish and construction that results in noise and vibration will need to be undertaken in accordance with advice from the Environment Agency to prevent disturbance to migratory fish; see also section 6.5.

Figure 6.16: Cascade upstream of the bridge at Highbridge

6.12.7 It is likely that otters travel along the Itchen Navigation passing under the road bridge. At times of high flows, the cascade and flow conditions in the channel may result in otters leaving the channel of the Navigation to pass over the bridge using the road. This could make them vulnerable to road traffic incidents and represents the most significant threat of the proposed bridge on the River Itchen SAC; see also section 6.8.

6.12.8 The nature and scale of any adverse effect will need to be assessed in detail as part of a future planning application for the proposed new crossing. However, mitigation measures are likely to be required to ensure otters have access along the Navigation at all times and states of flow. This might involve the incorporation of a berm or ledge under the bridge that can be used by the otters at times of high flow. The bridge abutments should also be set back from the edge of the Navigation channel to provide safe passage for otters and other wildlife under the bridge. Guidance on bridge construction for otters is provided by the Highways Agency in

2001[41]. Although this is now quite old advice, it includes the following statement; "*Bridge design should allow space between the abutments of the bridge and the river bank to enable otters to pass at times of high water flow. The abutments should be set back far enough to allow the natural riverbank and riverbed to be retained.*"

Southern damselfly

6.12.9 In its representation on the Submission plan, Natural England raised concerns over the potential impacts on southern damselfly dispersal ability or changes to water flow and habitat that may impact this species specifically.

6.12.10 The proposed replacement bridge over the Itchen Navigation at Highbridge is currently heavily shaded and flows between steeply sloping and mostly hard engineered banks with poor marginal vegetation growth. This provides unsuitable southern damselfly habitat, both for breeding and for dispersal. The nearest southern damselfly habitat is located to the east of the bridge crossing within Highbridge Farm (Transects 2a, 2b and 3 in Rushbrook, 2017) and along the main River Itchen to the east and south of the bridge. Transects closer to the bridge (2c and 32) do not support good southern damselfly habitat. The Rushbrook (2018b) repeat survey report states; "*two transects at Highbridge Farm, specifically transects 2c and 32, were excluded from the repeat study as it was considered that individuals recorded on these transects in 2017 were most likely transient individuals, since these transects were considered to be unsuitable and largely unsuitable for southern damselfly respectively*" (p.26). The location of southern damselfly survey transects in the vicinity of the proposed bridge crossing are shown in Figure 9 of Rushbrook (2018a), which is included towards the end of Appendix V.

6.12.11 Adult southern damselfly are therefore likely to use the main river channel and its flood plain to breed and disperse and are not likely to use the Itchen Navigation in the vicinity of the bridge for these purposes. It is therefore considered that there are no likely significant effects from the bridge construction on southern damselfly.

6.13 Solent & Dorset Coast pSPA

6.13.1 No likely significant effects were identified in relation to the Solent and Dorset Coast pSPA.

41 The Highways Agency, The Scottish Executive, The National Assembly for Wales, The Department for Regional Development. (2001): *Design Manual for Roads and Bridges HA 81/99, Volume 10, Part 9, Nature Conservation Advice in Relation to Otters*. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol10/section4/ha8199.pdf

Figure 6.17: Itchen Navigation downstream of the bridge at Highbridge looking downstream from east bank

Figure 6.18: Itchen Navigation downstream of the bridge at Highbridge looking upstream under the bridge from east bank. Note the absence of marginal and emergent vegetation

7 Appropriate Assessment

7.1 Introduction

7.1.1 The following assessment uses the conservation objectives and ecological data for each European site defined in Chapters 3 and 4, and considers these against the range of impact pathways described in Chapter 6, in light of the EBLP incorporated mitigation measures (section 5.3).

7.2 River Itchen SAC

Atmospheric pollution

7.2.1 The source of atmospheric pollution impacts derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S4 Employment provision (and by implication proposed employment allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
- S6 Allbrook Hill, Bishopstoke and Fair Oak link road
- S12 Transport infrastructure

7.2.2 Five of the six Conservation Objectives for River Itchen SAC (section 3.5) relate to qualifying species, in this case the southern damselfly. These refer to the extent and distribution of the habitat used by these species, the structure and function of these habitats, the supporting processes upon which the species' habitats rely, the populations of the species and their distribution within the site.

Population and distribution

7.2.3 The population of southern damselfly within Eastleigh Borough was surveyed by Arcadian Ecology in 2017 (Rushbrook, 2017). This identified a number of water courses within the Borough from where southern damselfly were recorded. Each water course was walked as part of the survey and was given a unique transect number. Southern damselfly were recorded from water courses within and outside of the River Itchen SAC boundary. The numbers of southern damselfly recorded on each of the survey transects was recorded to provide the basis of an assessment of the current population distribution and size.

Habitat distribution

7.2.4 The vegetation of the Itchen Valley flood plain was surveyed in detail during 2002 by Richard Collingridge as part of the Itchen Sustainability Study[42]. This remains the most comprehensive

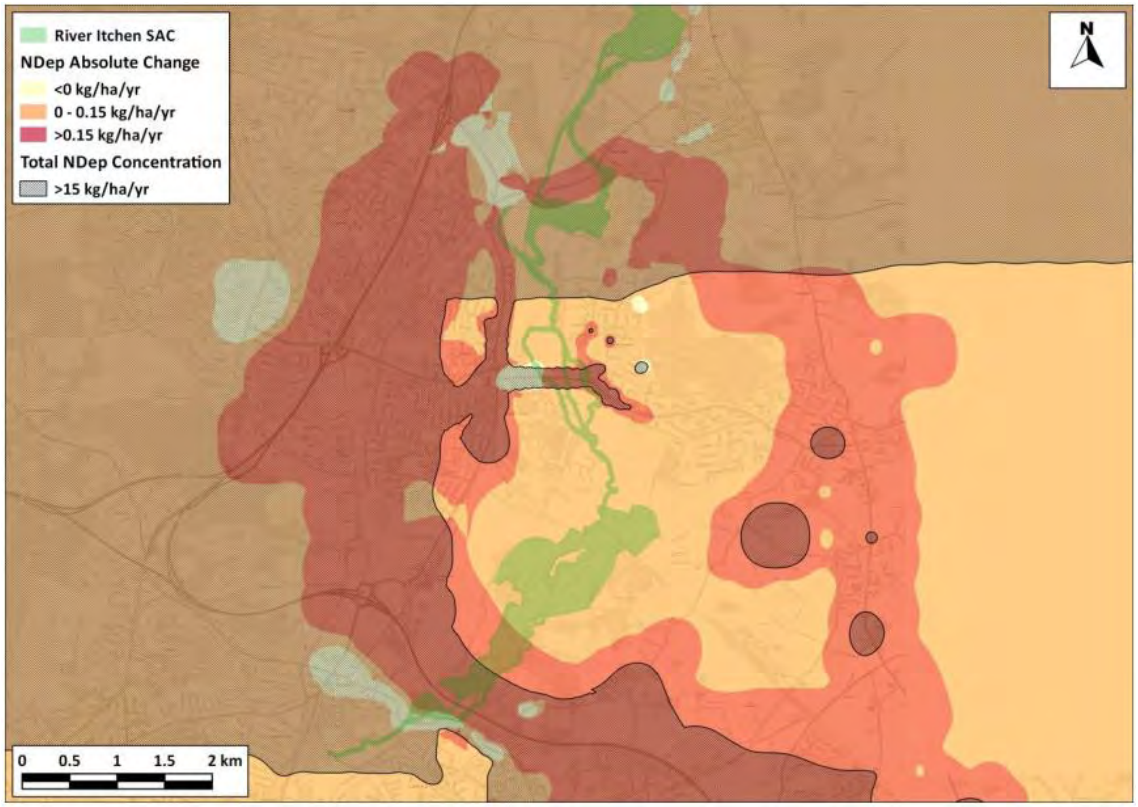
[42] Collingridge, R. (2002): *River Itchen wet grassland NVC survey*. Report to the River Itchen Steering Group, November 2002.

survey of vegetation within the Itchen flood plain and although quite old is still considered to be reliable. Data from this survey has been used to assess the effects of air quality on potential habitat of the southern damselfly.

7.2.5 In addition, walk over surveys were undertaken of the main road crossings of the River Itchen in May 2018 to better understand the distribution of southern damselfly habitat in the potentially impacted water courses.

Air quality assessment

7.2.6 Taking a precautionary approach, the worse-case scenario (see section 6.2.20-6.2.21) for nitrogen deposition was used to identify areas of the Itchen Valley where NDep exceeded the 1% threshold (>0.15 kg N/ha/yr) and where the Critical Load of 15 kg N/ha/yr was also exceeded using the local plan in combination scenario and both the Defra and ST pollution models. The results of this model produced by AQC (June 2018) are reproduced in Figure 7.1 and Figure 7.2.



The 15kg N/ha/yr critical load is exceeded over much of the borough in both baseline and future year predictions.

Figure 7.1: River Itchen nitrogen deposition, absolute changes in-combination and total nitrogen deposition (Defra model)

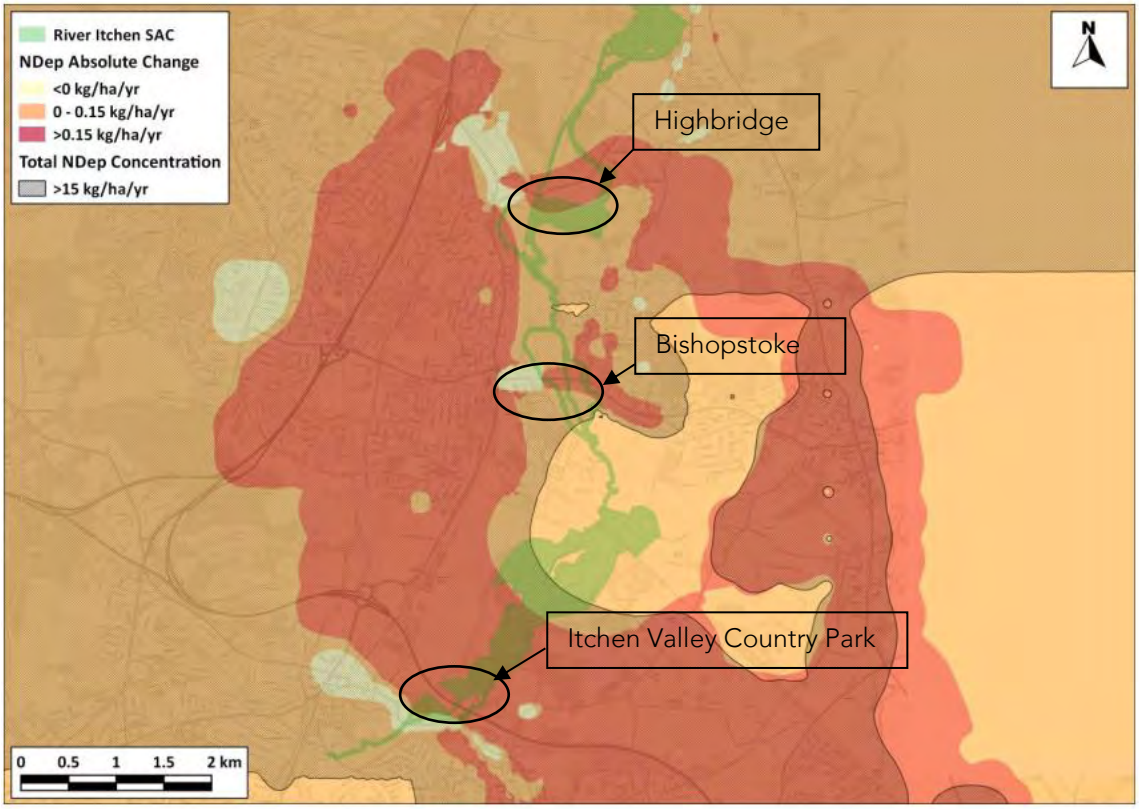


Figure 7.2: River Itchen nitrogen deposition, absolute changes in-combination and total nitrogen deposition (ST model)

7.2.7 The air quality modelling predicts that the environmental concentration (PEC) for nitrogen will exceed the critical load for Fen, Marsh and Swamp habitat of 15kg N/ha/yr over the majority of Eastleigh Borough, as shown by the dark edged grey polygons in the above figures. However, the extent of the Critical Load contour is much greater using the ST traffic model, extending further from the road at both Bishopstoke and Itchen Valley Country Park. The areas over which the local plan in combination contribution will further increase the nitrogen load by >1% of the critical load is shown by the red hatched polygons. This is referred to as the Process Contribution (PC) in Defra guidance[43] and is the trigger for more detailed assessment. Using these criteria, areas of the Itchen Valley where the 1% PC threshold were predicted to be exceeded and the PEC was in excess of the critical load were identified and overlain with the location of southern damselfly transects identified by Rushbrook (2017) as shown in Figure 7.3 and Figure 7.4. The analysis identified three areas of the Itchen Valley where nitrogen deposition could have an impact on southern damselfly habitats. These were at the following locations:

- B3335 at Highbridge Farm;
- Morris's land and Ashtrim Nursery, Bishopstoke Road, Bishopstoke; and
- M27 crossing of the Itchen Valley Country Park.

[43] Defra (2016): *Air emissions risk assessment for your environmental permit.* Accessed online [18/10/17] at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-insignificant-pcs

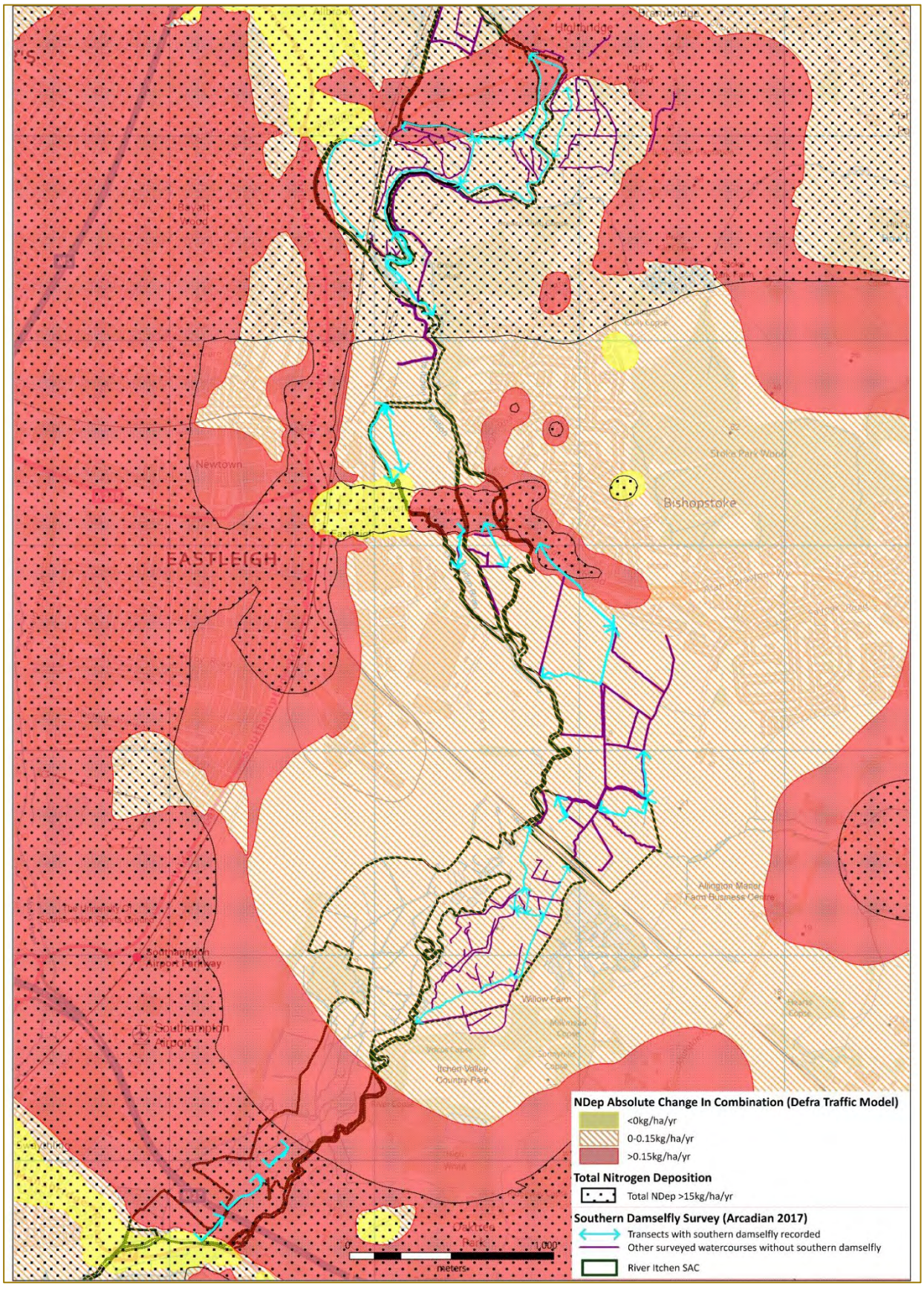


Figure 7.3: Distribution of southern damselfly transects in relation to NDep 15kg/ha/yr critical load for Rich Fen and 1% exceedance contour in the lower Itchen Valley. In combination assessment using Defra traffic model

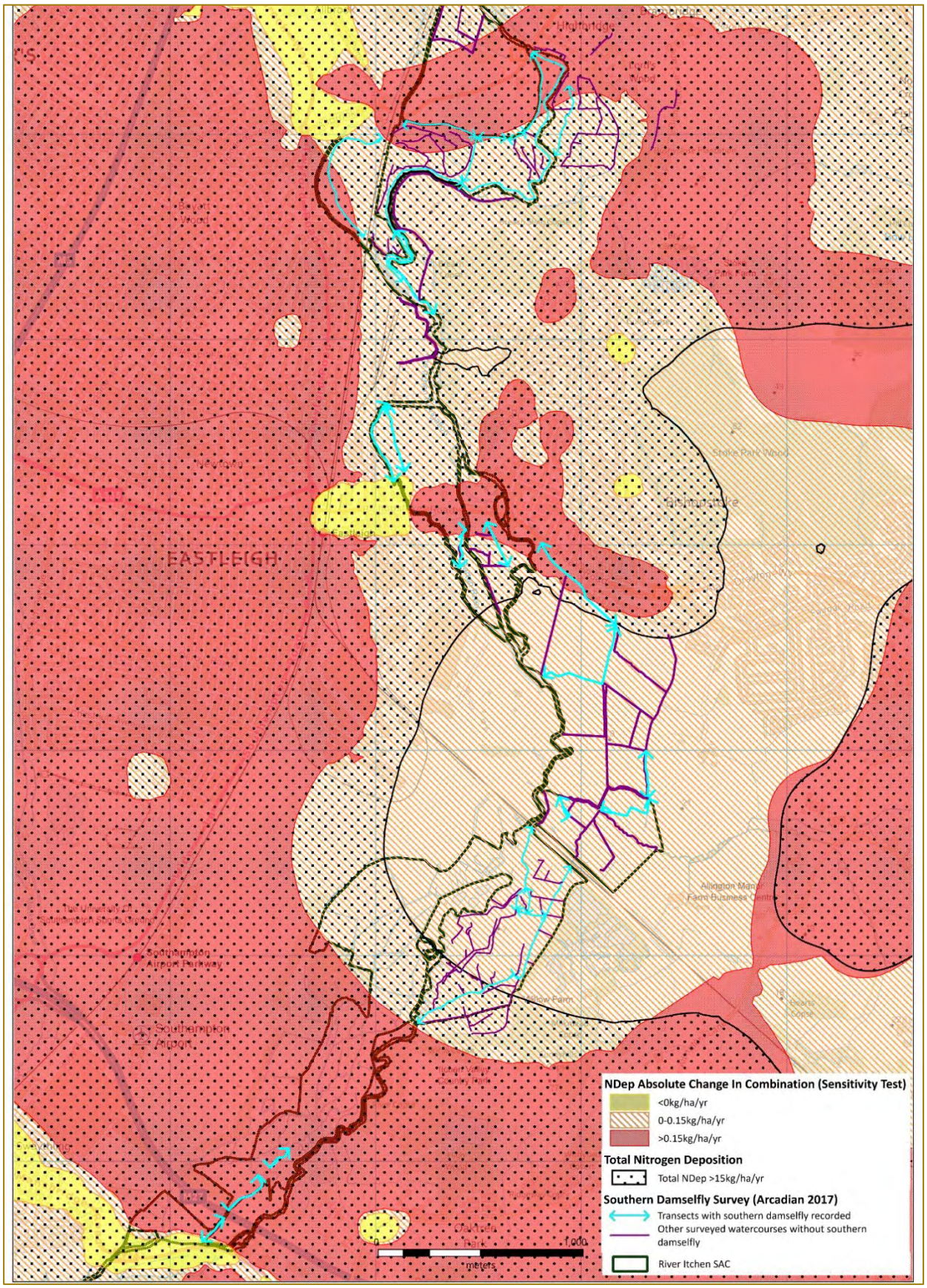


Figure 7.4: Distribution of southern damselfly transects in relation to NDep 15kg/ha/yr critical load for Rich Fen and 1% exceedance contour in the lower Itchen Valley. In combination assessment using Sensitivity Test model

7.2.8 The extent of different vegetation types present within the vicinity of these three locations was determined by overlaying the vegetation mapping data from the Itchen Sustainability Study survey (Collingridge, 2002). This provided information on the extent of various habitats within the 1% threshold area at each of the three locations and potential habitat suitability for southern damselfly.

Assessment results

Southern damselfly transects

7.2.9 Table 7.1 shows the length of survey transect supporting southern damselflies (Rushbrook, 2017) at the three locations listed above, based on the worst-case (Sensitivity Test) model results as illustrated in Figure 7.4. More detailed maps showing the location of the southern damselfly transects in relation to predicted air pollution contours are shown in Appendix II. The transects at Highbridge Farm (except 32) and the Itchen Valley Country Park were all within the River Itchen SAC boundary. However, the transects at Morris's Land/Ashtrim Nursery, Bishopstoke (and Highbridge transect 32) were all outside of the SAC.

Table 7.1: Length of southern damselfly transects within the 1% threshold contour and >15kg/ha/year (NDep in combination using the ST traffic model)

Site	Trans No.	Length (m)	Length (m) SD transect impacted	In SAC
Highbridge	1	416	336	Y
Highbridge	2b	133	69	Y
Highbridge	2c	387	387	Y
Highbridge	3	229	33	Y
Highbridge	4 (river)	1,371	423	Y
Highbridge	32	759	368	N
Morris' Land Bishopstoke	6	237	99	N
Ashtrim, Bishopstoke	1	200	39	N
Dunford's Land	1	553	346	N
IVCP	1	140.9	141	Y
IVCP	2	246.3	246	Y
IVCP	3	157	120	Y
IVCP	1 mon*	231	102	Y
Total length SD transect	**-**	***4,301.2***	***2,341.2***	**-**

* Population monitored by Itchen Valley Country Park

7.2.10 The greatest lengths of southern damselfly transects affected are at Highbridge Farm where a total of 1,616m of water course from which southern damselfly were recorded is within the 1% NDep threshold for Rich Fen habitat. The highest densities of southern damselfly are associated with transects 2b, 3 and 4 (Table 7.2). Transect 1 supported moderate densities of southern damselfly. Only two individuals were recorded in transect 2c; these are believed to have been vagrants from the adjacent transect 2b as the habitat in 2c is not suitable to support southern damselfly. A ditch outside the SAC (transect 32) also falls within the 1% contour,

however, only four individuals were recorded in this water course which was assessed as being largely unsuitable habitat for southern damselfly with low potential for enhancement.

Table 7.2: Population of southern damselfly associated with survey transects within impacted areas of the Itchen Valley. Transects at Ashtrim Nursery, Morris' Land and Dunford's Land, Bishopstoke, are outside of the SAC boundary

Site	Trans No.	Length (m)	Abundance (males)	Density (males per 100m)
Highbridge Farm	1	421	34	8.08
Highbridge Farm	2b	149	72	48.32
Highbridge Farm	2c	397	2	0.50
Highbridge Farm	3	229	135	59.08
Highbridge Farm	4	1,371	194	14.04
Highbridge Farm	32	759	4	0.53
Morris' Land	6	237	2	0.84
Ashtrim Nursery	1	200	53	26.47
Dunford's Land	1	553	3	0.54
IVCP	1	136	27	19.85
IVCP	2	262	19	7.25
IVCP	3	157	2	1.27

7.2.11 Three water courses are within the 1% NDep threshold polygon at Bishopstoke. These occur in three different monitored sites; Ashtrim Nursery (transect 1), Morris' Land (transect 6) and Dunford's Land (transect 1) over a total of 484m of water course. Highest densities of southern damselfly were recorded at Ashtrim Nursery, with very low numbers recorded at Morris' Land (2 individuals) and Dunford's Land (3 individuals) (Table 7.2). It is thought that the southern damselfly recorded at Morris' Land were transient individuals probably from the adjacent Ashtrim Nursery ditch. The stream at Dunford's Land is also of poor quality and assessed as being sub-optimal to unsuitable for southern damselfly.

7.2.12 The survey undertaken by Rushbrook (2017) did not include all water courses within the Itchen Valley Country Park (IVCP) known to support southern damselfly, with four additional transects being monitored by the Country Park staff. A total of 609m of watercourse are within the 1% NDep contour in the IVCP. The three transects surveyed by Rushbrook (2017) to the south of the Country Park, in the vicinity of the M27, are within the 1% NDep threshold contour. Highest densities of southern damselfly were recorded in transect 1, located furthest from the M27. Transect 2 to the north of the motorway had lower densities of southern damselfly whilst transect 3, to the south of the motorway, had the lowest recorded density at this site (Table 7.2).

7.2.13 In total, therefore, 1,857m of southern damselfly supporting watercourses within River Itchen SAC are expected to fall within the 1% NDep threshold contour (Local Plan in combination, Sensitivity Test), with an additional 852m of southern damselfly supporting watercourses falling within the contour but outside of the SAC. Further analysis was undertaken of the amount by which the screening threshold (1% of the Critical Load) is expected to be exceeded in these locations; plans illustrating this analysis are shown in Appendix II. The analysis shows that,

across much of the area covered by 1% NDep threshold contour, the amount of exceedence is limited to between 1% and 1.33% of the Critical Load, or between 0.15 and 0.2 kg N/ha/yr. In other words the amount of exceedence over the screening threshold is not substantial, even under the worst-case in combination Sensitivity Test scenario.

Review of southern damselfly habitat at River Itchen crossing points

7.2.14 Field surveys were undertaken during May 2018 to review the habitat conditions for southern damselfly at the three River Itchen road crossings discussed in section 7.2.9. Site visits were made by Jonathan Cox and Ben Rushbrook of the Hampshire and Isle of Wight Wildlife Trust. Visits to the Itchen Valley Country Park were guided by Eastleigh Borough Council staff responsible for the management of this site. Photos from the site visits are shown in Appendix IV.

Itchen Valley Country Park

7.2.15 Water courses in the vicinity of the M27 within the Itchen Valley Country Park were visited to the north and south of the motorway. Transect 2 to the north of the motorway was found to be in relatively poor condition for southern damselfly with marginal vegetation dominated by tall reed and sedge species including reed sweet-grass (*Glyceria maxima*), lesser pond-sedge (*Carex acutiformis*), common reed (*Phragmites australis*) and clumps of water-dock (*Rumex hydrolapathum*). These had all developed on wide silt berms that had accumulated along the margins of the water course. This appeared likely to be due to the effect of the motorway bridge on flow rate upstream of the bridge leading to increased silt deposition. Downstream of the bridge, Transect 3 was also in relatively poor condition, again with the marginal berms dominated by tall fen species dominated by lesser pond-sedge.

7.2.16 On both transects adjacent to the motorway bridge, the soft fleshy aquatic plants preferred for egg laying by the southern damselfly were rare or absent with the habitat being dominated by tall fen vegetation. It was apparent that silt deposition, water quality and fluvial processes were the predominant influences on the habitat. There was no evidence of elevated nutrient enrichment affecting the marginal swamp vegetation on these two transects in the vicinity of the motorway.

7.2.17 A small ditch on the west side of the flood plain was investigated on the south side of the motorway bridge. This is reported by the Country Park staff to take some surface water drainage from the motorway. It was found to have imperceptible levels of flow at the time of survey, but had a heavily silted bed and supported a dense growth of branched bur-reed (*Sparganium erectum*). This is a swamp community of eutrophic conditions that is tolerant of pollution by sewage and some industrial effluents (Haslam, 1978[44]). If air pollution was having a significant effect on the margins of Transect 2 and 3, it might be expected that these would also show an increased growth of branched bur-reed. The absence of this species suggests they are not subject to the elevated nutrient levels seen in the ditch that takes drainage from the motorway.

[44] Haslam, S.M. (1978) *River Plants*. Cambridge University Press.

7.2.18 Transect 1 is furthest away from the motorway and has the highest density of southern damselfly recorded in the 2017 survey of the Country Park. This had much better developed marginal swamp vegetation for southern damselfly with a greater abundance of both fools watercress (*Apium nodiflorum)* and watercress (*Rorippa nasturtium-aquaticum*). This more suitable habitat is likely to be related to better flow conditions on this section of the watercourse, and possibly more recent marginal vegetation management.

Highbridge Farm

7.2.19 Three southern damselfly transects occur within the 1% exceedance contour at Highbridge Farm - transects 1, 2 and 4. Transect 2 is divided into three sub-sections (2a, 2b and 2c). Previous assessments had considered only parts of 2c, 1 and 4 to be within the 1% exceedance threshold, based on initial air pollution modelling (AQC, February 2018). The most recent modelling suggests a greater extent of the 1% exceedance polygon might include a greater length of transect 1, 2 and 4, but was made available after the site visits.

7.2.20 The ditch in Transect 2c was largely dry and overgrown in May 2018 and unsuitable for southern damselfly. The two individuals recorded at the eastern end of this transect in 2017 may have been vagrants from the neighbouring ditch (2b).

7.2.21 Transects 1, 2a, 2b and 3 follow the course of a single water meadow drain that is fed from the main river just upstream of the High Bridge giving good perennial flow. Transect 1, 2a and 2b follow the line of a hedge. It has steep banks and water flows some distance below the level of the flood plain. Despite this, it has a good diverse marginal vegetation and tall uncut ruderal vegetation along its banks. These provide a reasonable southern damselfly habitat although shading from the hedge and scrub is reducing habitat quality.

7.2.22 Transect 4 follows the bank of the main river Itchen. The marginal vegetation along the main river is managed more intensively by the local angling club. This maintains a dense mixed fen vegetation dominated by yellow iris (*Iris pseudacorus*) and reed canary grass (*Phalaris arundanacea*) with a diversity of tall fen species. Marginal growth of watercress, water mint (*Mentha aquatica*) and other species used by ovipositing southern damselfly is abundant.

7.2.23 None of the water courses at Highbridge Farm show signs of nutrient enrichment related to the proximity of the road. Ditch 2c is largely dry and is unsuitable habitat for southern damselfly. Ditches 1, 2a and 2b are influenced by shading and current vegetation management, but show no signs of eutrophication closer to the road such as increasing dominance of coarser ruderal plants including stinging nettle (*Urtica dioica)*, woody nightshade (*Solanum dulcamara)*, bind-weed (*Convolvulus* spp.) and greater growth of grasses. The marginal vegetation along the main river in Transect 4 is influenced by river management practices and river water quality, and shows no evidence of a link with nutrient enrichment derived from the road.

Bishopstoke (Ashtrim Nursery)

7.2.24 A visit was made to the Ashtrim Nursery site at Bishopstoke. This is a strategically important location linking the southern damselfly populations to the north and south of Eastleigh. Although not included within the SAC, this site has an important role in maintaining the range

and meta population of southern damselfly in the Itchen Valley. The ditch through Ashtrim Nursery (Transect 1) was excavated by Eastleigh Borough Council to enhance its nature conservation value. It has created ideal conditions for southern damselfly with well-developed marginal growth of watercress, water forget-me-not (*Myosotis scorpioides*) and water mint.

7.2.25 Scrub growth to the south of the ditch and high water flows at the northern end of the ditch limit the use of this watercourse by southern damselfly to its middle reaches. However, it provides very good quality southern damselfly habitat over much of its length. There is no evidence of any nutrient enrichment or eutrophication of the marginal habitat due to proximity to the road.

Conclusion of site visits and effects of atmospheric nitrogen deposition on southern damselfly habitats

7.2.26 Site visits to the three locations where roads crossing the Itchen Valley will result in the 1% exceedance threshold being breached revealed a number of important factors relating to the southern damselfly habitat condition in these locations.

7.2.27 The marginal swamp vegetation associated with southern damselfly habitat falls within the broad habitat type of Rich Fen. However, this encompasses a wide range of vegetation types from the nutrient poor sedge rich and brown moss fens to eutrophic fen communities in which plant nutrients are much more abundant. This includes the tall fen vegetation recorded along the water courses within the Itchen Valley Country Park and at Highbridge as well as the specific emergent marginal swamp vegetation used for egg laying by southern damselflies. This conforms to the NVC community S23 'Other water-margin vegetation', which is described as a vegetation of mesotrophic to eutrophic waters. It might be anticipated that the Critical Load (CL) for nitrate in these eutrophic vegetation types will be greater than the 15kg/ha/year identified for the Rich Fen broad habitat type, which includes the nitrate sensitive sedge and brown moss fens.

7.2.28 The marginal swamp vegetation upon which the southern damselfly depends for egg laying is an aquatic vegetation type that grows from within the watercourse and hence largely derives its nutrients from the water in which it grows. Nitrate is in excess in these environments with phosphate being the limiting plant nutrient. Nitrate concentrations in the River Itchen are in the range of 4.5-5.5 mg/l[45] whilst phosphate levels are <0.1 mg/l. Small increases (0.15-0.4kg/ha) in nitrogen deposition from air pollution in restricted locations close to the road corridors are therefore unlikely to have a significant adverse effect on the growth of this vegetation.

7.2.29 The APIS website provides guidance on nitrate critical loads for standing waters. It states; "*Deposition of ammonia, nitrate and other forms of nitrogen from the atmosphere is unlikely to be the largest source of this nutrient to eutrophic standing waters (Gibson et al. 1992, Gibson et al. 1995, Jordan 1997[46]) and, therefore, in general, N deposition is unlikely to be very harmful to*

[45] River Itchen Sustainability Study (2004), Water Quality Technical Appendix, Halcrow Ltd

[46] Gibson, C.E.; Smith, R.V.; Stewart, D.A. 1992 nitrogen cycle in Lough Neagh, N. Ireland, 1975 to 1987 Int. Revue ges. Hydrobiol 77 73-83
Gibson, C.E.; Wu, Y.; Smith, S.J.; Wolfe-Murphy, S.A. 1995 Synoptic limnology of a diverse geological region: catchment and water chemistry Hydrobiologia 306 213-227

eutrophic standing waters, even when close to sources." Although the water in which the southern damselfly habitat grows is flowing it can be concluded that, in the small slow flowing water courses in which this habitat is found, nitrogen deposition is unlikely to be harmful.

7.2.30 The APIS website does not provide guidance on nitrate critical loads for flowing waters, but states; "*In most lowland rivers and burns, nitrogen inputs from catchment land-use, not deposition from the atmosphere, are likely to be much more significant (Strong et al. 1997, Smith & Stewart 1989, Foy et al. 1982*[47]*).*"

7.2.31 There is no apparent transition or gradient in marginal swamp vegetation composition or structure related to the distance from the highway at any of the three sites visited. The vegetation is far more affected by fluvial process in the water course, in particular sediment deposition, bank shading and vegetation management intervention, including grazing by livestock and ditch clearance. Against these factors, the relatively small changes in nitrogen deposition predicted to result from changes in road traffic are considered to be insignificant.

Assessment against the River Itchen SAC conservation objectives

7.2.32 Table 7.3 assesses the impacts of predicted changes in air quality against the conservation objectives for the River Itchen SAC southern damselfly population. It is concluded that there will be no adverse effect on the integrity of the SAC for this species as a consequence of predicted changes in air quality arising from implementation of the Eastleigh Borough Local Plan, either alone or in combination with other plans and projects.

Jordan, C. 1997 Mapping of rainfall chemistry in Ireland 1972-94 Biology and Environment: Proceedings of the Royal Irish Academy 97B 53-73

[47] Foy, R.; Smith, R.V.; Stevens, R.J. 1982 Identification of factors affecting nitrogen and phosphorus loadings to Lough Neagh Journal of Environmental Management 15 109-129
Smith, R.V.; Stewart, D.A. 1989 A regression model for nitrate leaching in Northern Ireland. Soil Use and Management 5 71-76
Strong, K.M.; Lennox, S.D.; Smith, R.V. 1997 Predicting nitrate concentrations in Northern Ireland rivers using time series analysis Journal of Environmental Quality 26 1599-1604

Table 7.3: Assessment against the River Itchen SAC conservation objectives

Conservation Objectives	Highbridge	Bishopstoke	IVCP
The extent and distribution of qualifying natural habitats and habitats of qualifying species	A total of 1,248m of existing SD habitat within the SAC (plus 368m outside the SAC) is within the 1% exceedance threshold, however, characteristics of habitat and other external influences on habitat quality lead to a conclusion that changes in air quality are not likely to affect the extent and distribution of SD habitat	A total of 484m of existing SD habitat outside the SAC is within the 1% exceedance threshold, however, characteristics of habitat and other external influences on habitat quality lead to a conclusion that changes in air quality is not likely to affect the extent and distribution of SD habitat	A total of 609m of existing SD habitat within the SAC is within the 1% exceedance threshold, however, characteristics of habitat and other external influences on habitat quality lead to a conclusion that changes in air quality is not likely to affect the extent and distribution of SD habitat
The structure and function of the habitats of qualifying species	The structure and function of SD habitat within the 1% exceedance zone is overwhelmingly influenced by other external factors including river water quality, fluvial characteristics and river and land management practices. Changes in atmospheric nitrogen deposition are not likely to have a significant effect on the SD habitat structure and function.	The structure and function of SD habitat within the 1% exceedance zone is overwhelmingly influenced by other external factors including river water quality, fluvial characteristics and river and land management practices. Changes in atmospheric nitrogen deposition are not likely to have a significant effect on the SD habitat structure and function.	The structure and function of SD habitat within the 1% exceedance zone is overwhelmingly influenced by other external factors including river water quality, fluvial characteristics and river and land management practices. Changes in atmospheric nitrogen deposition are not likely to have a significant effect on the SD habitat structure and function.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely	River and land management processes and natural succession have overwhelming influence on SD habitat quality. Nitrogen deposition levels are already exceeding Critical Load and likely to be in excess in aquatic environment. Increased nitrogen deposition will not have a significant effect on processes supporting the SD habitat.	River and land management processes and natural succession have overwhelming influence on SD habitat quality. Nitrogen deposition levels are already exceeding Critical Load and likely to be in excess in aquatic environment. Increased nitrogen deposition will not have a significant effect on processes supporting the SD habitat.	River and land management processes and natural succession have overwhelming influence on SD habitat quality. Nitrogen deposition levels are already exceeding Critical Load and likely to be in excess in aquatic environment. Increased nitrogen deposition will not have a significant effect on processes supporting the SD habitat.
The populations of	SD populations are dependent upon the	SD populations are dependent upon the	SD populations are dependent upon the

Conservation Objectives	Highbridge	Bishopstoke	IVCP
qualifying species, and,	conservation of a meta-population across multiple sites within the Itchen Valley. Air quality and nitrogen deposition will not have a significant effect on the maintenance of the SD meta-population.	conservation of a meta-population across multiple sites within the Itchen Valley. Air quality and nitrogen deposition will not have a significant effect on the maintenance of the SD meta-population.	conservation of a meta-population across multiple sites within the Itchen Valley. Air quality and nitrogen deposition will not have a significant effect on the maintenance of the SD meta-population.
The distribution of qualifying species within the site.	The site has an important role in the conservation of the meta-population of SD linking the lower Itchen Valley with populations to the north around Twyford Moors. However, increased aerial N deposition will not have a significant effect on the quality of the habitat at this site.	This site is critical to the conservation of the meta-population of SD within the lower Itchen Valley linking fragmented populations to north and south of Bishopstoke. However, increased aerial N deposition will not have a significant effect on the quality of the habitat at this site.	This site at the southern edge of the SD distribution in the Itchen Valley and has a high population density. It is therefore critical to the conservation of the species range. However, increased aerial N deposition will not have a significant effect on the quality of the habitat at this site.

Noise and vibration

7.2.33 The source of noise and vibration impacts derives from the following policies (Appendix I):

- S3 Location of new Housing
- S4 Employment provision
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
- S6 New Allbrook Hill, Bishopstoke and Fair Oak link road (including new bridge crossing of River Itchen SAC at B3355 Highbridge Road)
- S12 Transport infrastructure
- DM24 Housing sites with planning permission (in combination effects)
- DM25 Redevelopment of urban sites in unneighbourly use
- AL1 Land east of Allbrook Way
- BO2 West of Uplands Farm, Botley
- BO3 East of Kings Copse Avenue
- BU1 Land north of Providence Hill
- BU2 Heath House Farm
- BU3 South east of Windmill Lane
- BU7 Riverside Boatyard
- CF1 Central Precinct, Chandler's Ford
- CF2 Steele Close, Chandler's Ford
- E1 Civic Offices, Eastleigh
- E6 Eastleigh River Side
- E7 Eastleigh River Side adjacent land
- E9abcd Southampton Airport (employment allocation)
- E10 Land south of M27 Junction 5
- E11 Lakeside Country Park (west)
- FO1 West of Durley Road, Fair Oak
- FO2 Land north of Mortimers Lane
- FO3 East of Allington Lane
- FO5 Land East of Knowle Lane
- FO6 Foxholes Farm, Fair Oak
- FO8 Hammerley Farm, Horton Heath
- HA2 Mercury Marina

- HE1 West of Woodhouse Lane
- HE2 Sunday's Hill / Pewett Hill Close
- HE4 Peewit Hill Close / Dodwell Ln
- WE3 Tollbar Way / Berrywood Park

7.2.34 Limited information is currently available on the precise form of these developments, construction methods or timeframe. Consequently the risk of adverse effects on the integrity of River Itchen SAC will need to be reconsidered at the planning application stage. However, an assessment of the EBLP against the site's conservation objectives is presented below.

Assessment of impacts on the River Itchen SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species   The EBLP proposals listed above are unlikely to alter the extent and distribution of the habitats of qualifying species.
The structure and function (including typical species) of qualifying natural habitats   The EBLP proposals listed above are unlikely to alter the structure and function of the qualifying habitats.
The structure and function of the habitats of qualifying species   In the absence of mitigation, noise/vibration emanating from these proposals could create an acoustic barrier which impedes the function of the habitats in providing a migration or dispersal route for qualifying species including Atlantic salmon and European otter. Landscape corridors between neighbouring catchments used by otter may be threatened by increased disturbance at strategic locations. This effect may act in combination with extant planning permissions (listed under policy DM24).
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely   The EBLP proposals listed above are unlikely to alter the supporting processes on which the habitats of the qualifying species rely.
The population of qualifying species   Obstructions to the movement of qualifying fish species including Atlantic salmon within the SAC could severely disrupt the species' productivity, particularly if it occurs during key migratory periods, resulting in population declines. Otter is likely to be more resilient to disturbance via noise/vibration and population effects are unlikely to occur.
The distribution of qualifying species within the site   In the absence of mitigation, for qualifying species including Atlantic salmon and European otter, noise/vibration impacts could result in avoidance of the affected areas and potentially lead to range contractions. For the majority of the proposals listed this effect is likely to be relatively short term and reversible as it would occur during site preparation and construction phases only. For the SGO there is a risk that the effect could continue for a prolonged period as the construction phase is likely to extend beyond 2036. However, the most significant watercourse supporting otter within the SGO is Bow Lake which runs through parts of the SGO allocated for green space. Only the north-western extremity of the developable area would fall within 100m of Bow Lake.

Hydrological impacts: Strategic Growth Option

7.2.35 The source of strategic hydrological impacts derives from the following policies (Appendix I):

- S3 Location of new housing
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
- S6 New Allbrook Hill, Bishopstoke and Fair Oak link road

7.2.36 Limited information is currently available on the precise form of these developments, construction methods or timeframe. Consequently the risk of adverse effects on the integrity of River Itchen SAC will need to be reconsidered at the planning application stage. However, an assessment of the EBLP against the site's conservation objectives is presented below.

Assessment of impacts on the River Itchen SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species
The Strategic Growth Option and north Bishopstoke bypass (assuming a clear span structure when crossing the SAC) are unlikely to alter the extent and distribution of Callitricho-Batrachion communities forming the Annex 1 habitat, and are also unlikely to alter the extent and distribution of white-clawed crayfish, southern damselfly, bullhead, brook lamprey, Atlantic salmon and otter habitats.
The structure and function (including typical species) of qualifying natural habitats
The Strategic Growth Option and north Bishopstoke bypass are could degrade the structure and function of the Annex 1 habitat as a result of changes in flow velocity, sedimentation, sediment character (type/size), substrate, rate of erosion and flow characteristics (riffle pool spacing).
The structure and function of the habitats of qualifying species
The Strategic Growth Option and north Bishopstoke bypass are could degrade the structure and function of the white-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon habitats as a result of changes in flow velocity, sedimentation, sediment character (type/size), substrate, rate of erosion and flow characteristics (riffle pool spacing). Otter are likely to be more resilient but would be at risk of displacement from the channel unless sufficient space is provided for dispersal during high flow conditions.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
The Strategic Growth Option and north Bishopstoke bypass are could alter the supporting processes on which the Annex 1 habitat and Annex 2 species rely by increasing water turbidity, chemistry, volume and velocity.
The population of qualifying species
The populations of white-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon could be reduced if hydrological impacts affect breeding success or increase mortality. Otter is likely to be more resilient but may be at risk of increased mortality when crossing road corridors.
The distribution of qualifying species within the site
White-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon could suffer range contractions if they avoid otherwise suitable habitat due to hydrological impacts. Otter is likely to be more resilient but its dispersal may be impeded by the new road route.

Land outside of European site boundaries

7.2.37 The source of impacts to land outside of the SAC boundary derives from the following policies (Appendix I):

- S3 Location of new housing
- S4 Employment provision
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
- S6 New Allbrook Hill, Bishopstoke and Fair Oak link road road (including new bridge crossing of River Itchen SAC at B3355 Highbridge Road)
- S12 Transport infrastructure
- DM24 Housing sites with planning permission (in combination effects)

7.2.38 Limited information is currently available on the precise form of these developments, construction methods or timeframe. Consequently the risk of adverse effects on the integrity of River Itchen SAC will need to be reconsidered at the planning application stage. However, an assessment of the EBLP against the site's conservation objectives is presented below.

Assessment of impacts on the River Itchen SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species Residential and commercial development and transportation infrastructure are unlikely to result in a loss of otter habitats.
The structure and function of the habitats of qualifying species Landscape corridors used by otter to move between neighbouring catchments (Figure 6.10) may be impeded by increasing traffic movement associated with residential commercial and infrastructure development where existing or new roads pass close to strategic locations.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely Residential and commercial development and transportation infrastructure are unlikely to adversely affect the supporting processes on which otter relies.
The population of qualifying species Increased road accident deaths could result in a reduction in population size.
The distribution of qualifying species within the site The distribution of otters within the Itchen catchment could be constrained by increased traffic movements at critical locations in the catchment affecting landscape corridors used by otter for dispersal.

Invasive non-native species and site-specific hydrological impacts

7.2.39 The source of site-specific impacts from invasive non-native species and water quality derives from the following policies (Appendix I):

- S3 Location of new Housing
- S4 Employment provision

- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
- S6 New Allbrook Hill, Bishopstoke and Fair Oak link road road (including new bridge crossing of River Itchen SAC at B3355 Highbridge Road)
- S12 Transport infrastructure
- DM24 Housing sites with planning permission (in combination effects)
- DM25 Redevelopment of urban sites in unneighbourly use
- AL1 Land east of Allbrook Way
- E6 Eastleigh River Side
- E7 Eastleigh River Side adjacent land
- E9abcd Southampton Airport (employment allocation)
- FO2 Land north of Mortimers Lane
- FO3 East of Allington Lane
- FO6 Foxholes Farm, Fair Oak
- FO8 Hammerley Farm, Horton Heath

7.2.40 Limited information is currently available on the precise form of these developments, construction methods or timeframe. Consequently the risk of adverse effects on the integrity of River Itchen SAC will need to be reconsidered at the planning application stage. However, an assessment of the EBLP against the site's conservation objectives is presented below.

Assessment of impacts on the River Itchen SAC conservation objectives

The extent and distribution of qualifying natural habitats and habitats of qualifying species

The release of invasive non-native species such as Japanese knotweed, giant hogweed or Himalayan balsam into riparian habitats linked to the SAC is unlikely to directly affected the extent and distribution of in-channel vegetation (e.g. stream water-crowfoot *R. penicillatus ssp. pseudofluitans*, a species especially characteristic of calcium-rich rivers, and river water-crowfoot *R. fluitans)* forming the Annex 1 habitat. These species could, however, directly affect bankside vegetation and potentially in-channel species composition through increased shading and siltation (through increased erosion).

Floating pennywort, creeping water primrose and other aquatic species (e.g. New Zealand swamp stonecrop *Crassula helmsii*, parrot's feather *Myriophyllum aquaticum* and curly waterweed *Lagarosiphon major*) generally prefer static or slow-moving waterbodies. However, they could affect botanical composition among emergent vegetation at the margins, or forming floating mats behind obstacles such as fallen trees. Signal crayfish consume large quantities of plant material in their native habitat; they may have an impact on macrophyte communities.

Invasive species causing changes to the structure of bankside vegetation and increased shading in side channels and field drains used by southern damselfly could have serious deleterious effect on the extent and distribution of its breeding habitat. All of the qualifying fish species (bullhead, brook lamprey and salmon) require coarse sediment substrate (gravel/cobble/pebble) for spawning, although brook lamprey also requires soft marginal silt or sand for the larvae. White-clawed crayfish also require a cobbly substrate which it uses for refuge alongside tree root systems. Increased siltation could reduce the extent and distribution of these habitats.

A major pollution event during construction of a site close to the SAC could theoretically be so severe

Assessment of impacts on the River Itchen SAC conservation objectives
as to reduce the extent and distribution of the Annex 1 habitat, though such events are unusual and there is limited evidence for damage from contaminants in recent site condition assessments.
The structure and function (including typical species) of qualifying natural habitats The structure and function of the Annex 1 habitat could be indirectly affected by non-native species through increased shading and siltation, or by a major pollution event.
The structure and function of the habitats of qualifying species As stated above, the breeding habitats of southern damselfly are at risk of severe impacts if invasive species out-compete bankside vegetation in the side channels. Habitats of bullhead, brook lamprey, salmon and white-clawed crayfish could be negatively affected through siltation but such impacts are likely to be less dramatic, more gradual and influenced by a variety of other factors, in particular water flow volumes and velocity.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely Non-native species are unlikely to directly or fundamentally affect the supporting processes on which the Annex 1 habitat or Annex 2 species rely. A major pollution event during construction of a site close to the SAC could alter water chemistry, though there is limited evidence for damage from contaminants in recent site condition assessments, and such an effect is likely to be temporary. Small scale cumulative effects are more likely as a result of changes in water flow, turbidity and chemical loading in surface water run-off from multiple operational developments but such impacts are likely to be gradual and influenced by a variety of other factors.
The population of qualifying species The populations of southern damselfly (in particular) and bullhead, brook lamprey, salmon and white-clawed crayfish could all be reduced by non-native species and deterioration in water quality, though such changes are likely gradual in the latter group and reflective of a combination of factors.
The distribution of qualifying species within the site The distributions of bullhead, brook lamprey, salmon and white-clawed crayfish could all be reduced by non-native species and deterioration in water quality, though such changes are likely gradual in the latter group and reflective of a combination of factors. Range contractions are possible for southern damselfly. The loss of critical stepping stone habitats for southern damselfly such as those around Bishopstoke (a strategically important location linking the populations of southern damselfly to the north and south) through invasive species would be likely to have a serious adverse effect on the species' distribution.

Water abstraction

7.2.41 The source of water abstraction impacts derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S4 Employment provision (and by implication proposed employment allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak

Assessment of impacts on the River Itchen SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species Unrestricted abstractions from the River Itchen could reduce the extent and distribution of stream water-crowfoot, river water-crowfoot and Callitricho-Batrachion communities, particularly in dry years and during periods of peak water demand. Low water flows and reduced extent/distribution of vegetation would also constitute a reduction in the extent and distribution of the habitats of white-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon. Otter is likely to be more resilient but may be adversely affected by reduced food availability. However, abstraction licences on the lower Itchen and related water sources have been amended and agreed between the Environment Agency and Southern Water to avoid adverse effects on integrity. As part of the agreement (which is draft as at June 2018 and subject to Secretary of State approval) the water company is still able to obtain authorisation from the Agency for abstractions over and above the revised licence under certain conditions, but a series of ecological monitoring, mitigation and compensation measures have been detailed to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.
The structure and function (including typical species) of qualifying natural habitats Low water flows could adversely affect the structure of the Annex 1 habitat. However, revised abstractions licences have been agreed and ecological monitoring, mitigation and compensation measures are in place to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.
The structure and function of the habitats of qualifying species Low water flows could adversely affect the structure of the Annex 1 habitat and its function in supporting white-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon. However, revised abstractions licences have been agreed and ecological monitoring, mitigation and compensation measures are in place to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely Unrestricted abstractions from the River Itchen would undermine the supporting process on which the Annex 1 habitat and populations of white-clawed crayfish, southern damselfly, bullhead, brook lamprey, Atlantic salmon and otter rely, particularly in dry years and during periods of peak water demand. However, revised abstractions licences have been agreed and ecological monitoring, mitigation and compensation measures are in place to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.
The population of qualifying species The populations of white-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon could suffer a decline if abstractions from the River Itchen continue unrestricted in in dry years and during periods of peak water demand. Otter is likely to be more resilient but may be adversely affected by reduced food availability. However, revised abstractions licences have been agreed and ecological monitoring, mitigation and compensation measures are in place to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.
The distribution of qualifying species within the site The distributions of white-clawed crayfish, southern damselfly, bullhead, brook lamprey and Atlantic salmon could suffer a contract if abstractions from the River Itchen continue unrestricted in in dry years and during periods of peak water demand. Otter is likely to be more resilient but may shift its

Assessment of impacts on the River Itchen SAC conservation objectives
distribution in response to reduced food availability. However, revised abstractions licences have been agreed and ecological monitoring, mitigation and compensation measures are in place to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.

Water pollution

7.2.42 The source of water pollution impacts derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak

Assessment of impacts on the River Itchen SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species
Growth projections are not expected to lead to impacts on the SAC via nutrient nitrogen pollution, however, unrestricted growth even within the existing discharge permit for Chickenhall WWTW could result in adverse effects via phosphate pollution. Other sources (agriculture, fish farms and upstream WWTW) also contribute significant quantities of phosphate. Excess phosphate may result in overgrowth by epiphytic filamentous algae that compete directly with vascular plants for light and nutrients, possibly leading to loss of nutrient-sensitive species, and reduced species composition, extent and condition of riverine plant communities. River water-crowfoot is likely to be much more sensitive to nutrient enrichment under low flow conditions (Hatton-Ellis & Grieve, 2003).
The structure and function (including typical species) of qualifying natural habitats
The structure and function of Callitricho-Batrachion communities is likely to deteriorate as a result of excess phosphate concentrations.
The structure and function of the habitats of qualifying species
Excess phosphate may result in increasing dominance of coarser ruderal plants altering the structure and function of marginal aquatic vegetation communities used by southern damselfly for egg laying.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
The supporting processes (trophic status) of Callitricho-Batrachion communities are likely to be degraded as a result of excess phosphate concentrations, although species composition, extent and condition are also heavily influenced by water flow, shading and base status.
The population of qualifying species
The southern damselfly population is likely to decrease if suitable reproductive conditions are not maintained as a result of excess phosphate concentrations.
The distribution of qualifying species within the site
Southern damselfly may undergo a range contraction within the site if the distribution of suitable egg laying habitats is adversely affected by excess phosphate concentrations.

Appropriate Assessment conclusion

7.2.43 In the absence of mitigation it cannot currently be concluded that development proposed in the Eastleigh Borough Local Plan will not have an adverse effect on the integrity of the River

Itchen SAC as a result of the following impacts: noise and vibration; hydrological impacts (SGO); land outside of European site boundaries (otter corridors); invasive non-native species and site-specific hydrological impacts; water abstraction; and water pollution. Chapter 8 sets out the mitigation strategy to prevent adverse effects on integrity.

7.3 Solent Maritime SAC

Invasive non-native species and site-specific hydrological impacts

7.3.1 The source of site-specific impacts from invasive non-native species and water quality derives from the following policies (Appendix I):

- S3 Location of new Housing
- S4 Employment provision
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak
- S6 New Allbrook Hill, Bishopstoke and Fair Oak link road
- S12 Transport infrastructure
- DM24 Housing sites with planning permission (in combination effects)
- BO2 West of Uplands Farm, Botley
- BO3 East of Kings Copse Avenue
- BO5 Botley bypass
- BU1 Land north of Providence Hill
- BU2 Heath House Farm
- BU3 South east of Windmill Lane
- BU7 Riverside Boatyard
- FO1 West of Durley Road, Fair Oak
- FO5 Land East of Knowle Lane
- HA2 Mercury Marina
- HE1 West of Woodhouse Lane
- HE2 Sunday's Hill / Pewett Hill Close
- HE4 Peewit Hill Close / Dodwell Ln
- WE3 Tollbar Way / Berrywood Park

7.3.2 Limited information is currently available on the precise form of these developments, construction methods or timeframe. Consequently the risk of adverse effects on the integrity of River Itchen SAC will need to be reconsidered at the planning application stage. However, an assessment of the EBLP against the site's conservation objectives is presented below.

Assessment of impacts on the Solent Maritime SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species The extent and distribution of qualifying natural habitats are unlikely to be adversely affected by non-native species; species of concern within the SAC were introduced via pathways other than residential or commercial development (e.g. shipping, aquaculture and natural dispersal). However, a major pollution event during construction of a site close to the SAC could theoretically be so severe as to reduce the extent and distribution of the Annex 1 habitat, though such events are unusual and there is limited evidence for construction-related impacts in recent site condition assessments. Desmoulin's whorl snail is unlikely to be affected due to its restricted distribution (Fishbourne Channel in Chichester Harbour) and possible local extinction (see section 4.3.25).
The structure and function (including typical species) of qualifying natural habitats The structure and function of Annex 1 habitats are unlikely to be adversely affected by non-native species, but could be indirectly affected by a major pollution event.
The structure and function of the habitats of qualifying species Desmoulin's whorl snail is unlikely to be affected due to its restricted distribution (Fishbourne Channel in Chichester Harbour) and possible local extinction (see section 4.3.25).
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely The supporting processes on which Annex 1 habitats rely are unlikely to be adversely affected by non-native species. A major pollution event during construction of a site close to the SAC could alter water chemistry, though there is limited evidence for construction-related impacts in recent site condition assessments, and such an effect is likely to be temporary. Small scale cumulative effects are more likely as a result of changes in water flow, turbidity and chemical loading in surface water run-off from multiple operational developments but such impacts are likely to be gradual and influenced by a variety of other factors.
The population of qualifying species Desmoulin's whorl snail is unlikely to be affected due to its restricted distribution (Fishbourne Channel in Chichester Harbour) and possible local extinction (see section 4.3.25).
The distribution of qualifying species within the site Desmoulin's whorl snail is unlikely to be affected due to its restricted distribution (Fishbourne Channel in Chichester Harbour) and possible local extinction (see section 4.3.25).

Water pollution

7.3.3 The source of water pollution impacts derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak

Assessment of impacts on the Solent Maritime SAC conservation objectives
The extent and distribution of qualifying natural habitats and habitats of qualifying species Growth projections are not expected to result in impacts on the SAC via nutrient nitrogen pollution in the short term, however, Peel Common WWTW (serving Eastleigh, Fareham, Gosport, Test Valley and

Assessment of impacts on the Solent Maritime SAC conservation objectives
Winchester) is predicted to reach capacity by 2025 at which point a review of N permit will be required. Recently implemented (2014/2015) measures for improvements at Pennington WWTW, Peel Common WWTW, Eastney/Budds Farm WWTW and several in Southampton Water, will all reduce N inputs into the Solent. No adverse effects to the extent and distribution of qualifying natural habitats or habitats of qualifying species are likely in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for adverse effects later in the plan period. The nitrogen budget for the EBLP suggests that developments allocated in the plan will lead to a surplus of 15,434.74 kg/TN/yr over the plan period; this scale of excess nitrogen entering the marine environment will require mitigation to prevent adverse effects on site integrity.
The structure and function (including typical species) of qualifying natural habitats
No adverse effects on the structure and function of qualifying natural habitats are likely in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for adverse effects later in the plan period.
The structure and function of the habitats of qualifying species
No adverse effects on the structure and function of habitats of qualifying species are likely in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for adverse effects later in the plan period.
The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
The supporting processes on which qualifying habitats/species rely is unlikely to be adversely affected in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for adverse effects later in the plan period.
The population of qualifying species
The population of qualifying species (Desmoulin's whorl snail) is unlikely to be significantly affected in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for adverse effects later in the plan period.
The distribution of qualifying species within the site
The distribution of Desmoulin's whorl snail is unlikely to be significantly affected in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for adverse effects later in the plan period.

Appropriate Assessment conclusion

7.3.4 In the absence of mitigation it cannot currently be concluded that development proposed in the Eastleigh Borough Local Plan will not have an adverse effect on the integrity of the Solent Maritime SAC as a result of the following impacts: invasive non-native species and site-specific hydrological impacts; and water pollution. Chapter 8 sets out the mitigation strategy to prevent adverse effects on integrity.

7.4 New Forest SPA

Disturbance (strategic impacts)

7.4.1 The source of (strategically-operating) disturbance impacts to the SPA derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak

Assessment of impacts on the New Forest SPA conservation objectives
The extent and distribution of the habitats of qualifying features
The EBLP is unlikely to alter the extent and distribution of the habitats of the New Forest SPA breeding populations of nightjar, woodlark and Dartford warbler as a result of increased disturbance.
The structure and function of the habitats of qualifying features
The plan has the potential to alter the structure and function of the habitats of the New Forest SPA breeding populations of nightjar, woodlark and Dartford warbler. The impact is likely to be indirect, intermittent and reversible due to increased human/dog activity leading to displacement of the birds from otherwise suitable nesting habitats. The impact is very likely act in combination with other plans and projects. The magnitude of the potential impact is uncertain but potentially large (approximately 14,580 dwellings within c.20km of the New Forest SPA), especially in combination, and is likely to be most severe during the spring and summer months. The risk of adverse effects on integrity is high. However, counteracting measures are being devised in cooperation with Natural England and other local planning authority members of the New Forest International Designation Working Group, and have been incorporated into the plan via proposed policy DM11, and are considered likely to effectively avoid and mitigate the impact. The Council is also committed to developing an interim approach to mitigating the effects of residential development in advance of a joint strategic mitigation programme being agreed.
The supporting processes on which the habitats of qualifying features rely
The plan is unlikely to significantly undermine the supporting processes on which the habitats of the New Forest SPA breeding populations of nightjar, woodlark and Dartford warbler rely, although minor indirect impacts are possible through trampling, soil compaction, erosion and localised eutrophication.
The population of each of the qualifying features
The New Forest SPA breeding populations of nightjar, woodlark and Dartford warbler could potentially be reduced via increased predation of eggs, trampling and thermal stress, leading to reduced breeding success as a result of increased disturbance. The magnitude of the potential impact is uncertain but likely to be significant, and is very likely act in combination with other plans and projects. However, counteracting measures have been incorporated into the plan and are considered likely to effectively avoid and mitigate the impact.
The distribution of qualifying features within the site
Without mitigation, the distribution of the New Forest SPA breeding populations of nightjar, woodlark and Dartford warbler populations within the site is likely to be altered as birds are displaced from otherwise suitable habitats in response to increased disturbance, and the impact is very likely act in combination with other plans and projects. However, counteracting measures have been incorporated into the plan and are considered likely to

Assessment of impacts on the New Forest SPA conservation objectives
effectively avoid and mitigate the impact.

Appropriate Assessment conclusion

7.4.2 In the absence of mitigation it cannot currently be concluded that development proposed in the Eastleigh Borough Local Plan will not have an adverse effect on the integrity of the New Forest SPA as a result of disturbance (strategic impacts). Chapter 8 sets out the mitigation strategy to prevent adverse effects on integrity.

7.5 Solent & Southampton Water SPA/Ramsar

Disturbance (strategic impacts)

7.5.1 The source of (strategically-operating) disturbance impacts to the SPA/Ramsar derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak

Assessment of impacts on the Solent & Soton Water SPA/Ramsar conservation objectives
The extent and distribution of the habitats of qualifying features
The EBLP is unlikely to alter the extent and distribution of the habitats of the Solent & Southampton Water SPA/Ramsar overwintering (dark-bellied Brent goose, black-tailed godwit, ringed plover and teal) bird populations as a result of increased disturbance.
The structure and function of the habitats of qualifying features
The plan has the potential to alter the structure and function of the habitats of the Solent & Southampton Water SPA/Ramsar overwintering bird populations. The impact could be indirect and permanent or reversible as a result of increased footfall within the site, leading to trampling of vegetation, soil compaction and erosion; or be direct, intermittent and reversible due to increased human/dog activity leading to displacement of the birds from otherwise suitable feeding or roosting habitats. The impact is very likely act in combination with other plans and projects. The magnitude of the potential impact is uncertain but potentially large (a minimum of 1,387 dwellings within 5.6km of the SPA/Ramsar), especially in combination, and is likely to continue year-round. The risk of adverse effects on integrity is high. However, counteracting measures were devised in cooperation with Natural England and other local planning authority members of the Solent Recreation Mitigation Partnership, and have been incorporated into the plan via proposed policy DM11, and are considered likely to effectively avoid and mitigate the impact.
The supporting processes on which the habitats of qualifying features rely
The plan is unlikely to significantly undermine the supporting processes on which the habitats of the Solent & Southampton Water SPA/Ramsar overwintering bird populations rely, although minor indirect impacts are possible through trampling, soil compaction and erosion.
The population of each of the qualifying features
The Solent & Southampton Water SPA/Ramsar overwintering dark-bellied Brent goose, black-tailed

Assessment of impacts on the Solent & Soton Water SPA/Ramsar conservation objectives
godwit, ringed plover and teal populations could potentially be reduced via increased energetic expenditure and starvation risk, leading to a fall in winter survival rates as a result of increased disturbance. The magnitude of the potential impact is uncertain but likely to be significant. The impact is very likely act in combination with other plans and projects. However, counteracting measures have been incorporated into the plan and are considered likely to effectively avoid and mitigate the impact.
The distribution of qualifying features within the site Without mitigation, the distribution of the Solent & Southampton Water SPA/Ramsar overwintering bird populations within the site is likely to be altered as birds are displaced from otherwise suitable habitats in response to increased disturbance, and the impact is very likely act in combination with other plans and projects. However, counteracting measures have been incorporated into the plan and are considered likely to effectively avoid and mitigate the impact.

Noise and vibration

7.5.2 The source of noise and vibration impacts derives from the following policies (Appendix I):

- HA2 Mercury Marina

7.5.3 Limited information is currently available on the precise form of this development, construction methods or timeframe. Consequently the risk of adverse effects on the integrity of Solent & Southampton Water SPA/Ramsar will need to be reconsidered at the planning application stage. However, an assessment of the EBLP against the site's conservation objectives is presented below.

Assessment of impacts on the Solent & Soton Water SPA/Ramsar conservation objectives
The extent and distribution of the habitats of qualifying features The EBLP proposal listed above is unlikely to alter the extent and distribution of the habitats of qualifying features.
The structure and function of the habitats of qualifying features In the absence of mitigation, noise/vibration emanating from this proposal could render otherwise suitable habitats unusable by breeding gulls and terns and overwintering waders and wildfowl.
The supporting processes on which the habitats of qualifying features rely The EBLP proposal listed above is unlikely to alter the supporting processes on which the habitats of the qualifying features rely.
The population of each of the qualifying features In the absence of mitigation, very loud construction processes associated with this proposal could displace breeding gulls and terns and overwintering waders and wildfowl, and create a risk of reduced breeding success or overwinter survival rates. The impact from HA2 Mercury Marina is unlikely to result in a population scale effect, however, in combination the impact could still be adverse.
The distribution of qualifying features within the site Any displacement of breeding gulls and terns and overwintering waders and wildfowl would change the distribution of qualifying features within the site, although the impact is likely to be short term and

Assessment of impacts on the Solent & Soton Water SPA/Ramsar conservation objectives
reversible as it would occur during site preparation and construction phases only.

Water pollution

7.5.4 The source of water pollution impacts derives from the following policies (Appendix I):

- S3 Location of new housing (and by implication proposed residential allocations)
- S5 New Communities, land north of Bishopstoke and land north and east of Fair Oak

Assessment of impacts on the Solent & Soton Water SPA/Ramsar conservation objectives
The extent and distribution of the habitats of qualifying features
Growth projections are not expected to result in impacts on the SPA/Ramsar via nutrient nitrogen pollution in the short term, however, Peel Common WWTW (serving Eastleigh, Fareham, Gosport, Test Valley and Winchester) is predicted to reach capacity by 2025 at which point a review of N permit will be required. Recently implemented (2014/2015) measures for improvements at Pennington WWTW, Peel Common WWTW, Eastney/Budds Farm WWTW and several in Southampton Water, will all reduce N inputs into the Solent. No adverse effects to the extent and distribution of habitats of qualifying species are likely in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for indirect adverse effects later in the plan period. The nitrogen budget for the EBLP suggests that developments allocated in the plan will lead to a surplus of 15,434.74 kg/TN/yr over the plan period; this scale of excess nitrogen entering the marine environment will require mitigation to prevent adverse effects on site integrity.
The structure and function of the habitats of qualifying features
No adverse effects on the structure and function of habitats of qualifying species are likely in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for indirect adverse effects later in the plan period.
The supporting processes on which the habitats of qualifying features rely
The supporting processes on which habitats of qualifying species rely is unlikely to be adversely affected in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for indirect adverse effects later in the plan period.
The population of each of the qualifying features
The populations of qualifying species are unlikely to be significantly affected in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for indirect adverse effects later in the plan period.
The distribution of qualifying features within the site
The distributions of qualifying species are unlikely to be significantly affected in the short term, however, the capacity constraint at Peel Common means it is not possible to rule out the potential for indirect adverse effects later in the plan period.

Appropriate Assessment conclusion

7.5.5 In the absence of mitigation it cannot currently be concluded that development proposed in the Eastleigh Borough Local Plan will not have an adverse effect on the integrity of the Solent and Southampton Water SPA/Ramsar as a result of the following impacts: disturbance (strategic impacts); noise and vibration; and water pollution. Chapter 8 sets out the mitigation strategy to prevent adverse effects on integrity.

8 Mitigation Strategy

8.1 Introduction

8.1.1 This chapter outlines the mitigation strategy of preventative measures which, together with incorporated mitigation (section 5.3), will be taken into account when determining whether there are adverse effects on the integrity of any European site. The mitigation strategy will need to be secured on adoption of the EBLP.

8.2 Disturbance: Strategic Impacts

Solent and Southampton Water SPA/Ramsar

8.2.1 The potential for adverse effects resulting from residential development within 5.6km of the SPA/Ramsar is adequately dealt with by DM11's (Nature conservation) requirement that contributions are made in line with the Solent Recreation Mitigation Strategy.

New Forest SPA

8.2.2 The potential for adverse effects resulting from residential development within c.20km of the SPA is adequately dealt with by DM11's (Nature conservation) requirement that contributions are made towards recreation mitigation for the New Forest. Although a recreation mitigation strategy for the New Forest has not yet been devised, this does not give rise to any realistic risk to this conclusion, given that Eastleigh Borough Council's membership of the New Forest International Designation Working Group demonstrates its commitment to implementing the strategy once agreed, and given that contributions or other mitigation measures pursuant to Policy DM11 are not contingent on a formal strategy being in place.

8.2.3 In addition Eastleigh Borough Council is developing an interim approach to mitigating the effects of residential development within the borough in advance of a joint strategic mitigation programme being agreed. The extent of the mitigation required will be calculated based on the average number of visits generated by new homes and reflecting the estimated proportion of households who visit the New Forest and designated SPA/SAC/Ramsar sites each year. The interim approach to mitigation may include:

- Creating new open spaces / SANG within Eastleigh borough, including as part of new development;
- Implementing changes to existing open spaces and recreational routes within Eastleigh borough; and
- Contributing to visitor access management projects which are already in place in the New Forest to address the impact of extra visits from Eastleigh residents.

8.3 Noise and Vibration

River Itchen SAC

8.3.1 Planning applications for sites within 100m of River Itchen SAC (including the new bridge crossing of River Itchen SAC at B3355 Highbridge Road and projects close to headwaters and tributaries used by otter when moving between catchments) and policy S12 listed in Table 6.5 which could result in adverse effects via noise/vibration will be required to:

- Adopt low impact construction methods such as vibro-piling;
- Incorporate noise attenuation measures to prevent exceedance of impact thresholds;
- Conduct a preconstruction habitat survey to be undertaken by a fisheries biologist to determine the likelihood of salmon spawning occurring in the relevant stretch of river;
- Restrict works to periods when qualifying species are not present or are less vulnerable to noise/vibration impacts (e.g. for Atlantic salmon avoid the following period: end of November to end of March when adults are migrating upstream for egg laying);
- Protect potential otter holts such as wet woodland and reed bed from disturbance;
- Protect corridors linking the Itchen, Test and Hamble catchments from disturbance, in particular the Tadburn Stream and Monks Brook and the Bow Lake Stream;
- Undertake project-level HRA to show that the above or other devised measures are capable of preventing adverse effects on integrity.

8.3.2 These measures are likely to be effective, will adequately mitigate for noise/vibration impacts potentially affecting the River Itchen SAC, and have been incorporated into the EBLP via changes to policy DM11 and supporting text.

Solent and Southampton Water SPA/Ramsar

8.3.3 The potential for adverse effects resulting from development at HA2 (Mercury Marina) is adequately dealt with by DM8's (Pollution) requirement that *"construction noise should be kept below 69dBA max (measured at the sensitive receptor which is the nearest point of the SPA/Ramsar or supporting habitat) during the bird overwintering period, or works timed so that they do not coincide with the wintering bird season"*.

8.4 Hydrological Impacts: Strategic Growth Option

River Itchen SAC

8.4.1 Detailed designs for the new communities north of Bishopstoke and north and east of Fair Oak, and for the north Bishopstoke bypass, will be required to consider the following mitigation measures to prevent adverse effects on the integrity of the River Itchen SAC in relation to hydrology and water quality issues. Planning applications for these developments will be required to undertake project-level HRA to show that the devised mitigation measures are capable of preventing adverse effects on integrity.

- Protection of headwater ecosystems and hydrological flows by ensuring buffer zones around headwater and associated stream tributaries as part of the development proposals, currently proposed at 20m which should be viewed as a minimum. The buffer zones are shown on Figure 6.8.
- The assessment has demonstrated that groundwater base flow to the headwater streams is limited due to the impermeable geology. However where the London Clay thins out over the Chalk within the northern portion of the study area, the chalk water levels must not be disrupted by deep excavations which fully penetrate the low permeability strata (e.g. river crossing foundations).
- In order to maintain the current conditions of water flow and quality supporting the River Itchen SAC, existing drainage pathways must not be blocked and currently unconnected drains should not be connected to the headwaters, to ensure the current flow paths are maintained and degradation in water quality to the River Itchen does not occur.
- Minimise the number of river crossings required, adopt clear span structures design (no in-stream support) such that there is no effect on the bed of the river, no artificial invert (the lowest part of the cross-section of a channel), and abutments are set back from the river edge to allow a riparian wildlife corridor.
- Foundations of abutments (and in stream piles if unavoidable) to be deep enough to prevent the requirement for bed or bank reinforcement or bridge weirs or aprons in order to maintain the natural bed materials levels, habitats corridors and fish movements. In addition foundations should be deep enough to allow for scour during high flows.
- Utilise, upgrade or replace existing structures where suitable and if environmental improvements can be made, in place of new constructions. In the vicinity of the River Itchen the proposed route is noted to utilise the existing B3335 road which bisects the River Itchen floodplain between Highbridge and Allbrook on one of the widest sections of floodplain. Although the proposed route will utilise the existing road network, suitable design measures will be required for any realignment in this location to ensure impacts on geomorphology of the River Itchen can be minimised.
- Structures and works should minimise the disruption to geomorphological processes. Routes and road crossing should avoid altering fluvial forms e.g. channel width, bank slopes, floodplain connectivity or impede natural hydromorphic functioning e.g. sediment transport, biotopes.
- Bridges levels will be required to be above the 1 in 100 year plus climate change flood level.
- Use of sustainable urban drainage schemes designed to preserve water quality and flows in the Itchen and its tributaries and other flood risk management measures as required. Flows should either infiltrate directly into ground at source or contain three forms of naturalised filtration to ensure water quality is treated before discharge, and flow maintained at greenfield levels. It is considered that the application of three forms of naturalised filtration would be sufficient to mitigate any potential water quality issues associated with discharges from the proposed development areas.

- Naturalised infiltration requires less room and maintenance: green roofs, vegetated swales, attenuation areas and basins, ponds, rain gardens and wetlands. Where flows are draining directly to natural wetland habitats or wet woodlands before entering river flows, off site flow will need to mirror natural hydrological pathways.
- An appropriate level of intrusive investigation to allow for an assessment of sites with respect to groundwater flow path and contaminative status, to allow for the development of suitable remediation measures where required.
- Provision of appropriately deigned bridges to span across rivers and tributaries to allow for the preservation of hydrological processes.
- Management of surface water runoff from the road network to ensure appropriate water quality and quantity.
- Retention and enhancement of watercourses where present onsite, with the use of new culverts not permitted and the removal of culverts where possible to increase on site flood storage areas.
- Incorporation of green infrastructure, within existing and proposed development in order to alleviate water quality impact and protect and enhance ecology. Mature trees and hedgerows to be maintained where possible.
- Providing verges along new road networks and adjacent to new developments in order to absorb pollutants associated with road traffic and to provide a natural habitat for foraging and commuting routes for wildlife, this will also allow for surface water infiltration where geology allows to offset additional hardstanding associated with new road networks and building footprints.
- Adoption of Construction Environment Management Plans (CEMP) for developments in close proximity waterbodies in order to ensure that appropriate measures are included within the development to include the safe storage of fuels and chemicals and the management of drainage associated with development works.
- The use of temporary infiltration where necessary to improve water quality which could include straw bales, silt curtains and interceptors, bunds, ditches swales and filter drains, attenuation tanks, settlement ponds/tanks and oils interceptors.
- Policy to ensure no gardens back onto watercourse and no development within at least 8m of the bank, with wider buffer strips for larger water courses.

8.5 Impacts on Otter outside European Site Boundaries

River Itchen SAC

8.5.1 Mitigation is required to prevent impacts on otters using dispersal corridors outside of the SAC boundaries in order to enable a conclusion of no adverse effect on the integrity of the River Itchen SAC to be reached. Mitigation is needed to achieve the following objectives:

- Reduce risk of road traffic accidents where water courses are crossed by existing or new roads through the provision of suitable under bridge high water pathways, appropriate fencing and roadside signage.

- In relation to the proposed new bridge crossing of River Itchen SAC at B3355 Highbridge Road, mitigation measures are likely to be required to ensure otters have access along the Navigation at all times and states of flow. This might involve the incorporation of a berm or ledge under the bridge that can be used by the otters at times of high flow. The bridge abutments should also be set back from the edge of the Navigation channel to provide safe passage for otters and other wildlife under the bridge.
- These measures should in particular be focused upon the Tadburn Stream and Monks Brook and the Bow Lake Stream, which link the Itchen, Test and Hamble catchments.
- Planning applications for development along these corridors will be required to undertake project-level HRA to show that the above or other devised measures are capable of preventing adverse effects on integrity.

8.5.2 These measures are likely to be effective, will adequately mitigate for otter dispersal corridors in relation to the River Itchen SAC, and have been incorporated into the EBLP via changes to policy DM11 and supporting text.

8.6 Non-native Species and Site-specific Hydrological Impacts

River Itchen SAC

8.6.1 Planning applications for sites within 100m of River Itchen SAC (including the new bridge crossing of River Itchen SAC at B3355 Highbridge Road and projects close to headwaters and tributaries draining into the SAC) listed in Table 6.6 which could result in adverse effects via non-native species and hydrological impacts will be required to:

- Control the risk of introduction of non-native species through careful site design, ensuring that access to the riverside is restricted and, where allowed, adequately overlooked by development frontages to discourage fly-tipping;
- Provide adequate facilities for the responsible disposal of garden waste such as community composting schemes;
- Circulate information leaflets to future residents advising them of the sensitivity of riparian habitats and facilities provided for responsible waste management;
- Incorporate monitoring and, where necessary, remediation commitments from the developer through its estate management programme to identify and rectify incidents of non-native species introductions;
- Prepare and implement Construction Environmental Management Plans to prevent water quality impacts, coupled with utilisation of standard pollution control measures (e.g. storage of chemicals and fuel away from the watercourse);
- Provide a separate construction-phase surface water drainage system which adopts forms of naturalised filtration to attenuate water flows (volume/velocity) and ensure water discharge quality (turbidity, chemical loading, pH, nutrient content, dissolved oxygen content);

- Provide an operational-phase surface water drainage system which adopts forms of naturalised filtration to attenuate water flows (volume/velocity) and ensure water discharge quality (turbidity, chemical loading, pH, nutrient content, dissolved oxygen content); and
- Undertake project-level HRA to show that the above or other devised measures are capable of preventing adverse effects on integrity.

8.6.2 These measures are likely to be effective, will adequately mitigate for non-native species and hydrological impacts potentially affecting the River Itchen SAC, and have been incorporated into the EBLP via changes to policy DM11 and supporting text.

Solent Maritime SAC

8.6.3 Planning applications for sites within 100m of Solent Maritime SAC (including headwaters and tributaries draining into the SAC) and site BO5 / policy S12 listed in Table 6.6 which could result in adverse effects via non-native species and hydrological impacts will be required to:

- Prepare and implement Construction Environmental Management Plans to prevent water quality impacts, coupled with utilisation of standard pollution control measures (e.g. storage of chemicals and fuel away from the watercourse);
- Provide a separate construction-phase surface water drainage system which adopts forms of naturalised filtration to attenuate water flows (volume/velocity) and ensure water discharge quality (turbidity, chemical loading, pH, nutrient content, dissolved oxygen content);
- Provide an operational-phase surface water drainage system which adopts forms of naturalised filtration to attenuate water flows (volume/velocity) and ensure water discharge quality (turbidity, chemical loading, pH, nutrient content, dissolved oxygen content); and
- Undertake project-level HRA to show that the above or other devised measures are capable of preventing adverse effects on integrity.

8.6.4 These measures are likely to be effective, will adequately mitigate for non-native species and hydrological impacts potentially affecting the Solent Maritime SAC, and have been incorporated into the EBLP via changes to policy DM11 and supporting text.

8.7 Water Abstraction

River Itchen SAC

8.7.1 The potential for adverse effects resulting from planned development in Eastleigh borough is adequately dealt with by the joint statement from the Environment Agency and Southern Water[48] which confirms that abstraction licences on the lower Itchen and related water sources

[48] Joint statement from the Environment Agency and Southern Water Services Ltd, 26 March 2018: Proposed Changes to Four Abstraction Licences held by Southern Water Authorising Abstraction from the Rivers Itchen and Test, and One Abstraction Licence

have been amended and agreed between the Environment Agency and Southern Water to avoid adverse effects on integrity. As part of the agreement (which is draft as at June 2018 and subject to Secretary of State approval) the water company is still able to obtain authorisation from the Agency for abstractions over and above the revised licence under certain conditions, but a series of ecological monitoring, mitigation and compensation measures have been detailed to ensure there will be no adverse effects on integrity and that the overall coherence of the Natura 2000 network is protected.

8.7.2 In addition policy DM2 seeks high sustainability standards from residential developments proposed in the EBLP, including a minimum standard for "predicted mains water consumption of no more than 110 litres/person/day", together with an upper standard of "predicted mains internal water consumption of no more than 90 litres/person/day" for all residential and non-residential developments of over 500m^2 external floorspace. Both standards better the building regulations minimum requirement of 125 litres/person/day. This measure will help to avoid the need for drought orders affecting the River Itchen SAC by contributing to an overall reduction in water demand per dwelling.

8.8 Water Pollution

River Itchen SAC, Solent Maritime SAC and Solent & Southampton Water SPA/Ramsar

8.8.1 Although the IWMS does not identify any specific measures required for WWTW serving Eastleigh in the short term, there are concerns over the concentration of phosphate permitted to be discharged from Chickenhall WWTW (River Itchen SAC) and Peel Common WWTW is expected to reach overall capacity in 2025 (Solent Maritime SAC / Solent and Southampton Water SPA/Ramsar). In addition, the total nitrogen budget for development proposed by the Eastleigh Borough Local Plan is 15,434.74 kg/TN/yr. A positive figure indicates a surplus of nitrogen resulting from development proposed in the EBLP and therefore mitigation will be required to achieve nutrient neutrality in accordance with Natural England's advice, and to avoid adverse effects on internationally designated sites.

8.8.2 The potential for adverse effects resulting from planned development in Eastleigh borough can be adequately dealt with by requirements for nutrient neutral development and associated measures as outline below, in line with the IWMS Action Plan (Amex Foster Wheeler, 2018), provided that EBC is committed to their implementation and provisions are made for infrastructure upgrades when required and/or adjustments to the phasing of development later in the plan period. A suite of mitigation measures is available including:

- Continued joint working between PUSH authorities, Environment Agency and Natural England, including production of a joint statement, as per the IWMS Action Plan;
- Establishment of a Water Quality Working Group to monitor progress and plan for required mitigation (infrastructure upgrades and nutrient management plans), as recommended by the IWMS Action Plan;
- Review of IWMS in 2020;

held by Environment Agency Affecting the Candover Stream. Accessed online [10/5/18] at: http://www.hwa.uk.com/site/wp-content/uploads/2017/12/EA-and-SWS-joint-statement-26-March-2018-final-1.pdf

- Requirement for Local Plans to acknowledge uncertainty regarding the need for mitigation (e.g. nutrient neutral development), and identify where adjustments to the phasing of development may be necessary, as recommended by the IWMS Action Plan;
- Requirement for Local Plans to acknowledge uncertainty regarding the availability of water resources over the plan period, and include a policy standard on water efficiency of 110l/head/day, as recommended by the IWMS Action Plan;
- Development of a nutrient neutral policy (e.g. in a detailed Supplementary Planning Document), including offsetting measures and development contributions, as advised by Natural England;
- Development contributions towards implementing mitigation measures proposed within the Southern Damselfly Strategic Conservation Plan (Rushbrook, 2018a), where proposals eventually drain into the River Itchen SAC, as advised by Natural England and the Environment Agency; and
- The need to achieve nutrient neutral development to address uncertainty can be met through a combination of the following measures:
    - Requirement for developments (resulting in any net increase in dwellings or overnight accommodation uses) that eventually drain into the European sites to have a calculated nutrient budget and mitigation measures in order to achieve nutrient neutrality, as advised by Natural England;
    - Measures to remove nitrogen leaching from the development site, for example by provision of engineered wetlands or reedbeds;
    - Developer offsetting through the acquisition, or contributions to the acquisition, of land elsewhere within the river catchment area containing the development site and changing to land use with a lower nitrogen load in perpetuity (for example acquisition of agricultural land and the creation of woodland or conservation grassland). This could have the additional benefit of contributing to other biodiversity objectives in the Borough;
    - Upgrading WWTWs to increase nitrogen removal capacity at the facility;
    - Measures to further decrease water consumption in the Borough as this has the additional benefit of decreasing nitrates entering WWTWs proportionally;
    - Additional measures to remove nitrogen in effluent discharged by the WWTW (such as wetlands or reedbeds);
    - Reducing the amount of nitrogen leaching from agricultural land in the wider Borough landholding through change in agricultural practices supported by catchment management officers working with local farmers; and
    - Taking agricultural land out of nitrogen intensive uses, e.g. where fertiliser is applied to crops, and converting to alternatives agricultural uses or other land uses.

8.8.3 These measures are likely to be effective, will adequately mitigate for water pollution impacts potentially affecting the River Itchen SAC, Solent Maritime SAC and Solent & Southampton Water SPA/Ramsar, and have been incorporated into the EBLP via changes to policies DM10, DM11 and supporting text.

9 Determining Adverse Effects on Integrity

9.1 Introduction

9.1.1 Using the information presented in Chapters 6 and 7, the following sections consider whether, in light of the mitigation strategy outlined in Chapter 8, adverse effects on the integrity of European sites can be ruled out.

9.1.2 English Nature (2004; now Natural England) has produced guidance on determining site integrity which includes a 'simple, pragmatic checklist' for assessing likely effects on integrity. This requires the assessor to pose a series of five questions to consider whether the Appropriate Assessment has shown:

- That the area of Annex 1 habitats (or composite features) will not be reduced?
- That there will be no direct effect on the population of the species for which the site was designated or classified?
- That there will be no indirect effects on the populations of species for which the site was designated due to loss or degradation of their habitat (quantity/quality)?
- That there will be no changes to the composition of the habitats for which the site was designated (e.g. reduction in species structure, abundance or diversity that comprises the habitat over time)?
- That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified?

9.1.3 The guidance suggests that if the answer to all of these questions is 'Yes' then it is reasonable to conclude that there is not an adverse effect on integrity. If the answer is 'No' to one or more of the questions then further site-specific factors need to be considered in order to reach a decision. Such factors include:

- Scale of impact;
- Long term effects and sustainability;
- Duration of impact and recovery/reversibility;
- Dynamic systems;
- Conflicting feature requirements;
- Off-site impacts; and
- Uncertainty in cause and effect relationships and a precautionary approach.

9.1.4 This two-step process is applied to determine whether there will be adverse effects on the European sites as a result of the Eastleigh Borough Local Plan.

9.2 River Itchen SAC

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced? The appropriate assessment has shown that there will be no reduction in the area of annex I habitats or habitats of annex II species as a result of atmospheric pollution. Taking account of the mitigation strategy, there will be no reduction in the area of annex I habitats or habitats of annex II species from noise and vibration, hydrological impacts, otter dispersal corridors, non-native species, water abstraction or water pollution.	**Y**
That there will be no direct effect on the population of the species for which the site was designated or classified? The appropriate assessment has shown that there will be no direct effect on the population annex II species as a result of atmospheric pollution. Taking account of the mitigation strategy, there will be no direct effects from noise and vibration, hydrological impacts, otter dispersal corridors, non-native species, water abstraction or water pollution.	**Y**
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)? The appropriate assessment has shown that there will be no indirect effect on the population annex II species due to loss or degradation of their habitat as a result of atmospheric pollution. Taking account of the mitigation strategy, there will be no indirect effects from noise and vibration, hydrological impacts, otter dispersal corridors, non-native species, water abstraction or water pollution.	**Y**
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)? The appropriate assessment has shown that there will be no changes to the composition of annex I habitats as a result of atmospheric pollution. Taking account of the mitigation strategy, there will be no changes in habitat composition from noise and vibration, hydrological impacts, otter dispersal corridors, non-native species, water abstraction or water pollution.	**Y**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified? The appropriate assessment has shown that there will be no degradation of the physical, chemical or biological processes supporting annex I habitats or annex II species as a result of atmospheric pollution. Taking account of the mitigation strategy, there will be no degradation of supporting processes from noise and vibration, hydrological impacts, otter dispersal corridors, non-native species, water abstraction or water pollution.	**Y**

9.2.1.1 It can be concluded that there will be no adverse effects on the integrity of the River Itchen SAC, either alone or in combination with other plans and projects. The Eastleigh Borough Local Plan can be considered compliant with the Habitats Regulations in this respect.

9.3 Solent Maritime SAC

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no reduction in the area of annex I habitats or habitats of annex II species from non-native species, site-specific hydrological impacts or water pollution.	**Y**
That there will be no direct effect on the population of the species for which the site was designated or classified? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no direct effect on the population of annex II species from non-native species, site-specific hydrological impacts or water pollution.	**Y**
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no indirect effect on the population of annex II species from non-native species, site-specific hydrological impacts or water pollution.	**Y**
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no changes to the composition of annex I habitats from non-native species, site-specific hydrological impacts or water pollution.	**Y**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no degradation of the physical, chemical or biological processes supporting annex I habitats or annex II species from non-native species, site-specific hydrological impacts or water pollution.	**Y**

9.3.1.1 It can be concluded that there will be no adverse effects on the integrity of the Solent Maritime SAC, either alone or in combination with other plans and projects. The Eastleigh Borough Local Plan can be considered compliant with the Habitats Regulations in this respect.

9.4 New Forest SPA

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no reduction in the area of habitats of qualifying features as a result of disturbance.	**Y**
That there will be no direct effect on the population of the species for which the site was designated or classified?	**Y**

Has the Appropriate Assessment shown:	Y/N
The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no direct effect on the populations of qualifying features as a result of disturbance.	
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no indirect effect on the population qualifying features as a result of disturbance.	**Y**
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)? The New Forest SPA does not contain designated habitats, its qualifying features instead comprise its breeding and non-breeding bird populations.	**Y**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no degradation of the physical, chemical or biological processes supporting the qualifying features as a result of disturbance.	**Y**

9.4.1.1 It can be concluded that there will be no adverse effects on the integrity of the New Forest SPA, either alone or in combination with other plans and projects. The Eastleigh Borough Local Plan can be considered compliant with the Habitats Regulations in this respect.

9.5 Solent & Southampton Water SPA/Ramsar

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no reduction in the area of qualifying habitats or habitats of qualifying features as a result of disturbance, noise and vibration or water pollution.	**Y**
That there will be no direct effect on the population of the species for which the site was designated or classified? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no direct effect on the populations of qualifying species as a result of disturbance, noise and vibration or water pollution.	**Y**
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no indirect effect on the populations of qualifying species as a result of disturbance, noise and vibration or water pollution.	**Y**
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)? The appropriate assessment has shown that, taking account of the mitigation strategy, there	**Y**

Has the Appropriate Assessment shown:	Y/N
will be no changes to the composition of Ramsar qualifying habitats as a result of water pollution.	
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified? The appropriate assessment has shown that, taking account of the mitigation strategy, there will be no degradation of the physical, chemical or biological processes supporting the qualifying habitats or habitats of qualifying features as a result of disturbance, noise and vibration or water pollution.	**Y**

9.5.1.1 It can be concluded that there will be no adverse effects on the integrity of the Solent and Southampton Water SPA/Ramsar, either alone or in combination with other plans and projects. The Eastleigh Borough Local Plan can be considered compliant with the Habitats Regulations in this respect.

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10 Summary and Conclusions

10.1 Summary of Findings

10.1.1 This report presents the findings of the Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036. It presents certain revisions to the June 2018 HRA in response to representations made on the Submission Plan, and responds to recent case law from the Court of Justice of the European Union and changes in Natural England's position in relation to nutrient neutral development. .

10.1.2 The HRA incorporates evidence on likely impact pathways and conducts an Appropriate Assessment in view of European site conservation objectives. Where adverse effects are identified, either alone or in combination with other plans and projects, the report defines a mitigation strategy capable of preventing adverse effects on ecological integrity. No reliance is placed on mitigation during the screening assessment.

10.1.3 In summary, the assessment of the EBLP finds that:

- No likely significant effects were identified in relation to Emer Bog SAC, Mottisfont Bats SAC, New Forest SAC/Ramsar or Solent and Dorset Coast pSPA, either alone or in combination with other plans and projects.
- Significant effects through coastal squeeze are not likely for Solent Maritime SAC or Solent and Southampton Water SPA/Ramsar, either alone or in combination with other plans and projects.
- Significant effects through atmospheric pollution are not likely for Solent Maritime SAC or Solent and Southampton Water SPA/Ramsar, either alone or in combination with other plans and projects.
- Significant effects through impacts to land outside the boundary of Solent and Southampton Water SPA/Ramsar (non-designated terrestrial wader and Brent goose sites) are not likely, either alone or in combination with other plans and projects.
- Significant effects resulting from recreation are not likely for River Itchen SAC, either alone or in combination with other plans and projects.
- There will be no adverse effect on the integrity of River Itchen SAC as a result of atmospheric pollution, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of River Itchen SAC as a result of noise and vibration, hydrological impacts, impacts to land outside the SAC boundary (otter dispersal corridors), non-native species, water abstraction or water pollution, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of Solent Maritime SAC as a result of non-native species,

site-specific hydrological impacts or water pollution, either alone or in combination with other plans and projects.

- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of New Forest SPA as a result of disturbance, either alone or in combination with other plans and projects.
- Taking account of the mitigation strategy, it can be concluded that there will be no adverse effect on the integrity of Solent and Southampton Water SPA/Ramsar as a result of disturbance, noise and vibration or water pollution, either alone or in combination with other plans and projects.

10.2 Conclusion

10.2.1 The Eastleigh Borough Local Plan can be considered compliant with the Habitats Regulations with regards to: Emer Bog SAC, Mottisfont Bats SAC, New Forest SAC/SPA/Ramsar; River Itchen SAC; Solent Maritime SAC; Solent & Dorset Coast pSPA; and Solent & Southampton Water SPA/Ramsar.

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