



European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

**River Itchen Special Area of Conservation (SAC)
Site Code: UK0012599**



Photo from [Environment Agency Webpage](#).

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to River Itchen SAC.

This advice should therefore be read together with the SAC Conservation Objectives available [here](#).

This advice replaces a draft version dated 16 January 2019 following the receipt of comments from the site's stakeholders.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England when developing, proposing or assessing an activity, plan or project that may affect this site'.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	River Itchen Special Area of Conservation (SAC)
Location	Hampshire
	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 st April 2005
Qualifying Features	See section below
Designation Area	309.26 ha
Designation Changes	N/A
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	River Itchen SSSI
Relationship with other European or International Site designations	N/A

Site background and geography

The Itchen typifies the classic chalk river and shows a greater uniformity in physical characteristics along its entire length than other rivers of this type. Since the river is mainly spring-fed, there is only a narrow range of seasonal variation in physical and chemical characteristics. The water is of high quality, being naturally base-rich and of great clarity; and its temperature is relatively constant, with dissolved oxygen levels at or near saturation.

The river's vegetation is dominated by higher plants, and the aquatic flora is exceptionally species rich with many of the typical chalk stream plants present in abundance. The majority of species are present throughout the system and downstream changes are less than in most other rivers. The river is rich in invertebrates and supports diverse populations of aquatic molluscs. The Itchen supports one of the few populations of the native freshwater crayfish remaining in the rivers of southern England and a population of otters.

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*.

The fish fauna of the Itchen is typical of lowland chalk rivers. Strong populations of bullhead *Cottus gobbio* and brook lamprey *Lampetra planeri* are notable elements of the natural fish fauna. 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. The river's runs of Atlantic salmon *Salmo salar* fluctuate markedly.

The upper and mid river provides much suitable habitat for otters. A localised population of Atlantic stream crayfish *Austropotamobius pallipes* remains in a headwater of the river.

The Itchen valley contains areas of fen, swamp and meadow supporting vegetation with diverse plant communities, some typically species-rich. Water courses, including meadow ditches, base-rich runnels and flushes in open areas, small side- channels and parts of the main river support strong populations of southern damselfly *Coenagrion mercuriale*. The numbers recorded place the site amongst the most important in Britain for this species.

The River Itchen falls within the Hampshire Downs National Character Area (NCA). The Hampshire Downs are part of the central southern England belt of Chalk, rising to 297m in the north-west on the Hampshire–Wiltshire border. A steep scarp face delineates the Downs to the north, overlooking the Thames Basin, and to the east, overlooking the Weald. The majority of the area is an elevated, open, rolling landscape dominated by large arable fields with low hedgerows on thin chalk soils, scattered woodland blocks (mostly on clay with-flint caps) and shelterbelts. To the east hedgerows are often overgrown and there are larger blocks of woodland. A fifth of the area is within the North Wessex Downs Area of Outstanding Natural Beauty and 6 per cent in the South Downs National Park due to the scenic quality of the landscape. More information on the Hampshire Downs NCA can be found [here](#).

About the qualifying features of the SAC

The following section gives you additional, site-specific information about this SAC's qualifying features. These are the natural habitats and/or species for which this SAC has been designated.

Qualifying habitats:

- **H3260 Water courses of plain to montane levels with the *Ranunculon fluitantis* and *Callitricho-Batrachion* vegetation ('Rivers with floating vegetation often dominated by water-crowfoot')**

This habitat type is generally characterised by the abundance of water-crowfoots *Ranunculus* spp. Floating mats of these white-flowered species are characteristic of river channels in early to mid-summer. They help to vary water flow, promote fine sediment deposition, and provide shelter and food for fish and invertebrate animals.

There are several variants of this habitat in the UK, depending on geology and river type, and at each site, the *Ranunculus* species will be associated with a different assemblage of other aquatic plants. The River Itchen 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*.

The habitat type is widespread in rivers in the UK, especially on softer and more mineral-rich substrates. It is largely absent from areas underlain by acid rock types (principally in the north and west). It has been adversely affected by nutrient enrichment, mainly from sewage inputs and agriculture, and where agriculture has caused serious siltation. It is also vulnerable to artificial reductions in river flows and to unsympathetic channel engineering works. Consequently, the habitat has been reduced or has disappeared from parts of its range in Britain.

Qualifying Species:

- **S1044 *Coenagrion mercuriale*; Southern damselfly**

The southern damselfly is one of several members of the genus *Coenagrion* males have a distinctive 'mercury' mark on segment 2 of the abdomen but females appear very similar to other *Coenagrion* species. The southern damselfly has very specialised habitat requirements, with most populations being confined to shallow, well-vegetated, base-rich runnels and flushes in open areas or small side-channels of chalk rivers. Some important populations are however found on larger carrier streams and sections of rivers and their margins.

The larvae live in flushes and shallow runnels, often less than 10 cm 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.

In the UK the southern damselfly occurs mainly in south-west England and in south Wales. It has declined in many places and appears to be present only in low numbers at most of its localities. Strong populations of southern damselfly occur at the Itchen, estimated to be thousands 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.

- **S1092 *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish**

There are several species of crayfish present in the UK but the white-claw crayfish is the only native species. The white-clawed crayfish lives in a diverse variety of clean aquatic habitats but especially favours hard-water streams and rivers. A major threat to the native white-clawed crayfish is posed by the

introduction of non-native species of crayfish, which have been farmed in Britain since the late 1970s. Soon after this, crayfish plague (a virulent disease caused by the fungus *Aphanomyces astaci*) broke out and spread rapidly, causing drastic losses of native crayfish in rivers in England. It is believed that this disease was introduced and is spread by the most frequently farmed species, the North American signal crayfish *Pacifastacus leniusculus*, a carrier of the disease. All North American crayfish species can be carriers of crayfish plague. Crayfish plague can be introduced into a waterbody not only by entry of crayfish but also by water, fish or equipment that has been in contact with signals. This greatly increases the risk to remaining white-clawed crayfish populations.

Austropotamobius pallipes was once widespread in most parts of England and is common in parts of eastern Wales. It is present in south-west Northern Ireland. However, the species is now seriously threatened over most of its range in Britain, with the most significant declines in the south.

White-clawed crayfish can grow up to 12cms long and live in rivers and streams about 1 metre deep where they hide in rocks and submerged wood. They can live up to 12 years and they usually have their first young when they are 3 years old. Females carry their eggs for 7-9 months until they hatch, once hatched the young hitch-hike on their mothers for a further 2 weeks. There appear to be differences in life history between northern and southern populations, for example crayfish in the Itchen are thought to hold young for a shorter time than in more northern populations.

- **S1096 *Lampetra planeri*; Brook lamprey**

The brook lamprey is a primitive, jawless fish resembling an eel, and is the smallest of the lampreys found in the UK. It is a non-migratory freshwater species, occurring in streams and occasionally in lakes in north-west Europe. Like other lamprey species, the brook lamprey requires clean gravel beds for spawning and soft marginal silt or sand for the ammocoete larvae. It spawns mostly in parts of the river where the current is not too strong.

The brook lamprey has declined in parts of the UK, although it is still widespread. This species is the most abundant and widespread of the British lampreys and is often found in the absence of the other two species, for example above a barrier that precludes the presence of the migratory species.

- **S1106 *Salmo salar*; Atlantic salmon**

The Atlantic salmon 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. Within the River Itchen, after a period of 1-2 years the young salmon migrate downstream to the sea as 'smolts'; this is much quicker than the normal 1-6 year period found elsewhere. 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 behavior 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.

Salmon rivers vary considerably in their ecological and hydrological characteristics and in the life-cycle strategies adopted by the salmon within them. There are particularly strong contrasts between southern and northern rivers, and the UK's varied climate, geology and terrain means that high diversity can be found within some of the large rivers. The cool and wet climate in the north, often with harder, more resistant rocks and steeper slopes, results in salmon rivers that are sparsely vegetated, nutrient-poor and prone to sudden increases in flow ('spates') in response to heavy downfalls or sudden snow-melt. As a result, salmon may take several years to reach the smolt stage and migrate to sea. In the south, rivers flow across gentler terrain and softer rocks, in a warmer, drier climate. Here, salmon often grow sufficiently quickly to smolt as yearlings.

The species is subject to many pressures in Europe, 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.

- **S1163 *Cottus gobio*; Bullhead**

The bullhead 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.

The Itchen is a classic lowland 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.

Bullheads spawn from February to June and up to four times. The male excavates a nest under a suitable large stone to attract a female. Part of this may be achieved by emission of acoustic 'knocking' sounds by the males. The female lays a batch of up to 400 eggs (2–2.5 mm in diameter), which adhere to the underside of the stone. In situations without suitable stones, bullheads may use other media, such as woody material or tree roots. The male then defends the brood against egg predators such as caddis larvae and manages the nest by fanning the eggs with his pectoral fins. The eggs hatch after 20 to 30 days, depending on water temperature. The newly hatched larvae (6–7mm in length) are supplied by a large yolk sac, which is absorbed after 10 days, after this time they leave the nest.

Generally, bullheads attain a length of 40–50 mm after their first year, 60 mm after their second and 70–90 mm after their third. They do not generally live for more than three or four years, although fish of over 10 years old have been recorded.

- **S1355. *Lutra lutra*; Otter**

Otters are semi aquatic, living mainly along rivers. They mainly eat fish, though crustaceans, frogs, voles and aquatic birds may also be taken. Being at the top of the food chain, an otter needs to eat up to 15% of its body weight in fish daily.

Otters are solitary shy animals, usually active at dusk and during the night. Otters can travel widely over large areas. Some are known to use 20 km or more of river habitat. Otters tend to live alone as they are very territorial. Otters deposit faeces in prominent places along a watercourse (known as spraints) which have a characteristic sweet musky odour. These mark their range which may help neighbouring animals keep in social contact with one another.

The Otter is also a 'European Protected Species' in the UK, and it is an offence to disturb, capture, injure or kill an otter (either on purpose or by not taking enough care), or to damage, destroy or obstruct access to its breeding or resting places, without first getting a license.

Table 1: Supplementary Advice for Qualifying Features: H3260. Water courses of plain to montane levels with the *Ranunculus fluitantis* and Callitriche-Batrachion vegetation; Rivers with floating vegetation often dominated by water-crowfoot

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	Extent of the feature within the site	Restore the total extent of the H3260 feature to that characteristic of the natural fluvial processes associated with the river type	<p>There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information.</p> <p>The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis.</p> <p>Restoration of this feature is targeted due to historic channel modification and a predominantly non-natural physical structure of the river as well as pressures from nutrient enrichment and localised sedimentation serving to limit the extent of this feature that would otherwise occur naturally (RHS 2014, Leafpacs Macrophyte Survey 2014).</p>	River Habitat Survey 2014, Leafpacs Macrophyte Survey 2014. Assessed against revised Common Standards Monitoring (CSM) targets 2014.
Structure and function (including its typical species)	Biological connectivity	The movement of characteristic biota should not be artificially constrained.	<p>Many species, including fish and invertebrates, require natural freedom of movement to complete their life cycle in rivers and maximise their population size and genetic diversity.</p> <p>Longitudinal connectivity within the river channel and river banks; and lateral connectivity between the channel and the floodplain are both critical to a healthy river ecosystem.</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>Constraints to longitudinal movement such as waterfalls and debris dams are a natural feature of rivers and add to the complexity and diversity of the habitat.</p> <p>New artificial constraints to movement should be avoided and existing artificial constraints should be addressed through strategic river restoration as outlined above. Barriers should be removed wherever possible to restore all aspects of habitat integrity - fish passes constitute a partial mitigation measure for longitudinal biological movement and should only be considered where it is not possible to remove the barrier.</p> <p>Where established, they should allow for the passage of as many species as possible, including southern damselfly, otter, Annex II fish species such as lamprey species and other characteristic species</p> <p>However a balance needs to be achieved by weighing the desire to ensure longitudinal connectivity against the need to minimise the risk of spreading signal crayfish to the headwaters from the lower catchment. As such this should be considered when making an assessment on the removal of any artificial structure.</p>	
Structure and function (including its typical species)	Biotope (habitat) mosaic	Restore the extent and pattern of in-channel and riparian biotopes (habitats) to that characteristic of natural fluvial processes.	<p>Watercourses with a high degree of naturalness are governed by dynamic processes which result in a mosaic of characteristic physical habitats or biotopes, including a range of substrate types, variations in flow, channel width and depth, in-channel and side-channel sedimentation features (including transiently exposed sediments), bank profiles (including shallow and steep slopes), erosion features (such as cliffs) and both in-channel and bankside (woody and herbaceous) vegetation cover. All of these biotopes, and their characteristic patterns within the river corridor, are important to the full expression of the biological community.</p> <p>A range of physical habitat modifications cause simplification of biotope mosaics, resulting in declines of characteristic biota dependent upon biotopes that have been lost or reduced in extent. Rivers that have sections that are already significantly</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p> <p>NATURAL ENGLAND (2016), A narrative for conserving freshwater and wetland habitats in England.</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>physically modified should be subject to a process for planning and implementing physical restoration measures. This should be based on restoring natural geomorphological processes (including restoration of hydrological continuity between river and floodplain) as far as possible to allow restoration of characteristic and sustainable biotope mosaics, working within the practical constraints of essential flood protection for people and the built environment. Excessive levels of livestock grazing denudes the riparian zone, causes artificially high bank instability, and degradation of the fauna and flora of exposed riverine sediments. Low levels of grazing by suitable livestock are important in generating the full expression of riparian biotopes. See also the 'Vegetation structure: riparian zone' attribute.</p> <p>A range of physical modifications have affected the Itchen river habitat, which have adverse consequences for characteristic biological communities of the habitat including specifically notified species. Modifications include weirs and other in-channel structures causing impoundment, siltation and interruptions to biological movements, over deepening, over-widening and straightening of channels, and bank re-sectioning and reinforcement.</p>	TEST AND ITCHEN RIVER RESTORATION STRATEGY. (2013). (Available on request from Natural England)
Structure and function (including its typical species)	Fisheries	<p>Restore fish densities at or to a level at or below the natural environmental carrying capacity of the river, and below historical levels (this means no stocking to previously unstocked rivers or river sections).</p> <p>Trout stocking should not elevate densities of adult trout (stocked plus natural) to more than 1-3 fish 100m⁻², this being the estimated range of natural trout densities in SAC rivers.</p>	<p>Fish stocking can cause elevated levels of competition and predation that may damage the characteristic biological community. Ideally, fishery management should be based on natural recruitment, with an emphasis on restoring characteristic river habitat in ways that promote natural recruitment. Exploitation should be controlled to suitable levels, and net limitations and catch-and-release techniques used where necessary to avoid population impacts. Fish introductions, exploitation and other removals should not interfere with the ability of the river to support self-sustaining populations of characteristic species. Stocking should be undertaken so as to avoid risks of disease transfer, including crayfish plague where white-clawed crayfish populations are at risk</p> <p>Exploitation and removals should not cause significant</p>	<p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>Data may be available from Natural England and survey/stocking data from Environment Agency upon request</p> <p>Environment Agency (2017): Solent and South Downs: Fish Monitoring report 2017</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>suppression of characteristic fish species (e.g. Atlantic salmon, eel, pike) or affect the balance of the fish or wider biological community. The stocking of carp to still waters immediately adjacent to SAC rivers is undesirable if there is continuity between river and still water during periods of flood and no effective biosecurity measures are in place. Stocking for population conservation purposes should only be considered as an interim measure whilst underlying environmental problems are addressed, and should not be undertaken if natural recovery can be achieved in reasonable timescales. Fish should be sourced to avoid impacts on the genetic integrity of local populations (including sub-catchment genetics where appropriate, e.g. for salmon).</p> <p>Fish stocking and transfers are a potential vector of crayfish plague (see feature on table 3). Fish should only be stocked from fish farms or other sources that are free of non-native crayfish or crayfish plague, or fish farms where suitable quarantine arrangements are in place. Excessively high densities of other fish species may cause unacceptably high predation pressure and competitive interactions</p>	
Structure and function (including its typical species)	Invasive, non-native and/or introduced species	Ensure non-native species categorised as 'high-impact' in the UK under the Water Framework Directive are either rare or absent but if present are causing minimal damage to the feature and there is no further spread. Where possible action should be taken to reduce the distribution of such species.	<p>Non-native species constitute a major threat to many river systems. Impacts may be on the river habitat itself (e.g. damage to banks and consequent siltation) or directly on characteristic biota (through predation, competition and disease), or a combination of these. For example, species such as signal crayfish have been responsible for much of the decline of native crayfish through competition, habitat damage and the introduction of crayfish plague.</p> <p>The UK Technical Advisory Group of the Water Framework Directive produces a regularly updated classification of aquatic alien species (plants and animals) according to their level of impact. In general high impact species are of greatest concern but low or unknown impact species may be included in the target on a site-specific basis where there is evidence that they are causing a negative impact (for example high cover values or abundances). Those taxa considered likely to colonise lakes, are indicated by an 'L' in the UKTAG guidance. Examples of</p>	NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>such high-impact species may include Water Fern, New Zealand pygmyweed and the zebra mussel.</p> <p>Species that can dominate and impact river banks of the Itchen include Himalayan balsam <i>Impatiens glandulifera</i>, Japanese knotweed <i>Fallopia japonica</i>, giant hogweed <i>Heracleum mantegazzianum</i>, pick-a-back-plant <i>Tolmiea menziesii</i> and <i>Lysichiton</i> spp. These species should be absent, or no more than occasional if present. There are widespread issues with Himalayan and orange balsam along the riparian corridor but the extent of the problem is unknown.</p>	
Structure and function (including its typical species)	Key structural, influential and/or distinctive species	<p>Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature:</p> <p>Plant communities characterised by pond water crowfoot <i>Ranunculus peltatus</i> and associated aquatic herbs and grasses</p> <p>Populations of fish species including bullhead, atlantic salmon and brook lamprey</p> <p>Southern damselfly</p> <p>Otter</p>	<p>Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include;</p> <ul style="list-style-type: none"> • Structural species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • Influential species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • Site-distinctive species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. <p>There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			this site becomes available.	
Structure and function (including its typical species)	Riparian zone	Restore a patchy mosaic of natural woody and herbaceous (tall and short swards) riparian vegetation. The riparian zone should be sufficiently wide to act as a healthy and functional habitat zone within the river corridor.	A mosaic of natural and semi-natural riparian vegetation types provides conditions for all characteristic in-channel and riparian biota to thrive, creating patches of tall and short riparian swards, a mixture of light and shade on the river channel, and tree root systems and a supply of large woody debris that add channel complexity. Patchy tree cover provides shade protection against rising water temperatures caused by climate change. Between 30 and 50% riparian tree cover is generally considered optimal for in-channel and riparian habitats. Intensive cutting across significant proportions of the riparian zone is not appropriate. Also see above comments on livestock grazing. See also Table 2 for tree/scrub cover targets for southern damselfly.	TEST AND ITCHEN RIVER RESTORATION STRATEGY. (2013). (Available on request from Natural England)
Structure and function (including its typical species)	Screening of intakes and discharges	All intakes and discharges likely to trap a significant number of individuals of characteristic species are being adequately screened.	Intakes and discharges can be responsible for significant mortalities of fish. Long-distance migratory species such as Atlantic salmon, sea trout, brook lamprey and European eel can be particularly susceptible. Archimedes screw turbines are a recent development in small-scale hydropower and should also be screened until such times that there is robust evidence that they cause no damage to characteristic fish populations. It is important that screens are maintained so that they do not impact water flows and levels (see 'Water course flow' attribute, below)	
Structure and function (including its typical species)	Sediment regime	Restore the natural supply of coarse and fine sediment to the river	Coarse sediment supply is essential for the stability of the river channel and for creating and sustaining key biotopes including riffles and exposed shingle banks. Coarse sediment supply can be interrupted by weirs and other impounding structures, and by dredging or extraction, and can result in channel incision and heavy bankside erosion that have consequences for both biodiversity and river management (e.g. flood risk). Excessive fine sediment supply can lead to the smothering of coarse substrates and the loss of flora and fauna dependent on them (note that impoundment of the river can have the same effects). Where fine sediment delivery is a problem, control measures need to be planned in the catchment. Siltation resulting from a variety of factors (direct inputs of silt	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			into the system from land use, runoff from diffuse sources, deposition arising from impoundments and overwide channels) is a widespread problem affecting the River Itchen, with consequences for macrophytes, southern damselfly habitat (where in ditches) and spawning gravels for fish. Further studies and initiatives seeks to further understand and reverse ecological problems associated with sediment and nutrients in the upper River Itchen,	
Structure and function (including its typical species)	Supporting off-site habitat	Habitats beyond the site boundary upon which characteristic biological communities of the site depend should be maintained in a state that does not impair the full expression of the characteristic biota within the site.	<p>The characteristic biological communities of the site are dependent on the integrity of sections of river channel, riparian areas, and transitional and marine waters that lie outside of the site boundary.</p> <p>Headwater areas and tributaries may not fall within the site boundary, yet a range of species characteristic of the site may use these areas for spawning and juvenile development and be critical for sustaining populations within the site. Fully developed riparian zones are essential to site integrity, yet part of this zone may lie outside of the site boundary, particularly if the river channel is operating under natural processes and moves laterally over time within the floodplain. The conditions experienced by long-distance migratory species (such as salmon, sea and river lampreys, allis and twaite shads and eels) outwith the site (through the saline transition zone, estuary, coastal waters and into the high seas) are critical to the well-being of populations within the site. Off-site influences that may impact on the well-being of the population within the site may include, but not limited to, entrainment, temperature, water quality, mortality from exploitation.</p> <p>The adjacent habitat is in hydrological continuity with the river. The river floodplain comprises characteristic vegetation types that reflect the natural variation in topographical and hydrological conditions. The fen habitats show characteristic zonations of vegetation types arising from hydrological factors and the zonation is not truncated or fragmented by land use or management factors.</p>	NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	Thermal regime	Restore a natural thermal regime to the river subject to a changing climate, ensuring that water temperatures should not be significantly artificially elevated	Climate change is driving increases in river temperatures which will create stress for a range of characteristic riverine species, particularly those on the southern limit of their range. This must not be exacerbated by catchment activities that are likely to raise water temperatures further. These may include impoundment, abstraction, discharges, excessive tree removal or maintenance. Any activities which seek to create or enhance habitat through water transfer from the main channel (e.g. rewetting of flood plains) also need to be considered against the scale of impact they have on the thermal regime. Restoration of riparian tree cover to suitable levels will be needed in many cases, particularly in headwater streams, systems affected by alder <i>phytophthora</i> and river reaches lacking any riparian trees (Any tree planting needs to take account of southern damselfly, see Table 2).	TEST AND ITCHEN RIVER RESTORATION STRATEGY. (2013). (Available on request from Natural England)
Structure and function (including its typical species)	Vegetation structure: cover of submerged macrophytes	Maintain a sufficient proportion of all aquatic macrophytes to allow them to reproduce in suitable habitat and unaffected by river management practices.	<p>Removal of submerged aquatic vegetation (often called 'weed-cutting') might be undertaken for flood risk management or fishery purposes. Except in situations of extreme flood risk, best practice is for cutting to leave a mosaic of submerged and marginal vegetation, and should promote a characteristic diversity of plant species. It is recommended that where appropriate a weed management plan is developed for the site, allowing for higher levels of cutting at flood risk pinch-points, balanced by lower levels of cutting in other stretches.</p> <p>Any weed-cutting operations should be undertaken to leave a sufficient proportion (of the order of at least 50% by area and river length) of in-channel and marginal vegetation in the river to support characteristic biota (in terms of cover, food supply and spawning substrate). Weed-cutting should not interfere with the ability of the river channel to downsize through encroachment of marginal vegetation during the summer flow recession.</p> <p>Weed cutting should not interfere with the provision of juvenile Salmon habitat in river types naturally supporting submerged vascular plants.</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)																													
Structure and function (including its typical species)	Vegetation structure: riparian zone	Restore grazing activity in the riparian zone and in the river channel at or to suitably low levels.	Ideally, grazing levels should be managed at low levels across whole riparian fields. Where this is not feasible, set-back fencing may be established with access provision for limited grazing within the riparian zone. Particularly sensitive areas (e.g. exposed riverine sediments likely to support good invertebrate communities) may need to be fenced off to avoid any concentration of livestock activity, even if only present in low numbers. Close bankside fencing that excludes the development of a functional river corridor is not appropriate.																														
Structure and function (including its typical species)	Water course flow	<p>Restore the natural flow regime of the river, with daily flows as close to what would be expected in the absence of abstractions and discharges (the naturalised flow).</p> <p>Springs in aquifer-fed rivers should be maintained.</p>	<p>The natural flow regime both shapes and sustains characteristic biotope mosaics, affecting factors such as current velocities and bed hydraulics, water levels and depths, wetted area, temperature regime and dissolved oxygen regime. All parts of the natural flow regime are important, including flushing flows, seasonal baseflows and natural low flows. Natural seasonal flow recession is critical in supporting the full expression of ephemeral habitats (marginal and riparian vegetation, exposed riverine sediments, ephemeral headwaters).</p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="4">Deviation from daily naturalised flow</th> </tr> <tr> <th>Unit 143</th> <th>Unit 142</th> <th>Unit 105</th> <th>Units 106-108</th> </tr> </thead> <tbody> <tr> <td><Qn95 (low flows)</td> <td><5%</td> <td><10%</td> <td><5%</td> <td><10%</td> </tr> <tr> <td>Qn50-95 (low – moderate flows)</td> <td><10%</td> <td><15%</td> <td><10%</td> <td><15%</td> </tr> <tr> <td>Qn10 – 50 (moderate – high flows)</td> <td><15%</td> <td><20%</td> <td><15%</td> <td><20%</td> </tr> <tr> <td>>Qn10 (high flows)</td> <td><15%</td> <td><10%</td> <td><15%</td> <td><10%</td> </tr> </tbody> </table> <p>Minor spatial and temporal non-compliances can be tolerated as long as the increased impact on naturalised flows is not dramatic. A total of 10 days of continuous non-compliance in any one year, or 20 days of non-compliance overall, should be considered as the maximum that could be considered acceptable. It is also suggested that non-compliance over a</p>		Deviation from daily naturalised flow				Unit 143	Unit 142	Unit 105	Units 106-108	<Qn95 (low flows)	<5%	<10%	<5%	<10%	Qn50-95 (low – moderate flows)	<10%	<15%	<10%	<15%	Qn10 – 50 (moderate – high flows)	<15%	<20%	<15%	<20%	>Qn10 (high flows)	<15%	<10%	<15%	<10%	
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Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>total river length of no more than 5% of a reporting unit should be considered as the maximum acceptable</p> <p>Any significant impacts on the natural flow regime should be rectified sustainably by reducing flow modifications, not by artificial augmentation, or by altering channel form to fit reduced levels of flow. There should be no increase in the existing level of impact on the natural flow regime, and any significant impacts should be controlled to acceptable levels. Flow targets for WFD high ecological status should be used to avoid deterioration and for restoration where this is technically feasible.</p>	
Structure and function (including its typical species)	Woody debris	Restore the presence of coarse woody debris within the structure of the channel. In smaller watercourses, temporary debris dams should be a feature of channel dynamics.	Dead woody material that falls into streams ('woody debris') plays an important role in increasing habitat diversity, providing shelter for fish, supplying a food source for aquatic invertebrates, and for slowing the passage of nutrients downstream. Woody debris is therefore a key feature of healthy rivers. Woody debris should be left in situ, unless there are overriding reasons of public safety (for example to prevent flooding or bridge collapse).	TEST AND ITCHEN RIVER RESTORATION STRATEGY. (2013). (Available on request from Natural England)
Supporting processes (on which the feature relies)	Air quality	Maintain as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p> <p>Currently there are no critical loads defined on APIS for the H3260 feature.</p>	
Supporting processes (on which the feature relies)	Water chemistry - alkalinity	Maintain natural levels of alkalinity	Natural alkalinity levels are critical to characteristic biological communities, with many species adapted to certain parts of the alkalinity range. Mass transfers of water can disrupt the natural alkalinity regime.	
Supporting processes (on which the feature relies)	Water quality - acidification	Maintain levels of acidity to those which reflect unimpacted conditions.	Acid deposition can cause major changes to flora, fauna and ecosystem functioning and affects organisms as diverse as diatoms, invertebrates and fish. Acid impacts are typically sporadic and tend to be greatest during the winter months. Humic compounds provide buffering capacity that helps to reduce fluctuations in pH. Acidification lowers dissolved organic carbon in water, reducing the buffering capacity and altering ecosystem functioning. The values given should be applied throughout the site, not just at routine sampling points.	NATURAL ENGLAND (2014). Progress goals and selected targets for N2K Rivers. Available on request from Natural England
Supporting processes (on which the feature relies)	Water quality - nutrients	<p>The natural nutrient regime of the river should be protected, with any anthropogenic enrichment above natural/background concentrations limited to levels at which adverse effects on characteristic biodiversity are unlikely.</p> <p>Nutrient targets for the River Itchen should reflect natural/background concentrations and</p>	<p>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.</p> <p>The respiration of artificially large growths of benthic or floating algae may generate large diurnal sags in dissolved oxygen and</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England upon request)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)												
		<p>limit enrichment to levels at which adverse effects on characteristic biodiversity are unlikely. Phosphorus targets do vary between individual SSSI units and are as follows:</p> <table border="1"> <thead> <tr> <th>SSSI Unit</th> <th>Phosphorus target</th> </tr> </thead> <tbody> <tr> <td>143</td> <td>20µg/l SRP</td> </tr> <tr> <td>142</td> <td>40µg/l SRP</td> </tr> <tr> <td>105</td> <td>20µg/l SRP</td> </tr> <tr> <td>106-107</td> <td>20µg/l SRP</td> </tr> <tr> <td>108</td> <td>50µg/l SRP</td> </tr> </tbody> </table>	SSSI Unit	Phosphorus target	143	20µg/l SRP	142	40µg/l SRP	105	20µg/l SRP	106-107	20µg/l SRP	108	50µg/l SRP	<p>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.</p> <p>The River Itchen often suffers from growth of filamentous algae, believed to be caused by excessive levels of phosphate from a variety of sources.</p>	<p>NATURAL ENGLAND (2014). Progress goals and selected targets for N2K Rivers. (Available on request from Natural England)</p>
SSSI Unit	Phosphorus target															
143	20µg/l SRP															
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105	20µg/l SRP															
106-107	20µg/l SRP															
108	50µg/l SRP															
Supporting processes (on which the feature relies)	Water quality - organic pollution	<p>Organic pollution levels should be controlled to levels that have minimal impact on the characteristic biota, targets as follows:</p> <p>10%ile Dissolved Oxygen - 85% saturation</p> <p>Mean Biological Oxygen Demand: - 1.5 mg L⁻¹</p> <p>90%ile total ammonia - 0.25 mg L⁻¹ NH₃-N</p> <p>95%ile un-ionised ammonia - 0.021 mg L⁻¹ NH₃-N</p>	<p>Organic pollution affects 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. The values given apply throughout the site not just at routine sampling points - assessment can be made by modelling (assuming full mixing of effluents at the point of discharge).</p> <p>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.</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p>												
Supporting processes (on which the feature relies)	Water quality - other pollutants	<p>Achieve at least 'Good' chemical status (i.e. compliance with relevant Environmental Quality Standards).</p>	<p>A wide range of pollutants may impact on habitat integrity depending on local circumstance. Good chemical status includes a list of Environmental Quality Standards (EQS) for individual pollutants that are designed to protect aquatic biota with high levels of precaution. These values should be applied</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both</p>												

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			throughout the site, not just at routine sampling points.	organisations upon request
Version Control Advice last updated: 15 March 2019 – following feedback from stakeholders. Target for Extent of feature within site changed to restore and supporting notes updated; explanatory notes for Biological Connectivity updated to reflect need to balance connectivity with minimising risk of spread of signal crayfish; target for Invasive non-native species revised to include prevention of spread; site specific species added to Key structural, influential and/or distinctive species attribute;				
Variations from national feature-framework of integrity-guidance: N/A				

Table 2: Supplementary Advice for Qualifying Features: S1044. *Coenagrion mercuriale*; Southern damselfly

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	Population abundance	<p>Restore the abundance of the population to level which is above 10 damselflies / 100 metres of transect (HARVEY <i>et al.</i>, 2005), whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.</p> <p>Comparisons made between transects or sites based on a single sample count do not allow robust assessment of sites. Comparative measures of adult damselfly abundance per 100m transect indicate transect and site favourability in the absence of attribute limits (HARVEY <i>et al.</i>, 2005).</p>	<p>This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve.</p> <p>This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature.</p> <p>Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment.</p> <p>Unless otherwise stated, the population size or presence will be that measured using standard methods, such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of</p>	<p>RUMBLE <i>et al.</i> (2006)</p> <p>THOMPSON <i>et al.</i> (2003)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise whether the figures stated are the best available.</p> <p>Transects are linear areas of continuous suitable habitat. Suitable habitat refers to;</p> <ul style="list-style-type: none"> • Open, unshaded lengths of ditch with slow water velocity or only moderate velocity in the central channel and shallow, slow-flowing areas at the edges • Ditch edges with broad fringes of herbaceous emergent and submerged macrophytes, typically including some cover of reed sweet-grass (<i>Glyceria maxima</i>), water mint (<i>Mentha aquatica</i>), fool's watercress (<i>Apium nodiflorum</i>), watercress (<i>Rorippa nasturtium-aquaticum</i>) and brooklime/ water speedwell (<i>Veronica</i> spp.). • Areas of adjacent bankside vegetation with medium-height tussocks. • Ditch largely unshaded by bankside shrubs and trees. • Unpolluted conditions indicated by absence of encroaching algae and bacterial film. No invasive tall emergents such as reed canary-grass (<i>Phalaris arundinacea</i>). • Some cover of silt or other organic substrate in ditch/stream. <p>A target for the total extent of watercourse where the 10 damselflies / 100 m of transect target should be met is being developed.</p>	
Supporting habitat: extent and	Distribution of supporting habitat	Restore the distribution and continuity of the feature and its supporting habitat, including	A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure	NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
distribution		where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>and composition, and may undermine its resilience to adapt to future environmental changes. Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p> <p>Maintenance of the area of open habitat surrounding streams, ditches, carriers and runnels is important as this provides feeding, resting and courting areas. Ideally, a structurally diverse habitat should be maintained close to known breeding sites with scattered scrub to provide shelter.</p> <p>There is evidence that the three population 'hubs' are becoming (or already are) physically and genetically isolated. These population hubs are centred at Twyford, Highbridge and Itchen Valley Country Park.</p>	(Available from Natural England on request)
Supporting habitat: extent and distribution	Extent of supporting habitat	Restore the total extent of the habitats which support the H3260 feature to that characteristic of the natural fluvial processes associated with the river type Wet woodland 69.57ha Lowland neutral grassland and Fen meadow 97.35 Swamp, reed-beds and tall-herb fen 145.75ha	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC.</p> <p>The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.</p>	<p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>RUMBLE <i>et al.</i> (2006)</p>
Supporting habitat: structure /function	Emergent and bankside vegetation: Chalk streams and rivers:	Restore a diverse riparian habitat structure, including areas of adjacent bankside vegetation with medium height tussocks and/or emergents in watercourse, and only scattered scrub or trees shading	The southern damselfly usually emerges from the water as final instar larvae by ascending emergent vegetation, rather than by walking onto shore. Tall rushes and sedges are known to have been used and emergence perches for the southern damselfly include semi-emergent plants such as lesser water parsnip (<i>Berula erecta</i>), bittersweet (<i>Solanum dulcamara</i>), water mint (<i>Mentha aquatica</i>) and watercress (<i>Rorippa nasturtium-aquaticum</i>). Ideal emergence perches are likely to be plants	<p>RUSHBROOK (2018a)</p> <p>RUMBLE <i>et al.</i> (2006)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>with rigid stems that would not bend in the wind. The damselfly's wings and abdomen were less likely to be damaged if they did not touch surrounding vegetation during expansion and drying.</p> <p>The eggs are laid into water plant tissue and plant species used as oviposition substrates may include fool's watercress (<i>Apium nodiflorum</i>), lesser water parsnip, reed sweet-grass (<i>Glyceria maxima</i>), watercress, brooklime (<i>Veronica beccabunga</i>) and blue water-speedwell (<i>V. anagallis-aquatica</i>), marsh St John's wort (<i>Hypericum elodes</i>), bog pondweed (<i>Potamogeton polygonifolius</i>) and jointed rush (<i>Juncus articulatus</i>).</p>	
Supporting habitat: structure/function	Emergent and bankside vegetation: Chalk streams and rivers:	Restore an abundance of emergent and fringing vegetation of reeds, grasses and herbs i.e. free of scrub and tree regeneration and little bare ground.	Scrub should be present at no more than 10% along the edges of these waterways. This is usually maintained through extensive grazing with cattle. Such grazing needs to be amended so that water course fringes are clear of scrub but not overly poached. Undoubtedly, one of the main reasons for the decline of the southern damselfly in Britain over the last 40 years has been the change in grazing regimes on some sites. Undergrazing impacts on wet meadow systems, causing degradation of southern damselfly habitat in particular. The use of moderate grazing regimes should reduce the establishment of scrub and invading emergents on most sites. Grazing by heavier animals, such as cattle and horses, is preferred, as it causes some poaching of watercourse margins and creates the diversity of tussock structure preferred by the southern damselfly.	NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan RUSHBROOK (2018a) RUMBLE <i>et al.</i> (2006)
Supporting habitat: structure/function	Emergent and bankside vegetation: chalk streams and rivers:	Retain small areas of tall scrub or trees within 20 m of watercourse for perching adults. This scrub and tree cover should not shade the watercourse.	Some scattered scrub can provide areas for roosting, maturation, feeding, displaying and basking.	
Supporting habitat: structure/function	Flow: Chalk streams and rivers	Restore open, unshaded lengths of ditch with slow flow or with moderate (7.5–20 cm s ⁻¹) flow.	The southern damselfly requires base-rich, shallow streams with a constant slow-to-moderate flow and relatively high water temperature. The rate of water flow can affect the composition of waterside plants used for emergence and oviposition. The southern damselfly favours chalk streams and rivers with slow	RUSHBROOK (2018a) RUMBLE <i>et al.</i> , (2006)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			or moderate flow which support a wide variety of emergent plant species.	
Supporting habitat: structure/function	Nutrient status: chalk streams and rivers:	Restore phosphate concentrations to be less than 0.025 mg l-1 but see individual unit targets for H3260 feature in Table 1.	Phosphate concentration is generally less than 0.025 mg l-1 in most watercourses occupied by the southern damselfly in England.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/function	River morphology: Chalk streams and rivers	Restore the physical structure of the river channel and its banks in a natural state	The southern damselfly requires base-rich, shallow streams with a constant slow-to-moderate flow and relatively high water temperature. A natural state may be considered as one where the watercourse is not artificially straightened, deepened, canalised or otherwise altered as this will usually adversely affect both flow, vegetation growth and the shallowness (where the water is warmest) of the channel edge where the larvae live. A natural channel will also maximise the diversity of in-channel habitat which provides the principal prey items for <i>C. mercuriale</i> larvae which are predominantly smaller invertebrates, which may include freshwater shrimp, fly larvae, including blackflies (<i>simuliids</i>) and non-biting midges (<i>chironomids</i>), mayfly larvae (<i>ephemeropterans</i>), and small freshwater shrimp (<i>gammarids</i>).	RUSHBROOK (2018a) RUMBLE <i>et al.</i> (2006)
Supporting habitat: structure/function	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, within typical values for the supporting habitat	Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.	
Supporting habitat: structure/function	Trophic conditions: chalk streams and rivers	Maintain mesotrophic conditions indicated by a lack of areas of watercourse with encroachment of algae (except brown flocculent algae), bacterial film or invasive tall emergents such as <i>Phalaris</i>	A wide range of pH is found in watercourses on southern damselfly sites, although the majority of sites fall within the range 7.0–7.5. These conditions ensure sufficient oxygen for larval and egg development and no eutrophication and encroachment of invasive emergents and algae.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<i>arundinacea, Solidago canadensis, Filipendula ulmaria and Rubus spp</i>		
Supporting habitat: structure/function	Vegetation composition: scrub cover	<p>Restore only small areas of tall scrub or trees within 20 metres of watercourse but not on intervening habitat between two areas of population.</p> <p>Trees and scrub cover less than 25% overall in fen or grassland close to breeding sites.</p>	Some scattered trees and scrub associated with base-rich runnels and streams can provide areas for roosting, maturation, feeding, displaying and basking	<p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>RUSHBROOK (2018a)</p> <p>RUMBLE <i>et al.</i> (2006)</p>
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	<p>The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be amongst the most vulnerable sites overall which are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority.</p> <p>This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.</p> <p>See Table 1 for discussion of water levels/flows.</p>	<p>NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].</p> <p>RUSHBROOK (2018a)</p> <p>RUMBLE <i>et al.</i> (2006)</p>
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p> <p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p> <p>Currently there are no critical loads defined on APIS for the H3260 watercourse supporting habitat of southern damselfly.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	<p>Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England.</p> <p>This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.</p>	<p>ENGLISH NATURE (2004), River Itchen SSSI, Views About Management</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p> <p>ROUQUETTE (2005).</p> <p>RUSHBROOK (2018b)</p>
Supporting processes (on which the feature and/or its supporting habitat relies)	Water quantity/ quality	Where the feature or its supporting habitat is dependent on surface water and/or groundwater, restore water quality and quantity to a standard which provides the necessary conditions to support the feature	<p>For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type.</p> <p>Typically, meeting the surface water and groundwater</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Water quality data is found within the H3260 section of this document (Table 1.)	environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. See also Table 1 for further discussion of water levels/flows.	Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request) NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan
Version Control: Advice last updated: 16 March 2019 following stakeholder feedback. Explanatory notes for Population Abundance expanded to provide more information on transects and suitable habitat; distribution of supporting habitat explanatory notes updated to include location of three main population hubs;				
Variations from national feature-framework of integrity-guidance: Attributes relating to seepages and runnels in heathland habitats removed as this is an example of chalk stream habitats				

Table 3: Supplementary Advice for Qualifying Features: S1092. *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	Population abundance	Maintain the abundance of the population at a level which would mean at least 5 out of 100 refuges contain white-clawed crayfish within a unit of assessment, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	<p>This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve.</p> <p>This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature.</p> <p>Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment.</p> <p>Unless otherwise stated, the population size or presence will be that measured using standard methods. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data</p>	<p>RUSHBROOK (2013)</p> <p>RUSHBROOK <i>et al.</i> (2012)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise that the figures stated are the best available.	
Population (of the feature)	Population health	Restore an absence of non-native crayfish species from the site and the catchment surrounding the site	<p>Once non-native crayfish species (such as signal, red-swamp and spiny-cheeked crayfish) are established in a waterbody, native populations of crayfish may be eliminated rapidly by them through direct competition for food, predation or the transfer of disease. These species can also cause physical damage to supporting habitat. The presence of non-native species within or close to the SAC poses a risk of adversely affecting the abundance and health of the feature.</p> <p>The presence of signal crayfish in parts of the catchment will pose a significant risk to the white-clawed crayfish population through the potential to spread crayfish plague.</p>	<p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p> <p>RUSHBROOK (2013)</p> <p>RUSHBROOK <i>et al.</i> (2012)</p>
Population (of the feature)	Population health	Maintain an absence of individuals within the site infected with crayfish plague and porcelain disease should not be seen to affect >10% of crayfish population.	<p>Non-native crayfish species (such as signal crayfish) carry a fungal infection called the crayfish plague (<i>Aphanomyces astaci</i>), which is lethal to European crayfish (including our native white-clawed crayfish) and has resulted in their eradication from a number of waters in England. The presence of this disease within the native crayfish population, either within or close to the SAC, may adversely affect the abundance and health of the feature.</p> <p>Porcelain disease may be present in a population at low levels without apparent harm. However this can be an indication of environmental stress and problems may occur if a higher prevalence is reached.</p>	<p>HOLDITCH (2003)</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p>
Population (of the feature)	Population health	Ensure human activities within or around the site do not pose a significant risk of plague transfer	Non-native crayfish species (such as signal crayfish) carry a fungal infection called the crayfish plague (<i>Aphanomyces astaci</i>), which is lethal to European crayfish (including our native white-clawed crayfish) and has resulted in their eradication from a number of waters in England. Human activities, such as angling and fish farming, is able to facilitate the spread of non-native species and the spread of this disease if legislative controls and best management practice are not followed.	
Supporting habitat:	Distribution of supporting	Restore the distribution and continuity of the feature and its	A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its	RUSHBROOK (2013)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
extent and distribution	habitat	supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes.</p> <p>Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p>	RUSHBROOK <i>et al.</i> (2012)
Supporting habitat: extent and distribution	Extent of supporting habitat	Restore the total extent of the habitat(s) which support the H3260 feature to that characteristic of the natural fluvial processes associated with the river type	In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.	
Supporting habitat: structure/function	River bed	Restore an abundance of naturally occurring cobbles, rubble and boulders on the river bed	<p>Habitat conditions for white-clawed crayfish vary naturally in rivers. Some river sections may provide optimal habitat whilst others may be largely unsuitable. Optimal conditions typically occur in relatively shallow, fast flowing reaches with coarse substrates. A characteristically diverse biotope mosaic allows the white-clawed crayfish and other species to move within the channel to locate optimal habitat conditions in the face of a fluctuating flow regime. Pools, exposed tree root systems and marginal shallows are important high-flow refugia for the species. Impounding structures in particular can have a dramatic effect on white-clawed crayfish habitat, generating heavy siltation and loss of coarse substrates on which white-clawed crayfish depend.</p> <p>White-clawed crayfish are not usually found inhabiting substrates covered in mud or silt, although they may cross such areas while foraging. Land-use change, the draining of lakes or ponds, and lowering or widening a stream or river bed can increase siltation and reduce water flow, resulting in a change</p>	<p>HOLDITCH (2003)</p> <p>RUSHBROOK (2013)</p> <p>RUSHBROOK <i>et al.</i> (2012)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>in the channel flora and creating unsuitable conditions for crayfish.</p> <p>While they are known to occur in sections of river where the banks are poached by cattle, such activity can have an adverse effect on a population by increasing turbidity and decreasing dissolved oxygen concentrations as a result of sediment and excrement entering the water</p>	
Supporting habitat: structure/function	River/ waterbody vegetation	Maintain the extent of submerged and marginal vegetation within the river channel / standing water body (as appropriate)	<p>To be considered in conjunction with supplementary advice for associated Annex I habitat features. Habitat conditions for white-clawed crayfish vary naturally in rivers. Some river sections may provide optimal habitat whilst others may be largely unsuitable. Optimal conditions typically occur in relatively shallow, fast flowing reaches with coarse substrates.</p> <p>A characteristically diverse biotope mosaic allows the white-clawed crayfish and other species to move within the channel to locate optimal habitat conditions in the face of a fluctuating flow regime. Pools, exposed tree root systems and marginal shallows are important high-flow refugia for the species. Impounding structures in particular can have a dramatic effect on white-clawed crayfish habitat, generating heavy siltation and loss of coarse substrates on which white-clawed crayfish depend.</p>	
Supporting habitat: structure/function	Shoreline refugia	Restore the extent and diversity of shoreline refuges associated with the water body, such as submerged tree roots, bank crevices and marginal vegetation	White-clawed crayfish of all ages need refuges, or places to shelter or hide. Juvenile crayfish are especially vulnerable to predation by fish, ducks and other water birds, otter and mink, carnivorous dragonfly larvae and other predatory invertebrates, including adult crayfish. Crayfish are also vulnerable to high flows in watercourses, when they can be washed away from favourable habitats and stranded, crushed or eaten. Pools, exposed tree root systems and marginal shallows are important high-flow refugia for the species.	<p>RUSHBROOK (2013)</p> <p>RUSHBROOK <i>et al.</i> (2012)</p>
Supporting habitat: structure/function	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, within typical values for the supporting	Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		habitat	soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.	
Supporting habitat: structure/function	Supporting off-site habitat	Restore the quality of any supporting habitat present beyond the site boundary upon which the white-clawed crayfish population of the site depend	White-clawed crayfish populations within the designated boundary of the SAC may be dependent on the continued or restored integrity of sections of river channel and riparian areas that lie outside of the site boundary. For example, headwater areas and tributaries may not fall within the site boundary, yet white-clawed crayfish may use these areas for spawning and juvenile development and be critical for sustaining populations in the SAC further downstream.	
Supporting habitat: structure/function	Total Nitrogen	Restore levels typically at or below 0.2 mg.l-1 NO2 suggested as reflecting the EPA limit for salmonid waters.	These need to be made bespoke the individual site, as they will vary both between fluvial and static water bodies, and within those class types. High levels of nitrogen are likely to be toxic to crayfish. There seems to be a tolerance of nitrates in this species, with food consumption being impacted before other physiological impacts are noted, though mortality climbs with increasing concentration.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/function	Turbidity: rivers	Restore an annual mean level of typically less than 25 mg/l of suspended solids throughout the site	The supporting riverine habitat of the feature should be characterised by clean gravels; excess siltation can obstruct crayfish gills and this may cause physico-pathological changes in the long term. Construction operations often cause marked and extensive turbidity in water, coupled with an increase in iron content	HOLDITCH (2003) NATURAL ENGLAND CSM Assessment (2015). Data available upon request
Supporting habitat: structure/function	Un-ionised Ammonia	Maintain ammonia levels at or to less than 0.6mg NH3 l-1 throughout the site	High level of ammonia in watercourses, derived from organic pollution, is likely to be toxic to white-clawed crayfish.	NATURAL ENGLAND (2014). Progress goals and Selected Targets for N2K Rivers. Available on request from Natural England
Supporting habitat: structure/function	Water pH	Maintain pH levels at or to within the range 6.5 - 9	Higher pH levels as part of supporting water habitat chemistry maximise the survival and growth of animals.	
Supporting habitat: structure/function	Water quality: biological	Restore supporting habitat to Good biological status (i.e. compliance with relevant Environmental Quality	Good water quality is important to this feature to ensure sufficient availability of prey which includes worms, insect larvae, snails, small fish, macrophytes and algae. For many SAC features which are dependent on wetland habitats	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Standards) throughout the site. Water quality data is found within the H3260 section of this document (Table 1.)	supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this supporting habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	may be available from both organisations upon request NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request) NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan
Supporting habitat: structure/function	Water quality: chemical	Restore supporting habitat to Good chemical status (i.e. compliance with relevant Environmental Quality Standards) throughout the site. Water quality data is found within the H3260 section of this document (Table 1)	Good water quality is important to ensure availability of prey which includes worms, insect larvae, snails, small fish, macrophytes and algae. For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request) NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan
Supporting habitat: structure/function	Water temperature	Maintain water temperature at naturally-occurring levels	Good water quality is important to ensure availability of food which includes worms, insect larvae, snails, small fish, macrophytes and algae	
Supporting habitat: structure/function	Woody debris	Maintain an abundance of large woody debris within the channel or water body	Woody debris is an important component of river habitat for white-clawed crayfish as well as the wider biological community. White-clawed crayfish are particularly associated with woody debris in lowland reaches, where it is likely that it provides an alternative source of cover from predators and floods. It may also be used as an alternative spawning	NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>substrate.</p> <p>Where they are present, fallen branches and trunks are used extensively by crayfish as refuge on the River Itchen. Woody debris is typically removed during maintenance operations, but it is important to retain as much as possible, particularly where other forms of refuge are in short supply.</p>	
Supporting habitat: structure/function	Biological connectivity	The movement of white-clawed crayfish within the site should not be artificially constrained.	Vertical drops are sufficient to prevent upstream movement of adult white-clawed crayfish. Even low weirs will therefore prevent recolonisation of upper reaches affected by lethal pollution episodes or drought, and more generally will also lead to constraints on life cycle movements and genetic interactions throughout the river that may have adverse consequences. However a balance needs to be achieved by weighing the desire to ensure longitudinal connectivity against the need to minimise the risk of spreading signal crayfish to the headwaters from the lower catchment. As such this should be considered when making an assessment on the removal of any artificial structure.	
Supporting habitat: structure/function	Calcium levels	Maintain calcium levels at or to above 5mg/l	<p>Because of their thick exoskeletons and regular moult cycles, freshwater crustaceans such as crayfish have high calcium needs. When calcium levels drop, their exoskeletons become weaker reducing the abundance, size, and weight of these crustaceans.</p> <p>A reduction in size can slow the onset of sexual maturity, making them more vulnerable to predators. This, in turn, may further affect the overall size of their population. Finally, affected crustaceans may become less tolerant of other factors such as temperature, toxic metals, and Ultra Violet radiation.</p>	
Supporting habitat: structure/function	Oxygen levels	Restore supporting rivers and waterbodies in/to a well-oxygenated state, typically with a dissolved oxygen standard of >70%	Good water quality, reflected in high oxygen levels, is important to ensure availability of food which includes worms, insect larvae, snails, small fish, macrophytes and algae	NATURAL ENGLAND CSM Assessment (2015). Data available upon request
Supporting habitat: structure/function	Pollution	Ensure supporting habitat is not at risk of effluent discharges from agricultural or fish farms from within the site's wider catchment	Native crayfish are particularly susceptible to pollution incidents, and the transfer of diseases from other sources	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				may be available from both organisations upon request
Supporting habitat: structure/function	River banks	Maintain the full extent of bankside tree cover including their root systems	<p>Habitat conditions for white-clawed crayfish vary naturally in rivers. Some river sections may provide optimal habitat whilst others may be largely unsuitable. Optimal conditions typically occur in relatively shallow, fast flowing reaches with coarse substrates. A characteristically diverse biotope mosaic allows the white-clawed crayfish and other species to move within the channel to locate optimal habitat conditions in the face of a fluctuating flow regime.</p> <p>Pools, exposed tree root systems and marginal shallows are important high-flow refugia for the species. Impounding structures in particular can have a dramatic effect on white-clawed crayfish habitat, generating heavy siltation and loss of the coarse substrates on which white-clawed crayfish depend.</p>	
Supporting habitat: structure/function	River flow	Ensure more than 90% of the naturalised daily mean flow remains in the river all year round	The natural flow regime both shapes and sustains characteristic biotope mosaics, affecting factors such as current velocities and bed hydraulics, water levels and depths, wetted area, temperature regime and dissolved oxygen regime, All parts of the natural flow regime are important, including flushing flows, seasonal baseflows and natural low flows. Natural seasonal flow recession is critical in supporting the full expression of supporting habitats (marginal and riparian vegetation, exposed riverine sediments, ephemeral headwaters). Any significant impacts on the natural flow regime should be rectified sustainably by reducing flow modifications, not by artificial augmentation, or by altering channel form to fit reduced levels of flow.	
Supporting habitat: structure/function	River morphology	Restore the physical structure of the river channel and its banks in a natural state	<p>To be considered in conjunction with supplementary advice for associated Annex I habitat features. Habitat conditions for white-clawed crayfish vary naturally in rivers. Some river sections may provide optimal habitat whilst others may be largely unsuitable. Optimal conditions typically occur in relatively shallow, fast flowing reaches with coarse substrates.</p> <p>A characteristically diverse biotope mosaic allows the white-clawed crayfish and other species to move within the channel to locate optimal habitat conditions in the face of a fluctuating</p>	<p>HOLDITCH (2003)</p> <p>RUSHBROOK (2013)</p> <p>RUSHBROOK <i>et al.</i> (2012)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>flow regime. Pools, exposed tree root systems and marginal shallows are important high-flow refugia for the species. Impounding structures in particular can have a dramatic effect on white-clawed crayfish habitat, generating heavy siltation and loss of coarse substrates on which white-clawed crayfish depend.</p> <p>A natural channel morphology provides a diversity of refuge and feeding opportunities for white-clawed crayfish. The proximity of different refuges facilitates foraging and the movement of individuals to different habitats with age.</p> <p>Operations that widen, deepen and/or straighten the channel reduce variations in habitat. Land-use change, the draining of lakes or ponds, and lowering or widening a stream or river bed can increase siltation and reduce water flow, resulting in a change in the channel flora and creating unsuitable conditions for crayfish.</p> <p>While they are known to occur in sections of river where the banks are poached by cattle, such activity can have an adverse effect on a population by increasing turbidity and decreasing dissolved oxygen concentrations as a result of sediment and excrement entering the water</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	<p>The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority.</p> <p>This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less</p>	<p>NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].</p> <p>RUSHBROOK (2013)</p> <p>RUSHBROOK <i>et al.</i> (2012)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p> <p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	<p>Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England.</p> <p>This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.</p>	<p>ENGLISH NATURE (2004), River Itchen SSSI, Views About Management</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	Fish density	Maintain fish populations at or to densities low enough to avoid significant predation of juvenile crayfish	<p>Predatory fish species may include chub, eel, perch, pike and trout</p> <p>Fish stocking and transfers are a potential vector of crayfish plague. Fish should only be stocked from fish farms or other sources that are free of non-native crayfish or crayfish plague, or fish farms where suitable quarantine arrangements are in place. Excessively high densities of other fish species may cause unacceptably high predation pressure and competitive interactions.</p>	NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)
Supporting processes (on which the feature and/or its supporting habitat relies)	Water quantity/ quality	<p>Where the feature or its supporting habitat is dependent on surface water and/or groundwater restore water quality and quantity to a standard which provides the necessary conditions to support the feature</p> <p>Water quality data is found within the H3260 section of this document (Table 1.)</p>	<p>For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type.</p> <p>Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>
Version Control Advice last updated: 16 March 2019 following stakeholder feedback explanatory notes for Biological Connectivity attribute revised to clarify need to balance biological connectivity with minimise risk of signal crayfish spreading upstream.				
Variations from national feature-framework of integrity-guidance: N/A				

Table 4: Supplementary Advice for Qualifying Features: S1096. *Lampetra planeri*; Brook lamprey

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	Juvenile densities	<p>Restore juvenile densities at those expected under unimpacted conditions throughout the site, taking into account natural habitat conditions and allowing for natural fluctuations.</p> <p>A mean density of brook lamprey in suitable habitat of >5 m-2.</p>	<p>Impacts on physical, chemical or hydrological integrity, or from non-native species, may suppress juvenile densities.</p>	<p>JNCC, Common Standards Monitoring guidance for freshwater fauna (2015)</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND(2018) River Itchen Brook Lamprey survey and condition assessment</p>
Population (of the feature)	Population abundance	<p>Maintain the abundance of the population at a level which is close to that expected under unimpacted conditions throughout the site (subject to natural habitat conditions and allowing for natural fluctuations), whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.</p> <p>As a minimum, brook lamprey should be present in not less than 50% of all sampling sites surveyed with suitable habitat present within the natural range.</p> <p>Where brook lamprey have been found in the past they should be present at 90% of sampling sites</p>	<p>This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve.</p> <p>This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature.</p> <p>Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level</p>	<p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND(2018) River Itchen Brook Lamprey survey and condition assessment</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		if suitable habitat remains	<p>established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment.</p> <p>Unless otherwise stated, the population size or presence will be that measured using standard methods, such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise that the figures stated are the best available.</p>	
Supporting habitat: extent and distribution	Distribution of supporting habitat	Restore the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes.</p> <p>Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p>	
Supporting habitat: extent and distribution	Extent of supporting habitat	Restore the total extent of the habitat(s) which support the H3260 feature to that characteristic of the natural fluvial processes associated with the river type	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC.</p> <p>The information available on the extent and distribution of supporting habitat used by the feature may be approximate</p>	NATURAL ENGLAND (2018) River Itchen Brook Lamprey survey and condition assessment

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			depending on the nature, age and accuracy of data collection, and subject to periodic review in light of improvements in data.	
Supporting habitat: structure/function	Biological connectivity	See general advice for river habitat (H3260)	<p>Lampreys can pass some potential barriers by attaching themselves to structures or river banks by their suckorial discs and creeping up by strong bursts of swimming. However, many in-channel structures are known to either completely or partially block access to historical spawning grounds. Whilst in-channel structures can artificially generate both siltbeds and clean gravels, both of value to lamprey species, this is not a justification for their continued existence or the construction of new structures.</p> <p>Suitable habitat for lamprey and other species can and should be generated by natural processes - where physical restoration of the channel is required this may involve changes in the distribution of species within the river system.</p>	
Supporting habitat: structure/function	Biotope mosaic	See general advice for river habitat (H3260)	Habitat conditions for lamprey species vary naturally in rivers. Some river sections may provide optimal habitat for some or all life stages whilst others may be largely unsuitable. Adult lamprey require spawning substrates of coarse material in which to deposit eggs in shallow scrapes (redds). Larval lamprey (ammocoetes) live in silt beds, which are often in channel margins but in relation to sea lamprey are known to occur in deep water in main river reaches. The advice for H3260 is based on natural river function, which provides a characteristic biotope mosaic that caters for lamprey life stages to a degree characteristic of the river.	
Supporting habitat: structure/function	Control of livestock grazing activity	See general advice for river habitat (H3260)	<p>Over-grazing of riparian areas can have a dramatic effect on lamprey habitat, trampling marginal siltbeds, eliminating marginal vegetation and generating excessive loads of fine sediment on spawning gravels.</p> <p>Ideally, grazing levels should be managed at low levels across whole riparian fields. Where this is not feasible, set-back fencing may be established with access provision for limited grazing within the riparian zone. Particularly sensitive areas (e.g. exposed riverine sediments likely to support good invertebrate communities) may need to be fenced off to avoid any concentration of livestock activity, even if only present in</p>	<p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			low numbers. Close bankside fencing that excludes the development of a functional river corridor is not appropriate	
Supporting habitat: structure/function	Fisheries - exploitation	All exploitation (e.g. netting or angling) of lamprey species should be undertaken sustainably without compromising any components of the population,	Controls on exploitation should include migratory passage within territorial waters, including estuarine and coastal net fisheries, as well as exploitation within the river. The Environment Agency do not consent netting of sea, brook or river lamprey on the River Itchen.	
Supporting habitat: structure/function	Fisheries - introduction of fish species	Ensure fish stocking/introductions do not interfere with the ability of the river to support self-sustaining populations of the feature	The presence of artificially high densities of fish may create unacceptably high levels of predatory pressure on brook lamprey and ammocoetes of all species. The management aim is to provide conditions in the river that support a healthy, natural and self-sustaining salmon population, achieved through habitat protection/restoration and the control of exploitation as necessary. Stocking represents a loss of naturalness and, if successful, obscures the underlying causes of poor performance (potentially allowing these risks to perpetuate). It carries various ecological risks, including the loss of natural spawning from broodstock, competition between stocked and naturally produced individuals, disease introduction and genetic alterations to the population	
Supporting habitat: structure/function	Flow regime	See general advice for river habitat (H3260).	The natural flow regime is critical to all aspects of lamprey life cycle. It shapes the characteristic biotope mosaic, maintains water in critical biotopes (including marginal siltbeds), and provides adequate flows for migratory passage (which is important not only for river and sea lamprey but also brook lamprey in its shorter distance migrations within the river).	
Supporting habitat: structure/function	Integrity of off-site habitats	See general advice for river habitat (H3260)	Lamprey populations may be dependent on the integrity of sections of river channel, riparian areas and transitional and marine waters that lie outside of the site boundary. Headwater areas and tributaries may not fall within the site boundary, yet lamprey (particularly brook and river lamprey) may use these areas for spawning and juvenile development and be critical for sustaining populations within the site. River and sea lamprey require safe passage through coastal waters and estuaries.	
Supporting	Riparian zone	See general advice for river	Active marginal vegetation including riparian trees provides	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
habitat: structure/function		habitat (H3260)	important habitat for lamprey ammocoetes, as it encourages and stabilises the formation of silt beds in which ammocoetes burrow. Riparian trees also add substrate diversity and aid the formation of siltbeds and clean gravels. They also provide temperature gradients in the channel that improves the availability of suitable micro-habitat.	
Supporting habitat: structure/function	Screening of intakes and discharges	See general advice for river habitat (H3260)	Adult lamprey and migrating sub-adults (transformers) can be entrained in intakes and discharges along with other fish species.	
Supporting habitat: structure/function	Sediment regime	See general advice for river habitat (H3260)	Natural levels of coarse sediment supply are critical to the maintenance of high quality spawning habitat for lamprey species, maintaining bed substrates in optimal condition for egg-laying and juvenile and adult cover. Excessive delivery of fine sediment, from the catchment or artificially enhanced bank erosion, can cause siltation of egg-laying sites and juvenile and adult refugia.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/function	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, within typical values for the supporting habitat	<p>Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms.</p> <p>Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.</p> <p>Spawning habitat comprises well-oxygenated gravel/pebble (1.5–11.0 cm diameter) dominated substrate of at least 10 cm depth and overlain by a range of water depths (0.2–1.5 m). River and sea lamprey typically spawn in deeper water than brook lamprey, but in larger reaches brook lamprey will also spawn in deep water. Elevated levels of fines (<0.83 mm diameter) can interfere with egg survival</p>	<p>MAITLAND (2003)</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p>
Supporting habitat: structure/function	Vegetation composition: invasive non-native species	See general advice for river habitat (H3260)	Species such as signal crayfish can have a serious effect on lamprey habitat and may predate heavily on brook lamprey and ammocoetes of all lamprey species if present at high densities. Chinese mitten crab is also of concern, not only in the lower	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			reaches of main river but due to its potential to migrate long distances upstream.	
Supporting habitat: structure/function	Water quality - acidification	See general advice for river habitat (H3260)	Brook lamprey may be affected by acidification in low alkalinity headwaters.	
Supporting habitat: structure/function	Water quality - nutrients	Restore the natural nutrient regime of the rivers, with any anthropogenic enrichment above natural/background concentrations limited to levels at which adverse effects on the feature are unlikely. See information for H3260 feature in table 1.	Nutrient enrichment can lead to loss of substrate condition for spawning, egg development and ammocoete growth, due to benthic algal growth and associated enhanced siltation and sediment anoxia. Lamprey species may be affected by both episodic and chronic organic pollution. Episodic pollution causes direct mortalities whilst chronic pollution affects substrate condition through the build-up of excessive microbial populations.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request MAITLAND (2003)
Supporting habitat: structure/function	Woody debris	See general advice for river habitat (H3260)	Woody debris is an important component of river habitat for lampreys as well as the wider biological community. It encourages characteristic heterogeneity in biotopes, provides a mosaic of substrates types that lamprey species need to fulfil their life cycle.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority. This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p> <p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	<p>ENGLISH NATURE (2004), River Itchen SSSI, Views About Management</p> <p>Natural England (2014), River Itchen SAC Site Improvement Plan</p> <p>(2018) River Itchen Brook Lamprey survey and condition assessment (Carcinus)</p>
Supporting processes (on which the	Water quantity/ quality	Where the feature or its supporting habitat is dependent on surface water and/or	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical,	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
feature and/or its supporting habitat relies)		<p>groundwater, restore water quality and quantity to a standard which provides the necessary conditions to support the feature</p> <p>Water quality data is found within the H3260 section of this document (Table 1)</p>	<p>especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p>	<p>Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>
<p>Version Control Advice last updated: 16 March 2019 following stakeholder feedback; explanatory notes for Fisheries – exploitation updated to reflect status of netting within the River Itchen</p>				
<p>Variations from national feature-framework of integrity-guidance: N/A</p>				

Table 5: Supplementary Advice for Qualifying Features: S1106. *Salmo salar*; Atlantic salmon

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	Adult run size	<p>Restore the population to that expected under un-impacted conditions, allowing for natural fluctuations. This should include a seasonal pattern of migration characteristic of the river and maintenance of the multi-sea-winter component.</p> <p>Ensure that the stock exceeds its Conservation Limit in 4 out of 5 years</p> <p>The Conservation Limit indicates the minimum desirable adult spawning stock levels (expressed as annual number of eggs deposited) below which stocks should not be allowed to fall.</p> <p>Conservation limit for the River Itchen is considered to be 1.63 million eggs per year.</p>	<p>Impacts on physical, chemical or hydrological integrity, or from non-native species, or from exploitation in freshwater or marine and coastal waters, may suppress adult run size. Salmon stocking is not permitted on the River Itchen.</p> <p>To assess the status of the river's salmon stock the Environment Agency have developed salmon Conservation Limits (CLs). These limits indicate the minimum desirable adult spawning stock levels (expressed as annual number of eggs deposited) below which stocks should not be allowed to fall.</p> <p>Annual egg deposition is calculated based on Returning Stock Estimates (RSE) from fish counters located in the lower reaches of the Rivers Test and Itchen. The Conservation Limit is set at a stock size below which further reductions in spawning numbers are likely to result in reductions in the number of juvenile fish produced in the next generation. Therefore, if the stock for a particular river is already performing below its CL, any further reductions in adult spawners would be expected to result in a direct reduction in juvenile production. This is because the river is already below its carrying capacity for juvenile salmon and therefore changes in the number of spawning fish directly influence recruitment to the next generation.</p> <p>Each individual salmon river's annual performance is expressed as a percentage of its meeting the CL, with 100% being at the CL.</p> <p>Stock on each river should exceed its Conservation Limit in 4 out of 5 years. To ensure that this happens a stock Management Target (MT) has also been set which is approximately 35% higher than the Conservation Limit. The Management Target is an aspirational target that fishery managers should aim to achieve to ensure that the stock has the best possible opportunity to meet the objectives.</p>	<p>Environment Agency (2017): Solent and South Downs: Fish Monitoring report 2017</p> <p>Environment Agency (2019) Information on salmon conservation limits. EA <i>pers comm</i>.</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>The salmon egg conservation limit on the River Itchen is 1.63 million eggs per year, the egg management target is 1.97million eggs per year.</p> <p>Between 1990 and 2018 the Salmon egg conservation limit on the River Itchen was exceeded in only 2010, 2014 and 2015. In most years less than 50% of salmon egg conservation limit target was reached</p>	
Population (of the feature)	Juvenile densities	Restore juvenile densities at those expected under unimpacted conditions throughout the site, taking into account natural habitat conditions and allowing for natural fluctuations	Impacts on physical, chemical or hydrological integrity, or from non-native species, or from exploitation of spawning adults in freshwater or marine and coastal waters, may suppress juvenile densities.	<p>JNCC, Common Standards Monitoring guidance for freshwater fauna (2015)</p> <p>Environment Agency (2017): Solent and South Downs: Fish Monitoring report 2017</p>
Population (of the feature)	Spawning distribution	Restore the distribution of spawning to reflect unimpacted conditions through the site, and avoid reductions in existing levels.	After a year or more at sea, adult salmon return from their feeding grounds back to their river. Once it is time for them to spawn they will migrate upstream to the areas of the SAC where they were born to spawn themselves. These spawning areas may be in small tributaries of river systems where there is clean gravel and a good flow of fresh clean water. Maintaining these spawning areas is critical to the successful reproduction and long-term viability of this feature.	Environment Agency (2017): Solent and South Downs: Fish Monitoring report 2017
Supporting habitat: extent and distribution	Distribution of supporting habitat	Restore the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes.</p> <p>Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p>	Environment Agency (2017): Solent and South Downs: Fish Monitoring report 2017

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: extent and distribution	Extent of supporting habitat	[Maintain OR Restore] the total extent of the habitat(s) which support the H3260 feature to that characteristic of the natural fluvial processes associated with the river type	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC.</p> <p>The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.</p>	
Supporting habitat: structure/function	Biological connectivity	See general advice for river habitat (H3260)	Freedom of movement throughout the river system is critical to all life stages of salmon. Barriers to adult migration have cumulative effects on the ability of individuals to reach spawning grounds and need to be considered in combination.	
Supporting habitat: structure/function	Biotope mosaic	See general advice for river habitat (H3260)	<p>Within the river, a characteristic habitat mosaic shaped by natural processes provides the diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile, adult and migratory requirements of salmon as well as other characteristic species. Some river sections will be naturally sub-optimal for some salmon life stages, and this is just a characteristic of the river.</p> <p>The species requires adult holding areas (generally pools of at least 150 cm depth, with cover from features such as undercut banks, vegetation, submerged objects and surface turbulence), spawning habitat (stable, clean gravel/pebble-dominated substrate without an armoured layer and with <10% fines in the top 30cm, and with 15-75cm of overlying water), nursery habitat (for fry, water of <20 cm deep and a gravel/ pebble/ cobble substrate; for parr, water 20-40 cm deep and similar substrate). Close juxta position of biotopes is needed to allow easy movement of individuals between suitable areas of the channel under different flow conditions and with age.</p>	
Supporting habitat: structure/function	Flow regime	See general advice for river habitat (H3260).	The natural flow regime is critical to all aspects of the salmon life cycle, including migratory passage through the estuary and up the river to spawning grounds, egg incubation in redds, fry and parr habitat quality and extent, and downstream smolt migration.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/function	Riparian zone	See general advice for river habitat (H3260)	High riparian tree cover is beneficial to salmon, in terms of physical habitat provision and combatting increasing temperatures caused by climate change. However, the extent of tree cover needs to be optimised to provide suitable conditions for the whole characteristic biological community.	
Supporting habitat: structure/function	Sediment regime	See general advice for river habitat (H3260)	Natural levels of coarse sediment supply are critical to the maintenance of high quality juvenile and salmon habitat, maintaining spawning gravels and characteristic biotope mosaics. Excessive delivery of fine sediment, from the catchment or artificially enhanced bank erosion, can damage gills, impair vision and cause siltation of spawning and nursery areas. Siltation within and on top of coarse beds is a major threat to salmon within the River Itchen, preventing the flow of dissolved oxygen to eggs and prevent the movement of waste products from redds. In addition, elevated levels of suspended solids can clog the respiratory structures.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)
Supporting habitat: structure/function	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, within typical values for the supporting habitat	Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.	
Supporting habitat: structure/function	Thermal regime	See general advice for river habitat (H3260)	Water temperature can affect egg development, fish survival, feeding and growth. The salmon is considered particularly vulnerable to increasing temperatures in the southern part of its English range, most notably in chalk streams.	
Supporting habitat: structure/function	Vegetation composition: invasive non-native species	See general advice for river habitat (H3260)	Species such as signal crayfish can have a serious effect on salmon habitat and can predate heavily on salmon juveniles if present at high densities. Chinese mitten crab has the potential to migrate long distances up rivers and damage marginal habitats used by both adult and juvenile salmon.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/function	Water quality - acidification	See general advice for river habitat (H3260)	Salmon are highly sensitive to acidification stress.	
Supporting habitat: structure/function	Water quality - nutrients	Restore the natural nutrient regime of the rivers, with any anthropogenic enrichment above natural/background concentrations limited to levels at which adverse effects on the feature are unlikely. See information for H3260 feature in table 1.	In addition to the wider ecosystem effects of eutrophication that have a detrimental effect on salmon habitat, enrichment can place salmon at a competitive disadvantage, for instance relative to brown trout. Salmon are efficient foragers that are adapted to low productivity environments, and increased productivity makes efficient foraging obsolete. Eutrophication and episodic pollution causes direct mortalities, whilst chronic pollution affects substrate condition through the build-up of excessive microbial populations. Salmon are particularly sensitive to reduce dissolved oxygen levels, in the water column and within the gravel substrate of spawning redds (nests).	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/function	Woody debris	See general advice for river habitat (H3260)	Woody debris is an important component of river habitat for salmon as well as the wider biological community.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority. Actions to address specific issues may include removing barriers to fish passes, appropriate tree planting, provision of protective screening on intakes and discharges, and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p> <p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	<p>ENGLISH NATURE (2004), River Itchen SSSI, Views About Management</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p> <p>Environment Agency (2017): Solent and South Downs: Fish Monitoring report 2017</p>
Supporting processes	Control of livestock	See general advice for river habitat (H3260)	Over-grazing of riparian areas can have a dramatic effect on salmon habitat.	NATURAL ENGLAND (2018) Definition of Favourable

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(on which the feature and/or its supporting habitat relies)	grazing activity		Ideally, grazing levels should be managed at low levels across whole riparian fields. Where this is not feasible, set-back fencing may be established with access provision for limited grazing within the riparian zone. Particularly sensitive areas (e.g. exposed riverine sediments likely to support good invertebrate communities) may need to be fenced off to avoid any concentration of livestock activity, even if only present in low numbers. Close bankside fencing that excludes the development of a functional river corridor is not appropriate.	Condition - River Itchen SSSI (Available from Natural England on request) NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan
Supporting processes (on which the feature and/or its supporting habitat relies)	Fisheries - exploitation	Ensure exploitation (e.g. netting or angling) of Atlantic salmon is undertaken sustainably without compromising any components of the population, including multi-sea winter fish and seasonal components of the adult run.	Controls on exploitation should include migratory passage within territorial waters, including estuarine and coastal net fisheries, as well as exploitation within the river from rod fisheries. Salmon fishing on the River Itchen is undertaken on a zero exploitation basis, e.g. catch and return; however there may be unintentional mortality to individual fish as a consequence of catch and release.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Fisheries - introduction of fish species	Ensure fish stocking/introductions do not interfere with the ability of the river to support self-sustaining populations of the feature	The presence of artificially high densities of other fish creates unacceptably high levels of predatory and competitive pressure on juvenile salmon. The management aim is to provide conditions in the river that support a healthy, natural and self-sustaining salmon population, achieved through habitat protection/restoration and the control of exploitation as necessary. Stocking represents a loss of naturalness and, if successful, obscures the underlying causes of poor performance (potentially allowing these risks to perpetuate). It carries various ecological risks, including the loss of natural spawning from broodstock, competition between stocked and naturally produced individuals, disease introduction and genetic alterations to the population.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Fisheries - introduction of salmon	Ensure fish stocking/introductions do not interfere with the ability of the river to support self-sustaining populations of the feature	The management aim is to provide conditions in the river that support a healthy, natural and self-sustaining salmon population, achieved through habitat protection/restoration and the control of exploitation as necessary.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
habitat relies)			<p>Stocking represents a loss of naturalness and, if successful, obscures the underlying causes of poor performance (potentially allowing these risks to perpetuate). It carries various ecological risks, including the loss of natural spawning from broodstock, competition between stocked and naturally produced individuals, disease introduction and genetic alterations to the population</p> <p>No stocking of salmon should take place within the River Itchen to maintain the genetic integrity of the species.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Integrity of off-site habitats	See general advice for river habitat (H3260)	<p>Salmon populations are dependent on the integrity of sections of river channel, riparian areas, and transitional and marine waters that lie outside of the site boundary. Headwater areas and tributaries may not fall within the site boundary, yet salmon may use these areas for spawning and juvenile development and be critical for sustaining populations within the site.</p> <p>Fully developed riparian zones are essential for salmon habitat, yet part of this zone may lie outside of the site boundary, particularly if the river channel is operating under natural processes and moves laterally over time within the floodplain. The conditions experienced by salmon on their marine migration (through the saline transition zone, estuary, coastal waters and into the high seas) are critical to the well-being of populations within the river, and vice versa.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Screening of intakes and discharges	See general advice for river habitat (H3260)	Salmon can be seriously affected by inadequate screening on their adult and smolt migrations, as well as on their smaller juvenile dispersion movements between spawning grounds and nursery areas.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Vegetation structure: cover of submerged macrophytes	See general advice for river habitat (H3260)	In rivers where it naturally occurs, submerged and marginal vegetation is an important element of juvenile salmon habitat.	
Supporting	Water	Where the feature or its	For many SAC features which are dependent on wetland	Environment Agency &

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
processes (on which the feature and/or its supporting habitat relies)	quantity/quality	<p>supporting habitat is dependent on surface water and/or groundwater restore water quality and quantity to a standard which provides the necessary conditions to support the feature</p> <p>Water quality data is found within the H3260 section of this document (Table 1.)</p>	<p>habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p>	<p>NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>
<p>Version Control Advice last updated: 16 March 2019 following stakeholder feedback. Target and explanatory notes for Adult run size revised to provide more detail and clarity; additional information added to explanatory notes for Adaptation & Resilience to provide clarity on how salmon may be impacted; clarity on status of exploitation of salmon on River Itchen added to Fisheries – exploitation explanatory notes; explanatory notes for Fisheries – introduction of salmon attribute updated to reflect current status of stocking within the SAC.</p>				
<p>Variations from national feature-framework of integrity-guidance: N/A</p>				

Table 6: Supplementary Advice for Qualifying Features: S1163. *Cottus gobio*; Bullhead

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	Juvenile densities	Maintain juvenile densities at those expected under unimpacted conditions throughout the site, taking into account natural habitat conditions and allowing for natural fluctuations	Impacts on physical, chemical or hydrological integrity, or from non-native species, may suppress juvenile densities.	JNCC, Common Standards Monitoring guidance for freshwater fauna (2015) NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)
Population (of the feature)	Population abundance	Maintain the abundance of the population at a density which is close to that expected under unimpacted conditions throughout the site (subject to natural habitat conditions and allowing for natural fluctuations), whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. Adult population densities should be no less than 0.5 m ⁻² in lowland rivers (source altitude ≤100m).	This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve. This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature. Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is	NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request) Data may be available from Natural England upon request and population survey data from the Environment Agency upon request

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment.</p> <p>Unless otherwise stated, the population size or presence will be that measured using standard methods, such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise that the figures stated are the best available.</p>	
Supporting habitat: extent and distribution	Distribution of supporting habitat	Restore the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes.</p> <p>Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p>	NATURAL ENGLAND (2015). CSM Assessment Data available upon request
Supporting habitat: extent and distribution	Extent of supporting habitat	Restore the extent of the habitats which support the H3260 feature to that characteristic of the natural fluvial processes associated with the river type	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC.</p> <p>The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/function	Flow regime	See general advice for river habitat (H3260).	The natural flow regime is critical to all aspects of the bullhead life cycle, maintaining the high current velocities and substrate conditions that are optimal for the species.	
Supporting habitat: structure/function	Integrity of off-site habitats	See general advice for river habitat (H3260)	Bullhead populations within the SAC may be dependent on the integrity of sections of river channel and riparian areas that lie outside of the site boundary. Headwater areas and tributaries may not fall within the site boundary, yet bullhead may use these areas for spawning and juvenile development and be critical for sustaining populations within the site.	
Supporting habitat: structure/function	Riparian zone	See general advice for river habitat (H3260)	Active marginal vegetation including riparian trees provides important cover for bullhead. A mosaic of vegetation types and sward heights provides suitable conditions for the whole characteristic biological community including bullhead.	
Supporting habitat: structure/function	Screening of intakes and discharges	See general advice for river habitat (H3260)	Bullhead can be entrained in intakes and discharges along with other fish species.	
Supporting habitat: structure/function	Sediment regime	See general advice for river habitat (H3260)	Natural levels of coarse sediment supply are critical to the maintenance of high quality bullhead habitat, maintaining bed substrates in optimal condition for egg-laying and juvenile and adult cover. Excessive delivery of fine sediment, from the catchment or artificially enhanced bank erosion, can cause siltation of egg-laying sites and juvenile and adult refugia.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/function	Soils, substrate and nutrient cycling	Restore the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, within typical values for the supporting habitat	Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.	
Supporting habitat: structure/function	Vegetation composition: invasive non-native species	See general advice for river habitat (H3260)	Species such as signal crayfish can have a serious effect on bullhead habitat (by destabilising banks and enhancing fine sediment input), and can predate heavily on bullhead if present at high densities. Chinese mitten crab has the potential to migrate long distances up rivers and can cause similar damage	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			to bullhead habitat.	
Supporting habitat: structure/ function	Vegetation structure: cover of submerged macrophytes	See general advice for river habitat (H3260)	In rivers where it naturally occurs, submerged and marginal vegetation can provide important cover for bullhead, particularly if coarse (cobble) substrates are in short supply for cover.	
Supporting habitat: structure/ function	Water quality - acidification	See general advice for river habitat (H3260)	The bullhead is susceptible to acidification stress in low alkalinity waters.	
Supporting habitat: structure/ function	Water quality - nutrients	Restore the natural nutrient regime of the river s, with any anthropogenic enrichment above natural/background concentrations limited to levels at which adverse effects on the feature are unlikely. See information for H3260 feature in table 1.	Nutrient enrichment can lead to loss of substrate condition for bullhead due to benthic algal growth and associated enhanced siltation. The bullhead is susceptible to both episodic and chronic organic pollution. Episodic pollution causes direct mortalities whilst chronic pollution affects substrate condition through the build-up of excessive microbial populations.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/ function	Woody debris	See general advice for river habitat (H3260)	Woody debris is an important component of river habitat for bullhead as well as the wider biological community. Bullheads are particularly associated with woody debris in lowland reaches, where it is likely that it provides an alternative source of cover from predators and floods. It may also be used as an alternative spawning substrate.	
Supporting habitat: structure/ function	Biological connectivity	See general advice for river habitat (H3260)	Vertical drops of >18-20 cm are sufficient to prevent upstream movement of adult bullheads. They will therefore prevent recolonisation of upper reaches affected by lethal pollution episodes or drought, and more generally will also lead to constraints on genetic interactions that may have adverse consequences.	
Supporting habitat: structure/ function	Biotope mosaic	See general advice for river habitat (H3260)	Habitat conditions for bullhead vary naturally in rivers. Some river sections may provide optimal habitat whilst others may be largely unsuitable. Optimal conditions typically occur in relatively shallow, fast flowing reaches with coarse substrates (used for egg-laying and juvenile/adult cover). A characteristically diverse biotope mosaic allows the bullhead	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			and other species to move within the channel to locate optimal habitat conditions in the face of a fluctuating flow regime. Pools, exposed tree root systems and marginal shallows are important high-flow refugia for the species. The advice for H3260 is based on natural river function, which provides a characteristic biotope mosaic that caters for bullhead to a degree characteristic of the river.	
Supporting habitat: structure/function	Control of livestock grazing activity	See general advice for river habitat (H3260)	<p>Over-grazing of riparian areas can have a dramatic effect on bullhead habitat, eliminating marginal habitat and generating excessive loads of fine sediment.</p> <p>Ideally, grazing levels should be managed at low levels across whole riparian fields. Where this is not feasible, set-back fencing may be established with access provision for limited grazing within the riparian zone. Particularly sensitive areas (e.g. exposed riverine sediments likely to support good invertebrate communities) may need to be fenced off to avoid any concentration of livestock activity, even if only present in low numbers. Close bankside fencing that excludes the development of a functional river corridor is not appropriate.</p>	<p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>
Supporting habitat: structure/function	Fisheries - introduction of fish species	Ensure fish stocking/introductions do not interfere with the ability of the river to support self-sustaining populations of the feature	<p>The presence of artificially high densities of fish can create unacceptably high levels of predatory pressure on bullhead. The management aim is to provide conditions in the river that support a healthy, natural and self-sustaining salmon population, achieved through habitat protection/restoration and the control of exploitation as necessary.</p> <p>Stocking represents a loss of naturalness and, if successful, obscures the underlying causes of poor performance (potentially allowing these risks to perpetuate). It carries various ecological risks, including the loss of natural spawning from broodstock, competition between stocked and naturally produced individuals, disease introduction and genetic alterations to the population.</p>	
Supporting processes (on which the feature and/or its supporting	Adaptation and resilience	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be the most vulnerable	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
habitat relies)			<p>sites overall and are likely to require the most adaptation action, most urgently.</p> <p>A site based assessment should be carried out as a priority. This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.</p>	<p>SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].</p>
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	<p>Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).</p>	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p> <p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p>	<p>More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).</p>
Supporting processes (on which the	Conservation measures	<p>Restore the management measures (either within and/or outside the site boundary as</p>	<p>Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site</p>	<p>ENGLISH NATURE (2004), River Itchen SSSI, Views About Management</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
feature and/or its supporting habitat relies)		appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	<p>can be provided by contacting Natural England.</p> <p>This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.</p>	<p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p> <p>NATURAL ENGLAND (2015). CSM Assessment Data available upon request</p>
Supporting processes (on which the feature and/or its supporting habitat relies)	Water quantity/ quality	<p>Where the feature or its supporting habitat is dependent on surface water and/or groundwater, restore water quality and quantity to a standard which provides the necessary conditions to support the feature</p> <p>Water quality data is found within the H3260 section of this document (Table 1)</p>	<p>For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type.</p> <p>Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>
Version Control				
Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Table 7: Supplementary Advice for Qualifying Features: S1355. *Lutra lutra*; Otter

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	Anthropogenic mortality	Reduce levels of mortality as a result of anthropogenic (man-made) factors so that they are not adversely affecting the overall abundance and viability of the population.	High numbers of otter casualties within or adjacent to SAC catchments will adversely affect the condition and viability of the population and mitigation measures should be initiated as quickly as possible. Causes of mortality may include roads, accidents with fishing equipment (nets, lobster creels), poisoning, pollutants, hunting and acidification/contamination of water courses (which reduces fish populations). It should be noted that otters are also a European protected species, and that it is an offence to deliberately disturb, capture, injure or kill an otter.	
Population (of the feature)	Population abundance	Restore the continued presence of an actively-breeding otter population within the SAC, whilst avoiding deterioration from current levels as indicated by the latest mean peak count, estimate or equivalent.	<p>This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve.</p> <p>This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature.</p> <p>Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment.</p> <p>For otters, it is difficult to estimate population size. It could be assumed that where there is a high frequency of positive signs in an area, such as a large number of spraints (of several ages), that otters are likely to be occupying the site. Breeding will be indicated by the presence of natal dens, cub sightings and intensive otter activity (e.g. feeding, sprainting, pathways through vegetation). DNA analysis of spraints is now being used as a technique for identifying otters.</p>	
Supporting habitat: extent and distribution	Distribution of supporting habitat	Restore the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes.</p> <p>Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p>	NATURAL ENGLAND (2015). CSM Assessment Data available upon request
Supporting habitat: extent and distribution	Extent of supporting habitat	<p>Restore the total extent of the habitat(s) which support the H3260 feature to that characteristic of the natural fluvial processes associated with the river type</p> <p>Wet woodland 69.57ha Lowland neutral grassland and Fen meadow 97.35</p>	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Swamp, reed-beds and tall-herb fen 145.75ha		
Supporting habitat: structure/function	Abundance of breeding and resting places	Restore an abundance of natural breeding and resting sites within the site	<p>It should be noted that otters are highly mobile and are likely to spend their time within wider territories, where designated sites only form a proportion of their range and make a contribution to their wider requirements. Otters are a European protected species, and it is an offence to disturb their resting places.</p> <p>Otters will often use many holts at any one time. They may give birth in one, but raise their young in another. Important features of a successful breeding site are the availability of food, limited disturbance and safety from the risk of flooding. It is important to consider the whole site and not just the known holts as appropriate management will influence all of these factors.</p> <p>Some natal den structures have a limited lifespan (e.g. hollow tree trunks, piles of timber etc.) and if alternative opportunities for natal dens are limited, suitable replacements can be created or constructed. Maintaining dense bank vegetation, areas of reed etc. will ensure that there are suitable areas for resting couches.</p>	
Supporting habitat: structure/function	Availability of refugia	Restore an abundance of dense bankside vegetation to limit significant disturbance to animals	For rivers, most of the floodplain is outside the boundary of the site, yet the integrity of the interest feature will often be dependent upon the quality of the adjacent habitat out with the boundary of the site. This is likely to be the case where bankside vegetation may be an important barrier to disturbing activity but may lie adjacent to and outside the boundary. Nevertheless it will be important to maintain, or in some cases, to restore dense bankside cover.	
Supporting habitat: structure/function	Food availability	Restore fish biomass within expected natural levels for the supporting habitat (subject to natural fluctuations).	<p>In freshwater, key fish prey sources for otters include eels, salmonids, roach and sticklebacks. Frogs can also form an important part of the diet, depending on the habitat and time of year. Crayfish and water beetles may also form part of the diet, as well as an occasional waterbird (young coots, moorhens, ducks) or mammal (rabbits, water voles - although this is uncommon).</p> <p>The diet of coastal otters may include eelpout, rockling,</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>butterfish, lumpsuckers and an occasional crab. The diet of otters varies depending on the availability of prey, which in turn varies with the time of year. There should be a diverse range of food sources available throughout the year, within the normal expectations of each particular water course.</p> <p>It should be noted however, that otters may take prey from adjacent fisheries which are stocked to an artificially high level, especially where there are numerous stocked gravel pits on a floodplain. This can lead to artificially high prey densities adjacent to European sites, which might be expected to, in turn, result in artificially high densities of otter on the designated sites. This highlights the importance of biosecurity around stocked fisheries, and if implemented at all artificial still water fisheries on a floodplain might result in a legitimate reduction in otter density.</p>	
Supporting habitat: structure/function	Habitat quality - river habitat	Restore the quality of supporting river habitat features, based on the advice for H3260 habitat, based on natural river function, which provides a characteristic biotope mosaic that caters for otters.	<p>Dense bank vegetation, marshes and reedbeds are important for otters, but they will use a long stretch of river and this won't necessarily fall within a protected site. Dense bank vegetation and reedbeds are favoured as resting areas, but otters will often travel some distance to a preferred 'couch' and this will not necessarily be along the edge of the river.</p> <p>The structure and quality of bankside vegetation, reedbeds and other nearby habitats should be maintained, particularly where there is evidence of use by otters. However, it is thought that the most significant determinant of otter usage of a habitat is the abundance of prey (Kruuk <i>et al.</i>, 1998)</p>	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request
Supporting habitat: structure/function	Habitat quality - waterway habitat	<p>Restore the quality of supporting waterways habitat features.</p> <p>Otters occur in and near the River Itchen with suitable cover. Optimal habitat includes the river, streams and areas of marginal vegetation with secure lying-up places and breeding sites and good fish populations</p>	Smaller tributaries of larger river systems (streams, becks etc.) are extremely important for otters and have been shown to have been used more frequently by otters than larger rivers (Kruuk <i>et al.</i> , 1993). This is thought to be in part due to differences in fish density and preference for hunting in shallow water with areas of riffles and boulders.	NATURAL ENGLAND (2015). CSM Assessment Data available upon request

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/function	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, within typical values for the supporting habitat	Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.	
Supporting habitat: structure/function	Water flow	Restore the natural flow regime of the river to that close to what would be expected in the absence of abstractions and discharges (the 'naturalised' flow).	Permanent or long-lasting reductions in flow may affect the availability and diversity of prey. This could lead to otters moving into new areas, increasing the likelihood of conflict with other otters. This may also alter they prey targeted by otters as they may hunt for low-preference food such as birds, rabbits, fish carrion or for frogs, depending on the time of year.	
Supporting habitat: structure/function	Water quality/quantity	Restore water quality and quantity to a standard which provides the necessary conditions to support the feature Water quality data is found within the H3260 section of this document (Table 1)	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year during key stages of their life cycle. Poor water quality and inadequate quantities of water can adversely affect the availability and suitability of breeding, rearing and feeding habitats. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the SAC Conservation Objectives but in some cases more stringent standards may be needed to support the SAC feature. Further site-specific investigations may be required to establish appropriate standards for the SAC. The main impact of water chemistry on this feature is its effect on the food supply. For example, moderate levels of levels of eutrophication may increase certain fish populations, but excessive eutrophication can be detrimental. Excessive acidity in watercourses may also affect fish populations. Impacts from toxic pollutants can be devastating and were the major cause of otter population declines in the 50s, 60s and 70s.	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request) NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	<p>The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently.</p> <p>A site based assessment should be carried out as a priority. This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.</p>	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis.</p> <p>Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			measures to tackle diffuse air pollution, within realistic timescales.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Connectivity within and to the site	Ensure there are no significant artificial barriers to the safe passage and movement of otters into, within and away from the site	<p>Barriers such as roads, weirs etc. can generally increase the risk of harm to animals as they traverse or avoid them. If these barriers are considered a problem then mitigating measures could be taken.</p> <p>Otter populations within the SAC are dependent on the integrity of sections of river channel, riparian areas, freshwater still-waters, floodplains and transitional and marine waters that lie outside of the site boundary. Headwater areas and tributaries may not fall within the site boundary, yet otters may use these areas for feeding and these will be critical for sustaining populations within the site.</p> <p>Boundaries to river SACs often follow the first break of slope on the bank, with the result that much of the riparian habitat will lie outside the SAC, particularly if the river channel is operating under natural processes and moves laterally over time within the floodplain. It is possible that holts of otters that form part of the population for a SAC may lie on the adjacent floodplain out with the boundary of the SAC.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	ENGLISH NATURE (2004), River Itchen SSSI, Views About Management NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan
Supporting processes (on which the feature and/or its supporting habitat relies)	Water quality : Toxic chemicals	Avoid the presence of pollutants affecting the site, which are potentially toxic to otters.	The major cause of the decline in otter populations in the 60s and 70s was toxic chemicals such as dieldrin and related pesticides. Contaminants that might have an effect on otters may have an indirect effect (e.g. on food supply - organic pollution, eutrophication, acidification from mine waste and acid rain), a mainly direct effect (e.g. oil spillage, radioactivity) or	Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			effects of bioaccumulation (e.g. metals, especially mercury, cadmium and lead; pesticides and PCBs). PCBs, organo-chlorine pesticides and heavy metals all being seen as detrimental to otters, although the use of many of these is now banned.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Water quantity/quality	<p>Where the feature or its supporting habitat is dependent on surface water and/or groundwater, restore water quality and quantity to a standard which provides the necessary conditions to support the feature</p> <p>Water quality data is found within the H3260 section of this document (Table 1)</p>	<p>For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type.</p> <p>Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p>	<p>Environment Agency & NATURAL ENGLAND, Test and Itchen and Alresford Pond Diffuse Water Pollution Plan (2018). Data may be available from both organisations upon request</p> <p>NATURAL ENGLAND (2018) Definition of Favourable Condition - River Itchen SSSI (Available from Natural England on request)</p> <p>NATURAL ENGLAND (2014), River Itchen SAC Site Improvement Plan</p>
Version Control				
Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: Attributes relating to coastal habitats have been removed as this is a river based site.				

References

- ENGLISH NATURE (2004) River Itchen SSSI. Views About Management. Available from: <https://designatedsites.naturalengland.org.uk/PDFsForWeb/VAM/1005547.pdf>
- HARVEY, M.C., DAGUET, C., POLAND, J., THOMAS, J. (2005) Assessment of Favourable Condition for the Southern Damselfly *Coenagrion mercuriale* on the New Forest candidate Special Area of Conservation (cSAC), Hampshire, England. Hampshire & Isle of Wight Wildlife Trust, Curdridge.
- HOLDITCH, D. (2003) [Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers, Ecology Series No. 1.](#) An ENGLISH NATURE Report
- JNCC (2015) Common Standards Monitoring guidance for freshwater fauna. ISN 1743-8160 (online).
- MAITLAND, P.S. (2003) [Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5.](#) An ENGLISH NATURE Report.
- NATURAL ENGLAND (2015). River Itchen SSSI Channel Unit Condition Assessment ECRC Research Report Number 160. Available on request from Natural England
- NATURAL ENGLAND (2016). [A narrative for conserving freshwater and wetland habitats in England.](#)
- NATURAL ENGLAND (2018) River Itchen Brook Lamprey Survey and Condition Assessment (Available on request from Natural England)
- ROUQUETTE, J.R. (2005). Conservation requirements of the Southern Damselfly in chalkstream and fen habitats. Environment Agency Science Report SC000017/SR.
- RUMBLE, D. DAGUET, C. PINCHEN., B. ROUQUETTE., J. 2006. Assessment of Favourable Condition for the Southern Damselfly *Coenagrion mercuriale* on the River Itchen (SAC, SSSI) and River Test (SSSI) Hampshire, England. ENGLISH NATURE. British Dragonfly Society. Hampshire and Isle of Wight Wildlife Trust.
- RUSHBROOK, B., (2013) Hampshire & Isle of Wight Wildlife Trust's Southern Chalkstream Project. Information available from <https://www.hiwwt.org.uk/southern-chalkstreams>
- RUSHBROOK, B. (2018a). Southern Damselfly repeat survey programme report: Eastleigh Borough. Arcadian Ecology & Consulting Ltd, Curdridge.
- RUSHBROOK, B. (2018b). Strategic conservation plan for southern damselfly *Coenagrion mercuriale*: habitat enhancement and creation opportunities in and adjacent to Eastleigh Borough. Arcadian Ecology & Consulting Ltd, Curdridge.
- RUSHBROOK, B.J., SELBY, T. & EVANS, K. (2012). Investigating the potential ecological implications of the Upper Itchen flow augmentation schemes: a specific focus on the resident white-clawed crayfish (*Austropotamobius pallipes*) population. A report prepared for the Environment Agency and Southern Water Services Limited. Hampshire and Isle of Wight Wildlife Trust.
- TEST AND ITCHEN RIVER RESTORATION STRATEGY (2013). Available online at the River Restoration Centre. www.therrc.co.uk/publications/test-and-itchen-river-restoration-strategy
- THOMPSON DJ, PURSE BV & ROUQUETTE JR (2003). Monitoring the Southern Damselfly, *Coenagrion mercuriale*. Conserving Natura 2000 Rivers Monitoring Series No. 8, ENGLISH NATURE, Peterborough.