European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features

Lower Derwent Valley Special Area of Conservation (SAC)
Site code: UK0012844

Hay meadows, Lower Derwent Valley NNR© Natural England/Peter Roworth

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Lower Derwent Valley SAC. This advice should therefore be read together with the SAC Conservation Objectives available here.

The site also overlaps with the Lower Derwent Valley Special Protection Area (SPA) and is contiguous with the River Derwent SAC. You should also refer to the separate advice on the European Site Conservation Objectives provided for those sites (see links on page 3 of this advice).

This advice replaces a draft version dated 29 June 2016 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. Any proposals or operations which may affect the site or its qualifying features should be designed so they do not adversely affect any of the attributes listed in the objectives and supplementary advice.

This supplementary advice to the Conservation Objectives describes in more detail the range of ecological attributes on which the qualifying features will depend and which are most likely to contribute to a site's overall integrity. It sets out minimum targets for each qualifying feature to achieve in order to meet the site's objectives.

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.

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	Lower Derwent Valley Special Area of Conservation (SAC)
Location	North Yorkshire, East Riding of Yorkshire, City Of York
Site map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	14 June 2005
Qualifying Features	See section below
Designation Area	915.91 hectares
Designation Changes	Not Applicable
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)	Derwent Ings SSSI, Melbourne and Thornton Ings SSSI, Breighton Meadows SSSI, Newton Mask SSSI
Relationship with other European or International Site designations	The site also overlaps with the Lower Derwent Valley Special Protection Area (SPA) and is contiguous with the River Derwent SAC.

Site background and geography

Situated to the south of York, the Lower Derwent Valley is one of the largest areas of traditionally managed, agriculturally-unimproved flood plain meadows in England. The Valley running north-south along the course of the River Derwent for approximately 10 miles falls within both the Vale of York and Humberhead Levels National Character Areas.

The meadows are known locally as 'ings' (a word of Nordic origin referring to low lying wet meadow or pasture) and support a wealth of native wildflowers in the spring and early summer. They also support a rich breeding bird community together with important populations of dragonflies and other invertebrates and otter. During the winter months these same grasslands are partially flooded and support internationally important populations of waterfowl. In addition to the open grassland the Valley also supports several pockets of alder woodland of conservation importance.

Many of the meadows are divided into historic strip ownership and have been traditionally managed in the same way for centuries; they are cut for their hay in the summer once the majority of meadow plants have flowered and the subsequent re-growth of vegetation (the 'aftermath') is grazed by cattle or sheep. The open floodplain is recognised as an important landscape.

Just under half the site is managed as a National Nature Reserve by Natural England and partner organisations, the Carstairs Countryside Trust and Yorkshire Wildlife Trust.

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:

- **H6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)**

This Annex I habitat type comprises species-rich hay meadows on the moderately fertile soils of river and tributary floodplains. Most examples are cut annually for hay, with light aftermath grazing. Seasonal flooding maintains an input of nutrients.

In the UK, this habitat corresponds to the NVC type MG4 *Alopecurus pratensis – Sanguisorba officinalis* grassland. This community is characterised by species-rich swards containing frequent red fescue *Festuca rubra*, crested dog's-tail *Cynosurus cristatus*, meadow foxtail *Alopecurus pratensis*, great burnet *Sanguisorba officinalis*, meadowsweet *Filipendula ulmaria* and meadow buttercup *Ranunculus acris*.

The Lower Derwent Valley SAC in north-east England contains a greater area of high-quality examples of lowland hay meadows than any other UK site and encompasses the majority of this habitat type occurring in the Vale of York. The abundance of the rare narrow-leaved water-dropwort *Oenanthe silaifolia* is a notable feature. Traditional management has ensured that ecological variation is well-developed, particularly in the local transitions between this grassland type and other types of wet and dry grassland, swamp and fen vegetation.

The site supports a significant proportion of the national resource of the NVC type MG4 grassland community and many of the characteristic species associated with this grassland occur including; great burnet, meadow vetchling *Lathyrus pratensis*, pepper saxifrage *Silaum silaus* and autumn hawk-bit *Leontondon autumnalis*.

- **H91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) * Priority feature ('alder woodland on floodplains')**

Alluvial forests with alder *Alnus glutinosa* and ash *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) comprises woods dominated by alder and willow *Salix* spp. on flood plains in a range of situations from islands in river channels to low-lying wetlands alongside the channels. The habitat typically occurs on moderately base-rich, eutrophic soils subject to periodic inundation.

Typically, many such woods are dynamic, being part of a successional series of habitats. Their structure and function are best maintained within a larger unit that includes the open communities, mainly fen and swamp, of earlier successional stages. On the drier margins of these areas other tree species, notably ash *Fraxinus excelsior* and elm *Ulmus* spp., may become abundant. In other situations the alder woods occur as a stable component within transitions to surrounding dry-ground forest, sometimes including other Annex I woodland types. These transitions from wet to drier woodland and from open to more closed communities provide an important facet of ecological variation.

The only significant area of this vegetation community within this SAC is found at Thornton Ellers. Covering an estimated 6.59 ha of a c.9ha block of woodland, this wet woodland type comprises several component woodland NVC communities notably*;* W6a *Alnus glutinosa* alder - *Urtica dioica* nettle, W7 *Alnus glutinosa – Fraxinus excelsior* ash - *Lysimachia nemorum* yellow pimpernel woodland and small areas of W2a *Salix cinerea* grey willow - *Betula pubescens* downy birch – *Phragmites australis* common reed; alder-meadowsweet sub community.

The woodland is characterised by an almost continuous canopy of coppiced alder with occasional pedunculate oak *Quercus robur* and ash *Fraxinus excelsior* with an understorey of grey willow *Salix*

cinerea, hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* and occasional holly *Ilex aquifolium*. Nettle *Urtica dioica* dominates the ground flora of the woodland areas classified as W6 whilst wood sorrel *Oxalis acetosella* and greater stitchwort *Stellaria holostea* are more prevalent in the W7 areas. The W2a woodland is characterised by the abundance of common reed within the ground flora.

Qualifying Species:

- **S1355 Otter *Lutra lutra***

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.

Within the Lower Derwent Valley SAC, otters utilise the systems of dykes and ditches linking the ings to the River Derwent (also an SAC for otters). These combined with the abundance of flood plain habitat which includes wet woodland, fen, wet grassland, and ponds provide excellent supporting habitat for the otters. There are many suitable undisturbed areas for shelter and holts and a good fish population available in the River Derwent and its tributaries provide a food source.

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 Licence.

References

THE FLOODPLAIN MEADOWS PARTNERSHIP at http://www.floodplainmeadows.org.uk/
RODWELL, J.S. (ed.) 1991. *British Plant Communities. Volume 1. Woodlands and scrub*. Cambridge University Press.
RODWELL, J.S. (ed.) 1992. *British Plant Communities. Volume 3. Grasslands*. Cambridge University Press.

Table 1: Supplementary Advice for Qualifying Features: H6510. Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)

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	Maintain the total extent of the H6510 feature at 172.65 Ha	There should be no measurable net 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. 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. For this feature, there will be year to year fluctuations in climate resulting in variable flooding regimes. This may mean that there will need to be allowance made for reversible shifts in vegetation types between MG4 (the H6510 habitat) and wetter vegetation types such as inundation grasslands (e.g. MG13, MG7c) and MG8 and related vegetation depending on the flood cycle. These natural variations in the extent have been documented by Wallace and Prosser (2004[a]) The extent figure is largely based upon data presented in Prosser and Wallace (2004[b]), Additional historic surveys have also been reviewed and in a limited number of SSSI units a higher baseline has been adopted. A full list of historic sources referred to is listed opposite.	PRIEST, S. & STUTTARD, P. 1983. TRINDER, C. 1990. ADAS. 1994. BENYON, P. 1998. WALLACE H.L. AND PROSSER M. 2004[a]: PROSSER, M. V. AND WALLACE, H. L. 2004[b]:
Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the feature, including where applicable its component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) 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.	WALLACE H.L. AND PROSSER M. 2004[a]

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also 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 some of the typical and more specialist species associated with the Annex I habitat feature. Distribution of the (*Alopecurus pratensis, Sanguisorba officinalis*) community correspond the NVC MG4 vegetation communities and its associates. Maps indicating distribution of relevant NVC communities across the site can be found in Wallace H.L. and Prosser M. (2004[a]). Information on an Ings by ings basis is available within the component Natural England SSSI Favourable Conservation Tables (in preparation).	
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H6510 feature are referable to and characterised by the following National Vegetation Classification type (s); MG4 *Alopecurus pratensis - Sanguisorba officinalis* grassland	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). In addition to the MG4 *Alopecurus pratensis - Sanguisorba officinalis* grassland community, reference should also be made to the MG7c *Lolium perenne-Alopecurus pratensis –Festuca pratensis* community. The expression of this community within the Lower Derwent Valley is particularly species rich and often grades imperceptibly into more typical MG4 type grassland. It has recently be suggested that this community be classified as a distinct vegetation type called *Alopecurus pratensis – Poa trivialis-Cardamine pratensis* (MG15) under the NVC (Wallace et al 2016 in prep & Rothero et al 2016)	WALLACE, H.L. 2016 ROTHERO, E, LAKE, S. & GOWING, D. 2016

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	Key structural, influential and distinctive species	Restore the abundance of the species listed below to enable each of them to be a viable component of the H6510 habitat; *Alopecurus pratensis* (meadow foxtail), *Filipendula ulmaria* (meadowsweet), *Leontodon autumnalis* (autumn hawkbit), *Oenanthe silaifolia* narrow-leaved water dropwort), *Sanguisorba officinalis* (great burnet), *Silaum silaus* (pepper saxifrage), *Succisa pratensis* (Devil's-bit scabious), *Thalictrum flavum* (common meadow-rue) *Centaurea nigra* (black knapweed), , *Galium verum* (lady's bedstraw), *Lathyrus pratensis* (meadow vetchling), *Leucanthemum vulgare* (oxeye daisy), *Lotus corniculatus* (common bird's-foot-trefoil) , *Primula veris* (cowslip), *Rhinanthus minor* (yellow rattle), *Serratula tinctoria* s(aw-wort), *Stachys officinalis* (betony), *Tragopogon pratensis* (goat's beard). Assemblage of birds including breeding waders (snipe, lapwing, redshank and curlew) and nationally important numbers of whimbrel on spring passage.	Some plant or animal species (or related groups of such species) make a particularly important contribution to the structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; – Structural species which form a key part of the habitat's structure or help to define an Annex I habitat on a site (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 site. 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 this site becomes available. Not all species listed will occur at all locations. It is generally accepted for this community to be considered favourable if at least two species should be frequent plus three species occasional throughout the sward or locally abundant in more than 10% of the sward (Robertson, H.J. & Jefferson R.G. 2000). It is accepted that in some areas the MG4 present within the Lower Derwent Valley is a northern expression of the community and slightly less species rich.	ROBERTSON H.J. & JEFFERSON, R.J. 2000
Structure and function (including its	Vegetation: undesirable species	Maintain the frequency/cover of the following undesirable species to within acceptable levels (no	Undesirable non-woody and woody vascular plant species may require active management to avert an unwanted succession to a different and less desirable state.	NATURAL ENGLAND, 2017.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		more than occasional throughout the sward or singly or together more than 5% cover) and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread; *Anthriscus sylvestris* (cow parsley), *Cirsium arvense* (creeping thistle), *Cirsium vulgare* (spear thistle), *Rumex crispus* (curled dock), *Rumex obtusifolius* (broad-leaved dock), *Senecio jacobaea* (common ragwort), *Urtica dioica* (common nettle). *Juncus spp* (rushes), *Deschampsia cespitosa* (tufted hair-grass), large *Carex* spp. (sedges) large grasses i.e. *Glyceria maxima* (reed sweet-grass, *Phalaris arundinacea* (reed canary-grass), *Phragmites australis* (common reed). Tree and scrub species should be no more than occasional throughout the sward or more than 1% cover. Giant hogweed (*Heracleum mantegazzianum)* and Himalayan balsam (*Impatiens glandulifera*) should be absent from hay meadows communities.	Such species may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural or acceptable components or even dominants. This feature is sensitive to prolonged waterlogging and some species listed here are indicative of this. Non-native species also constitute a major threat to many river systems. Impacts may be on the river and adjacent habitats. The UK Technical Advisory Group (UKTAG) of the Water Framework Directive produces a regularly updated classification of aquatic alien species (plants and animals) according to their level of impact. Further information on non-native species associated with the adjacent River Derwent SAC can be found within the supplementary advice relating to the River Derwent SAC (Natural England 2017) http://publications.naturalengland.org.uk/publication/4824082210095104 Within the Lower Derwent Valley SAC giant hogweed (*Heracleum mantegazzianum)* can be found on the edge of meadows adjacent to the River Derwent. Himalayan balsam (*Impatiens glandulifera*) is abundant within the River Derwent catchment and can be found in ditches and watercourses flowing into the River.	
Structure and function	Vegetation community	Maintain the pattern of naturally-occurring vegetation zonations	Transitions/zonations between adjacent but different vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such	WALLACE & PROSSER 2004a

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(including its typical species)	transitions	and transitions within the H6510 feature	'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in the adjacent communities. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. As stated above the component MG4 vegetation community grades imperceptibly into adjacent related vegetation communities, the exact location of these transitions can vary from year to year as result of prevailing conditions, particularly relating to flooding and soil moisture content	
Structure and function (including its typical species)	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, to within typical values for the H6150 habitat. For this feature soil P index should typically be between index 0 and 1 (<15 mg/l)	Soil is the foundation of basic ecosystem function and 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 this Annex I feature. The *Alopecurus pratensis - Sanguisorba officinalis* community is particularly associated with the “Fladbury” soil series. It has been suggested that the location of this soil series could be used to target restoration projects for the community. A detailed analysis on the soils associated with much of the site was undertaken in 2002 (Palmer & Holman 2003).	PALMER, R.C. & HOLMAN, I P 2003
Structure and function (including its typical species)	Water quality	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the H6510 feature	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. Reference should be made to water quality targets provided in the River Derwent SAC Conservation Objectives; supplementary advice and referenced in River Derwent Diffuse Water Pollution (Natural England & Environment Agency 2014).	NATURAL ENGLAND & THE ENVIRONMENT AGENCY 2014.
Structure and function (including its	Hydrology: Water table	Maintain a hydrological regime which provides a consistently near-surface water table which	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature.	WALLACE, H. & PROSSER, M. 2014c.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		typically averages depths of 35 cm (winter), 45cm (spring), 70cm (summer) and 60cm (autumn) below ground level	Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. For this feature sub-surface water table levels during the year should be at levels consistent with published guidance. Investigations into hydrological conditions and vegetation at this site have been undertaken by the Floodplain Meadows Partnership (Wallace and Prosser 2004a & 2014c). For this feature, the timing, frequency, extent and duration of surface flooding should be commensurate with maintenance of the feature at this site. A non-optimal flooding regime can result in a shift from H6510 habitat to other vegetation types (such as inundation grassland, swamps). Too little flooding may compromise the necessary conservation/agricultural management due to reduced nutrient inputs which will reduce hay yields making hay management less viable and sustainable. Flooding is difficult to control within the site as it is largely a gravity fed system with few water control structures. The site is therefore largely at the vagaries of climatic and river conditions. Consequently factors in the wider River Derwent Catchment may have a significant influence on conditions within the SAC. At Wheldrake Ings water control structures do exist and a water management protocol has been established. However this can be compromised in extreme flood conditions when structures can be drowned out.	WALLACE & PROSSER 2004a.
Structure and function (including its typical species)	Hydrology: Flooding regime	Maintain a hydrological regime which provides a cumulative duration of annual surface flooding (typically less than 10 days between December-February and less than 3 days between September-November, with no inundations during March – August), subject to natural changes.		
Structure and function (including its typical species)	Hydrology	At a site and catchment level maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. For this feature surface flooding regime and sub-surface irrigation via gravel aquifers can be affected by land use change, water abstraction, flood	CHALK, L. (2004)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			alleviation, development and mineral extraction in the catchment. One possible influence on water levels on the site is the operation of the Barmby Barrage where the River Derwent meets the River Ouse. Potential impacts of the Barmby Barrage were assessed by the Environment Agency in 2004 (Chalk 2004).	
Structure and function (including its typical species)	Adaptation and resilience	Maintain the H6150 feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing need of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature, for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being *high*, taking into account the sensitivity, fragmentation, topography and management of its habitats/supporting habitats. This means that action to address specific issues is highly 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 required.	NATURAL ENGLAND, 2015.
Supporting processes (on which the feature relies)	Air quality	Restore 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).	This habitat type is considered sensitive to changes in air quality, especially nitrogen, acidity and ammonia. 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. 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	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

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. 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.	Information System (www.apis.ac.uk .
Supporting processes (on which the feature relies)	Conservation measures	Maintain the management measures within and/or outside the site boundary) which are necessary to maintain the structure, functions and supporting processes associated with the H6510 feature	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 (VAM) for the underpinning SSSI and/or management agreements. Conservation measures for this feature will typically include grazing, hay cutting, scrub management, weed control, recreation/visitor management. Also covered is maintenance of surface drainage features such as grips, gutters and foot drains. Retention of suitable land use infrastructure/patterns to enable site management e.g. pastoral livestock farming. It should be noted that the Site Improvement Plan for the site identified a number of current pressures on the site, notably hydrological changes and under-grazing. Additional information relating to the management of the site can be found within; The Sustainable Management of the Lower Derwent Valley, Yorkshire. Lower Derwent Valley Management Plan 2005-2010 (Chalk, L. Leighton, E. & Bentley) and the Lower Derwent Valley National Nature Reserve Management Plan.	NATURAL ENGLAND, 2014. ENGLISH NATURE, 2005. CHALK, L. LEIGHTON, E. & BENTLEY, M 2005. NATURAL ENGLAND. Lower Derwent Valley NNR Management Plan (in prep.)
Version Control Advice last updated: **18 March 2019** following stakeholder feedback Additional explanatory text in **Spatial distribution of feature within site** attribute to clarify location of evidence. Further information provided on **Vegetation: undesirable species** attribute include key species and further sources of information; clarification in supporting notes of **Hydrology – flooding regime** attribute that factors in the wider catchment may impact on the feature within the SAC				
Variations from national feature-framework of integrity-guidance: The attribute relating to supporting off site habitat and functional connectivity with the wider				

Attributes	Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
landscape has been removed as it is considered not relevant. The community being restricted to the designated site only. Similarly that relating to the Functional connectivity with the wider landscape has also be removed			

Table 2: Supplementary Advice for Qualifying Features: H91E0. Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae); Alder woodland on floodplains *

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	Maintain the total extent of the H91E0 feature at 6.59 hectares.	See the notes for this attribute in Table 1 above. For this feature tree roots (particularly of veteran trees) can extend a considerable distance beyond the boundary of the site - they can be impacted by soil compaction and chemical applications which get into the soil. Any loss of woodland area - whether at the edge or in the middle of a site will reduce the core woodland area where woodland conditions are found - these support significant assemblages of species dependent on woodland conditions (e.g. lichens and bryophytes - being one example). Loss of any woodland area which fragments a site into different parts will clearly disturb the movement of species between the remaining parts of the woodland. Vegetation surveys since designation show that relevant woodland communities actually cover a slightly lower area than that previously taken as the baseline at the time of designation which was estimated in the absence of NVC surveys.	PROSSER, M.V. & WALLACE, H.L. 2003 PROSSER, M. V. AND WALLACE, H. L. 2004[b] REILLY, J.2008
Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the H91E0 feature, including where applicable its component vegetation types, across the site	See the notes for this attribute in Table 1 above. This feature is restricted to one location within the site, this being at Thornton Ellers (SE729456). Although other small pockets of alder woodland do occur within the site these were deemed not to contribute towards the SAC feature. This decision was made in accordance with advice from English Nature Woodland specialist at the time of designation.	
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification type(s); W6a *Alnus glutinosa* (alder) - *Urtica dioica* (nettle) W7 *Alnus glutinosa* **(**alder) – Fraxinus excelsior (ash) -	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations).	PROSSER, M.V. & WALLACE, H.L. 2003 REILLY, J. 2008

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Lysimachia nemorum (yellow pimpernel) and W2a *Salix cinerea* (grey willow) - *Betula pubescens* (downy birch) – *Phragmites australis* (common reed); alder-meadowsweet sub community.		
Structure and function (including its typical species)	Vegetation structure - canopy cover	Maintain an appropriate tree canopy cover across the H91E0 feature, which will typically be between 30-90% of the site	Canopy cover is the overall proportion of vegetative cover consisting of any woody layer ranging from established regeneration to mature and veteran stages. Woodland canopy density and structure is important because it affects ecosystem function and in particular microclimate, litterfall, soil moisture, nutrient turnover and shading; this in turn influences the composition of plants and animals in lower vegetation layers and soil. Open canopies with just scattered trees will have less of a woodland character and reduced diversity of woodland-dependent species (although they may be still be important as a form of woodland-pasture). Completely closed canopies across the whole woodland are not ideal either however, as they cast heavier shade and support fewer species associated with edges, glades and open grown trees, and have little space where tree regeneration could occur. In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well. Canopy cover will vary according to coppice cycle being undertaken.	
Structure and function (including its typical species)	Vegetation structure - open space	Maintain areas of permanent/temporary open space within the woodland feature, typically to cover approximately 10%of area	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. Having some open, sunlit and largely tree-less areas as part of the woodland community is often important to facilitate natural tree and shrub regeneration and also to provide supporting habitat for specialist woodland invertebrates, birds, vascular and lower plants. Such open space can be permanent or temporary and may consist of managed grazed areas, linear rides and glades, or naturally-produced gaps caused by disturbance events such as windthrow/fire/tree falling over/snow damage.	
	Vegetation structure - old growth	Maintain the extent and continuity of undisturbed, mature/old growth stands	Good woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		(typically comprising at least 10% of the H91E0 feature at any one time) and the assemblages of veteran and ancient trees (typically c.5 trees per hectare).	For this habitat type, old or over-mature elements of the woodland are particularly characteristic and important features, and their continuity should be a priority. The abundance of veteran and ancient trees is likely to be less than the 10% specified under targets given that the area of woodland has a long history of coppice management resulting in a lack of this age class. Figures given in targets are in line with JNCC Common Standards for monitoring.	
	Vegetation structure - dead wood	Maintain the continuity and abundance of standing or fallen dead and decaying wood, (typically between 30 - 50 m^3 per hectare of standing or fallen timber or 3 fallen trees >30cm per hectare, and 4 standing dead trees per hectare)	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. Dead and actively decaying wood, either as part of a standing tree or as a fallen tree on the woodland floor, is an important component of woodland ecosystems, and supports a range of specialist invertebrates, fungi, lichens and bryophytes, and associated hole-nesting birds and roosting bats, all of which may be very typical of the feature.	
Structure and function (including its typical species)	Vegetation structure - age class distribution	Maintain at least 3 age classes (pole stage/ medium/ mature) spread across the average life expectancy of the commonest trees.	A distribution of size and age classes of the major site-native tree and shrub species that indicate the woodland will continue in perpetuity, and will provide a variety of the woodland habitats and niches expected for this type of woodland at the site in question.	
Structure and function (including its typical species)	Vegetation structure - shrub layer	Maintain an understorey of shrubs covering 10 - 60% of the stand area (this will vary with light levels and site objectives)	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning.	
	Vegetation structure - woodland edge	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other woodland/wood-pasture types or scrub.	Woodland edge is defined as being the transitional zone between the forest feature and adjacent but different habitat types - the best woodland edges will have a varied structure in terms of height and cover. Many typical forest species make regular use of the edge habitats for feeding due to higher herb layer productivity and larger invertebrate populations. Grasslands / arable fields managed with high doses of agro-chemicals could potentially not allow this gradation of woodland edge and could have other impacts on the integrity of the site (pollution/ nutrient enrichment etc.).	
	Adaptation and resilience	Maintain the resilience of the feature by ensuring a diversity (at least 3 species) of site-native trees (e.g. alder, willow *Salix* spp,	See notes for this attribute in Table 1 above.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		ash, elm *Ulmus* spp, black poplar) across the site.		
	Browsing and grazing by herbivores	Maintain browsing at a (low) level that maintains a well-developed understorey with no obvious browse line and lush ground vegetation with some grazing sensitive species evident (bramble, ivy etc.), and tree seedlings and sapling common in gaps.	Herbivores, especially deer, are an integral part of woodland ecosystems. They are important in influencing woodland regeneration, composition and structure and therefore in shaping woodland wildlife communities. In general, both light grazing and browsing is desirable to promote both a diverse woodland structure and continuous seedling establishment. Short periods with no grazing at all can allow fresh natural regeneration of trees, but a long-term absence of herbivores can result in excessively dense thickets of young trees which shade out ground flora and lower plant species. However, heavy grazing by deer or sheep prevents woodland regeneration, and can cause excessive trampling and/or poaching damage, canopy fragmentation, heavy browsing, bark stripping and a heavily grazed sward.	
Structure and function (including its typical species)	Regeneration potential	Maintain the potential for sufficient natural regeneration of desirable trees and shrubs; typically tree seedlings of desirable species (measured by seedlings and <1.3m saplings - above grazing and browsing height) should be visible in sufficient numbers in gaps, at the wood edge and/or as regrowth from coppice stumps as appropriate ;	The regeneration potential of the woodland feature must be maintained if the wood is to be sustained and survive, both in terms of quantity of regeneration and in terms of appropriate species. This will Include regeneration of the trees and shrubs from saplings or suckers, regrowth from coppice stools or pollards, and where appropriate planting. Browsing and grazing levels must permit regeneration at least in intervals of 5 years every 20. The density of regeneration considered sufficient is less in parkland sites than in high forest. Regeneration from pollarding of veteran trees should be included where this is happening.	
	Tree and shrub species composition	Maintain a canopy and under-storey of which 95% is composed of site-native trees and shrubs e.g. *Alnus glutinosa* (alder) *Fraxinus excelsior* (ash) and to a lesser extent *Quercus robur* (Oak)	Native trees and shrubs in general support a greater diversity of associated species than non-native species, especially amongst groups of invertebrates which depend directly on trees for food and shelter. There are many plants and animals which use or co-exist with non-native trees, but many rare and threatened woodland species are specialists adapted to one or a few native trees or shrub species (birches, willows and oaks, are examples of trees that host many specialist insect species).	
	Key structural, influential and distinctive species	Restore the abundance of the species listed below to enable each of them to be a viable component of the H91E0 habitat;	See notes for this attribute in Table 1 above.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Higher plants: alder *Alnus glutinosa,* ash *Fraxinus excelsior,* downy birch *Betula pubescens,* willows *Salix* spp., sedges *Carex* spp*.,* hawthorn *Crataegus monogyna*, blackthorn Prunus spinosa, holly *Ilex aquifolium*. Nettle *Urtica dioica,* wood sorrel *Oxalis acetosella*, greater stitchwort *Stellaria holostea* and localised common reed *Phragmites australis*.		
Structure and function (including its typical species)	Invasive, non-native and/or introduced species	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the H91E0 feature	Invasive or introduced non-native species are a serious potential threat to the biodiversity of native and ancient woods, because they are able to exclude, damage or suppress the growth of native tree, shrub and ground species (and their associated typical species), reduce structural diversity and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides). Such species can include Rhododendrons, snowberry, Japanese knotweed, giant hogweed and Himalayan balsam, for example. Similarly, this would include pheasants, rabbits and non-native invertebrate 'pest' species. Himalayan Balsam is a particular potential threat to the site.	
	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, to within typical values for the H91E0 habitat.	Soil is the foundation of basic ecosystem function and 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 this Annex I feature.	
Supporting processes (on which the feature relies)	Water quality/quantity	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard	For many SAC features which are dependent on surface and/or ground water, such as the H91E0 habitat, 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	NATURAL ENGLAND & THE ENVIRONMENT

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		which provides the necessary conditions to support the H91E0 feature.	this habitat type. One critical aspect is that water levels should be consistently at or very close to surface level (subject to natural variation), 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. Reference should be made to water quality targets provided in the River Derwent SAC conservation Objectives; supplementary advice and referenced in the River Derwent Diffuse Water Pollution (Natural England & Environment Agency 2014).	AGENCY 2014.
	Hydrology	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the H91E0 feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Alluvial forests can be dynamic in nature, being part of successional habitats and transitions to drier woodlands. Hydrological processes (including periodic inundation) are critical to how they function and must not be negatively impacted. It should be noted that extent of flooding is difficult to control within the site as it is largely a gravity fed system with few water control structures. The site is therefore largely at the vagaries of climatic and river conditions. Consequently factors in the wider River Derwent Catchment may have a significant influence on conditions within the SAC.	
Supporting processes (on which the feature relies)	Functional connectivity with wider landscape	Maintain the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis.	
	Conservation measures	Maintain the management measures within and/or outside the site boundary) which are necessary to maintain the structure, functions and supporting processes associated with the H91E0 feature	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 (VAM) for the underpinning SSSI and/or management agreements.	NATURAL ENGLAND, 2014. ENGLISH NATURE, 2005. CHALK, L. LEIGHTON, E. & BENTLEY, M 2005. NATURAL ENGLAND. Lower Derwent Valley NNR Management Plan (in prep.)
Supporting processes (on which the feature relies)	Illumination	Ensure artificial light is maintained at a level which is unlikely to affect natural phenological cycles and processes to the detriment of the H91E0 feature and its typical species at this site.	Woodland biodiversity has naturally evolved with natural patterns of light and darkness, so disturbance or modification of those patterns can influence numerous aspects of plant and animal behaviour. For example, light pollution (from direct glare, chronically increased illumination and/or temporary, unexpected fluctuations in lighting) can affect animal navigation, competitive interactions, predator-prey relations, and animal physiology. Flowering and development of trees and plants can also be modified by un-natural illumination which can disrupt natural seasonal responses.	
Version Control Advice last updated: **18 March 2019** following stakeholder feedback. Additional explanatory notes for **Hydrology** attribute outlining influences of wider Derwent catchment on the SAC.				
Variations from national feature-framework of integrity-guidance: n/a				

Table 3: Supplementary Advice for Qualifying Features: S1355. *Lutra lutra*; Otter

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)	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 otter 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.	CHALK, L. LEIGHTON, E. & BENTLEY, M. 2005.
Supporting habitat: extent and distribution	Extent of supporting habitat	Maintain the total extent of the habitat(s) which support otter at approximately: 586.18ha wet grassland 274.77ha fens marsh and swamp 27.47ha standing open water 18ha deciduous woodland 9ha dry neutral grassland.	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. Habitat figures are based on information on the SAC Natura 2000 standard data form which gives percentage cover for relevant habitats). http://jncc.defra.gov.uk/protectedsites/sacselection/n2kforms/UK0012844.pdf These were based on best available evidence at time of completion and provide an indication of relative extent of various habitats. A more accurate review of habitat extent by NVC community (excluding open water) is now provided by Prosser, M.V. and Wallace H.L. (2004)	PROSSER, M. V. AND WALLACE, H. L. 2004[b]
	Distribution of supporting habitat	Maintain the distribution and continuity of the feature's supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	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. 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	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.	
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Maintain 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	See supporting notes for this attribute in Table 1 above.	
	Water quantity/quality	Where the feature or its supporting habitat is dependent on surface water, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	See supporting notes for this attribute in Table 2 above.	
	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)	The supporting habitat of this feature is considered sensitive to changes in air quality, especially acidity. 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. No critical loads are available for this feature on APIS	
Supporting habitat: structure/ function	Habitat quality - river habitat	Maintain the quality of supporting river habitat features based on natural river function, which provides a characteristic river-habitat mosaic that caters for otters.	A combination of dense bank vegetation, marshes and reedbeds are important for otters. 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. 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 et al 1998). Supplementary advice has been produced for the River Derwent SAC which should be cross referenced with this document	KRUUK, H. (1998) NATURAL ENGLAND, 2017.
Supporting habitat: structure/ function	Habitat quality - waterway habitat	Maintain the quality of supporting waterways habitat features used by the otter population	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. 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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	Food availability	Maintain fish biomass within expected natural levels for the supporting habitat (subject to natural fluctuations).	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). T 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. It should be noted 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.	
	Abundance of breeding and resting places	Maintain an abundance of natural breeding and resting sites for otter within the site	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 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. 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.	
Supporting habitat: structure/ function	Availability of refugia	Maintain 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 outwith 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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/ function	Water flow - rivers	Maintain 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 which may affect their fitness and condition. It should be noted that flows with adjacent River Derwent are significantly affected by factors in the wider catchment. These in turn may have a significant influence on conditions for otter within the SAC.	NATURAL ENGLAND, 2016.
	Water quality/quantity	Maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	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. 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. Reference should be made to water quality targets provided in the River Derwent SAC conservation objectives; supplementary advice and referenced within the River Derwent Diffuse Water Pollution (Natural England & Environment Agency 2014).	NATURAL ENGLAND & THE ENVIRONMENT AGENCY 2014. NATURAL ENGLAND, 2016.
Supporting processes (on which the feature and/or its supporting habitat relies)	Water quality : Toxic chemicals	Avoid any increase in the level 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 effects of bioaccumulation (e.g. metals, especially mercury, cadmium and lead; pesticides and PCBs). PCBs, organochlorine pesticides and heavy metals all being seen as detrimental to otters, although the use of many of these is now banned.	

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)	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	Otter populations within the SAC are likely to be dependent upon the integrity of other sections of river channel, riparian areas, freshwater still-waters and floodplains that lie outside of the site boundary, 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 outwith the boundary of the SAC. Barriers to movement between such habitats, 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.	
Population (of the feature)	Population abundance	Maintain 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.	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. 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 otter 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.	EA Review of Consents otter records (Appendix 26) CRAWFORD, A., 2012.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. The National Otter Surveys undertaken by EA do not provide a population estimate but check for presence at designated 600m sections. The first survey in 1977/78 showed no sign of otter presence in sections associated with the site but positive signs have increased to 85% of sections in the last survey (2009/10). It is estimated that the carrying capacity will be reached when 80% positive signs have been recorded on two consecutive surveys.	
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.	CRAWFORD, A., 2012.
Version Control. Advice last updated: **18 March 2019** following stakeholder feedback. Additional explanatory notes for **Water Flow – rivers** attribute outlining influences of wider Derwent catchment on the SAC.				
Variations from national feature-framework of integrity-guidance: Removal of attributes and references relating to coastal otters given Lower Derwent Valley SAC is entirely inland coastal attributes consequently not relevant.				

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