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

Dungeness Special Area of Conservation (SAC)
Site Code: UK0013059

©Jo Dear April 2018

Date of Publication: 11 February 2019

About this document

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

Where this site overlaps with other European Sites, you should also refer to the separate European Site Conservation Objectives and Supplementary Advice (where available) provided for those sites.

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'

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.

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	Dungeness Special Area of Conservation (SAC)
Location	Kent
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	See section below
Designation Area	3223.56 ha
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)	Dungeness Romney Marsh and Rye Bay SSSI
Relationship with other European or International Site designations	The boundary of this SAC overlaps/coincides with Dungeness Romney Marsh and Rye Bay SPA and Ramsar

Site background and geography

The Romney Marshes is an open landscape of reclaimed, low-lying marshland. The area is bounded to the south and east by the English Channel and to the north and west by the clearly recognisable ancient cliff-line, which now forms the backdrop to the marshes. The Dungeness SAC sits with the Romney Marshes National Character Area. This NCA is an area that contains international importance for its geomorphology, plants, invertebrates and birds. Home to some of the UK's rarest species it is designated as a National Nature Reserve, Special Area of Conservation, Special Protection Area, Ramsar and Site of Special Scientific Interest.

.

Dungeness is the UK's largest shingle structure. It includes the vast sand and shingle beaches of the Dungeness foreland with the flat marshland between Hythe in Kent and Pett in Sussex. This unique and sometimes forbidding area has a character all of its own and contains a wealth of wildlife and geomorphological features. Dungeness Foreland during the last 5000 years has demonstrated remarkable geomorphological resilience in accommodating changes in relative sea-level, storm magnitude and frequency, variations in sediment supply as well as significant changes in back-barrier sedimentation. (Long A.J. *et al.* 2004)

The foreland consists of over 500 shingle ridges building out into the English Channel. Each shingle ridge is a former shoreline, and the foreland we see today has built up over approximately 3,000 years, the shape modified over this time by coastal erosion to the west, and the deposition of this eroded shingle to the east. This can be seen from the air. The ridges to the south west of Dungeness at Rye Harbour are the remains of one of the earlier beaches that formed the site. Stretching south-west from Jury"s Gap towards Hastings they have mostly been eroded away, and the shingle has recycled to form younger ridges that built the structure seen today within Rye Bay. (May, V.J. 2003)

Whereas most shingle beaches form narrow “spits”, here the flints have accumulated, halted by the old mouth of the River Rother at Greatstone to form a prominent land-form known as a cuspate (tooth-shaped) spit. Such features are globally very rare and Dungeness is regarded as one of the best examples in the world. Given that some of the others are in the New World, it is particularly valuable because features that can be seen relate to historical accounts of storms or maps from medieval times onwards.

Flint shingle beaches are a globally rare habitat, and most sites in the UK are small, being less than 50 ha in area. With an area of 1650 ha Dungeness is easily the largest example of this habitat in the UK, three or four times larger than Orfordness or Chesil Beach, the next largest structures in the UK. The shingle vegetation at Dungeness is unusually variable, more so than any other shingle beach in the UK and probably also Europe due to:

- The very large size of the site.
- The unusual distance the shingle occurs exposed inland allowing a fuller range of vegetation communities to develop away from the saline conditions by the coast.
- Transitions from pure shingle into different communities including sand dunes, freshwater pits and fen, saltmarsh and saline lagoon, grazing marsh and neutral grassland.
- The erosion of the south-coast into areas of ancient stable shingle, to provide an unusual coastal variant.
- Variations in substrate size. Wave action has sorted the gravel into separate bands of fine and coarse flints. The latter are naturally unvegetated, largely because the coarser gravel is too hostile an environment for higher plants to colonise. In some places, these bands of coarse gravel can be very broad.

The Soil Survey of England and Wales (Green, 1968) has shown that shingle ridges often extend many hundreds of metres beyond the area of exposed shingle, the Beach Bank soil series representing the distal parts of successive beach ridges. Parts of the Lydd soil series also lie above shingle, while the Lydd series itself and parts of the Greatstone series are dominated by sand and loamy sand, which may be derived from sandy beaches associated with the shingle beaches in much the same way as sandy beaches are found today on the eastern shoreline of Dungeness. Recent archaeological and geomorphological studies have built on the work of the Soil Survey.

The site retains very large areas of intact parallel ridges with characteristic zonation of vegetation. It has the most diverse and most extensive examples of stable vegetated shingle in Europe, including the best representation of scrub on shingle, notably prostrate forms of broom *Cytisus scoparius* and blackthorn *Prunus spinosa*. The study of Dungeness by Ferry, Lodge and Waters in 1990 demonstrates it is clear that the succession of vegetation communities across the site are particularly important, but also that some of the vegetation communities are unique to the site or have a very restricted distribution elsewhere. The shingle communities at Dungeness are not always covered by the National Vegetation Classification (NVC) and have been subject to a separate classification by Ferry *et al..,* 1990.
A feature of the site, thought to be unique in the UK, is the small depressions formed within the shingle structure, which support fen and open-water communities.

The Dungeness foreland has a very extensive and well-developed shoreline, with sparse vegetation. The strandline community on this site comprises Babington’s orache *Atriplex glabriuscula,* which occurs mostly on the accreting eastern shoreline, although it is also present on the eroding southern shoreline often occurring landward of the storm ridge particularly as a result of overwashing that can cause ‘fan’ formations landward of the shingle storm ridge.

This extensive site also hosts a large and viable great crested newt *Triturus cristatus* population in a range of natural and anthropogenic habitats. These include natural pools and those resulting from gravel extraction and other activities. Terrestrial habitat of importance for feeding and shelter is provided by a range of open shingle vegetation with scrub in the vicinity of some of the waterbodies.

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:

- **H1210 Annual vegetation of drift lines**

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

In the UK this Annex I type is not always easy to classify using the NVC because it is highly variable between sites and from year to year at the same site. It can include NVC types SD2 *Honkenya peploides – Cakile maritima* strandline community and SD3 *Matricaria maritima – Galium aparine* strandline community on stony substrates. MC6 *Atriplex prostrata – Beta vulgaris* ssp. *maritima* sea-bird cliff community and other vegetation with abundant orache *Atriplex* spp. may also occur on shingle shores. Drift-lines on essentially sandy beaches are assessed as sand dune communities (see 2110 Embryonic shifting dunes), and are not included in this Annex I type. However, where drift line vegetation develops on other coarse clastic sediments, such as shell-banks (cheniers), it can be considered as part of Annual vegetation of drift lines.

The mobility of shingle foreshores is an overriding consideration, and colonising species are able to tolerate periodic disturbance, which may involve the total removal of the surface and subsequent recolonisation with vegetation. Species are also tolerant of saltwater inundation, as the beaches are often over-topped by the tide or subject to spray from waves breaking over the beach. Level or gently-sloping, high-level mobile beaches, with limited human disturbance, support the best examples of this vegetation.

The Dungeness foreland has a very extensive and well-developed shoreline, although with sparse vegetation and in places some human disturbance. It is one of two representatives of Annual vegetation of drift lines on the south coast of England. The strandline community on this site comprises Babington's orache Atriplex glabriuscula, which occurs mostly on the accreting eastern shoreline, although it is also present on the eroding southern shoreline.

- **H1220 Perennial vegetation of stony banks**

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

Sneddon & Randall (1993) provide a comprehensive classification system for shingle vegetation types, some of which have equivalents in the NVC. The NVC only describes part of the pioneer phase of perennial shingle vegetation, namely SD1 *Rumex crispus – Glaucium flavum* shingle community. Narrow, less-stable structures (spits and bars or the fringing beach associated with older, fossil beaches) are more exposed to waves or salt spray. Where wave energy causes movement of the shingle, the plant communities have affinities with **1210 Annual vegetation of drift lines**. The presence of the yellow horned-poppy *Glaucium flavum* and the rare sea-kale *Crambe maritima* and sea pea *Lathyrus*

japonicus, all species that can tolerate periodic movement, is significant. In more stable areas above this zone, where sea spray is blown over the shingle, plant communities with a high frequency of salt-tolerant species such as thrift *Armeria maritima* and sea campion *Silene uniflora* occur. These may exist in a matrix with abundant lichens.

On the largest and most stable structures the sequence of vegetation includes scrub, notably broom *Cytisus scoparius* and blackthorn *Prunus spinosa*. This sequence of plant communities is also influenced by natural cycles of degeneration and regeneration of the shrub vegetation that occurs on some of the oldest ridges

Dungeness is the UK's largest shingle structure and represents the habitat type on the south-east coast of England. The total area of exposed shingle covers some 1,600 ha, though the extent of the buried shingle ridges is much greater. Despite considerable disturbance and destruction of the surface shingle, the site retains very large areas of intact parallel ridges with characteristic zonation of vegetation. It still has the most diverse and most extensive examples of stable vegetated shingle in Europe, including the best representation of scrub on shingle, notably prostrate forms of broom *Cytisus scoparius* and blackthorn *Prunus spinosa*. A feature of the site, thought to be unique in the UK, is the small depressions formed within the shingle structure, which support fen and open-water communities.

Qualifying species

- **S1166 Great crested newt *Triturus cristatus***

The great crested newt is the largest native British newt, reaching up to around 17cms in length. Newts require aquatic habitats for breeding. The particular combination and distribution of aquatic and terrestrial habitats in Dungeness SAC provide exceptional breeding, foraging and hibernation conditions for great crested newts. The site contains three metapopulations of great crested newts of which two are in the Dungeness area and one is at Romney Warren.

At Dungeness the eggs are laid singly on pond vegetation from as early as January onwards if weather conditions are mild. This is worth noting as standard guidance suggests egg laying in late March into April which is often too late for surveying to confirm breeding on Dungeness. Larvae develop over summer to emerge in August – October, normally taking 2–4 years to reach maturity. Juveniles spend most time on land, and all terrestrial phases may range a considerable distance from breeding sites.

Dungeness in south-east England has the largest shingle expanse in Europe and contains a large number of waterbodies within its 2,000 ha. This extensive site hosts a large and viable great crested newt Triturus cristatus population in a range of natural and anthropogenic habitats. These include natural pools and those resulting from gravel extraction and other activities. Terrestrial habitat of importance for feeding and shelter is provided by a range of open shingle vegetation with scrub in the vicinity of some of the waterbodies.

At designation, the water-bodies across this SAC, consistently yielded high counts of great crested newts. Three meta-populations were identified at the RSPB reserve, the MoD Lydd Ranges training grounds and at Lydd Airport. The water bodies used by great crested newts range from the natural shingle wetlands found out on the exposed shingle ridges to the small to medium sized ponds found across the site, some created by historical aggregate extraction. The breeding ponds are unshaded but can be prone to scrub encroachment without appropriate management. The adjacent habitat associated with the wetlands at Dungeness reflect the transition from the open shingle ridges to wetland and fen like habitats. Also the wetlands associated with the previous aggregate extraction activities provide ideal terrestrial habitat in the surrounding area

The great crested newt is also fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended), making it a 'European Protected Species'. A Licence may therefore be required for any activities likely to harm or disturb great crested newts.

Table 1: Supplementary Advice for Qualifying Features: H1210 Annual vegetation of drift-lines

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution	**Extent of the feature within the site**	Restore the total extent of the feature The extent of the feature is better measured as a length along the shingle shoreline rather than an area extent as the H1210 habitat is variable in its extent and area on a seasonal basis. The total length of coastline within the Dungeness SAC is approx. 19.5km Pett Level to Rye Harbour mouth approx. 3.5km Jury's Gap to the Dungeness Power Station approx. 8km Dungeness Power Station to Greatstone sand dunes approx. 6km Greatstone sanddunes to Littlestone Water Tower approx. 2km	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. 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. This habitat is visible in the form of plants during the growing season (June to September, but variable depending on local conditions) but will exist in the form of a seedbank within the beach sediments and in coastal waters for the rest of the year. It may form overlapping transitions with some elements of Perennial Vegetation of Stony Banks.	Annual vegetation surveys - conducted on behalf of the Environment Agency in connection to their coastal management operations within the SAC Jacobs 2016,2017 2018 EKEP 2018 Romney Sands BMP EA (2007 to 2018 and ongoing) Denge Beach Management Plan (BMP) Annual vegetation surveys - conducted on behalf of the EDF Energy in connection to their coastal management operations within the SAC WSP (2017 to 2018 and ongoing) Dungeness Borrow Pit Annual Management Reports (AMR) on behalf of EDF Energy Joint Nature Conservation Committee. 2007 Article 17 reporting on Annual Vegetation of Drift Lines
Extent and distribution	**Future extent of habitat within the site and ability to respond to**	Restore the ability of this habitat to re-establish itself in response to coastal processes and re-colonise after natural events	This recognises the need to allow for natural fluctuations in the extent and the distribution of this habitat feature, often during particular seasons and usually as a result of natural coastal processes. The habitat must be able to re-establish on newly-deposited beach formations of suitable sediment.	Annual vegetation surveys - conducted on behalf of the Environment Agency in connection to their coastal management operations within

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	seasonal changes		Copies of Beach Management Plans (BMP) held by the Environment Agency will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities	the SAC Jacobs 2016,2017 2018 EKEP 2018 Romney Sands BMP EA (2007 to 2018 and ongoing) Denge Beach Management Plan (BMP) Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory Annual Management Reports produced in support of EDF Energy operations within the Dungeness Borrow Pit provides analysis of beach monitoring data WSP 2017, 2018
Extent and distribution	**Spatial distribution of the feature within the site**	Restore the distribution and continuity of suitable beach conditions such that this habitat has the greatest opportunity to colonise annually	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. The conditions for annual establishment of this feature need to be secured for the whole beach frontage of a site to enable it to reach favourable condition. The distribution may change if the beach is responding to coastal processes. Copies of Beach Management Plans held by EA will provide	Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory Annual Management Reports produced in support of EDF Energy operations within the

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities (See above)	Dungeness Borrow Pit provides analysis of beach monitoring data
Structure and function (including its typical species)	**Key structural, influential and distinctive species**	Maintain the abundance of the species listed to enable each of them to be a viable component of the H1210 Annex I habitat feature The annual drift line vegetation community is typically composed of just one species *Atriplex glabriuscula*	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; • 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'). The annual drift line vegetation community is typically composed of just one species *Atriplex glabriuscula* • 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. The annual drift line vegetation community on Dungeness SAC is typically composed of just one species *Atriplex glabriuscula* 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. For this habitat feature, the vegetation will re-colonise each	Annual vegetation surveys - conducted on behalf of the Environment Agency and EDF Energy in connection to coastal management operations within the SAC

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			year so stable stands are unlikely, and these are limited in species due to the requirement for plants to be adapted to this environment.	
Structure and function (including its typical species)	**Niches for seedling establishment**	Maintain] the availability of niches which provide the potential for seedling establishment	Disturbance of wave-deposited sediment reduces potential niches for seed germination, changes the arrangement of wave-sorted sediment and can lead to burial of seeds to a greater depth which suppresses germination. Information from a LIFE project on Orfordness is assessing the impact of footfall on shingle habitats and aiming to minimise this across the site Copies of Beach Management Plans held by EA will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities	Detailed vegetation survey reports supporting EA Flood management schemes. Detailed foreshore vegetation and anthropogenic damage survey reports available from landowners WSP 2017, 2018
Structure and function (including its typical species)	**Nutrient availability**	Maintain] the input of nutrients from tidally-derived organic matter and ensure these are able to break down in situ	Tidal litter is an essential element to provide both nutrients and shelter for the germination of seeds. The combination of inorganic and organic substrate is an important pre-curser to development of the habitat and its successful establishment of its component vegetation on an annual basis. Both elements will be regulated by coastal processes.	Annual vegetation surveys that include record of tidal litter are conducted on behalf of the Environment Agency and EDF Energy in connection to coastal management operations within the SAC
Structure and function (including its typical species)	**Sediment size range and type**	Maintain the availability and size range of those sediments typical of the feature at the site	Sediment size influences the establishment of vegetation and types of vegetation, and natural sorting of material by wave action maintains the optimum conditions. Some sites will have different sediment size ranges and material, but should generally be in the range of 2-200mm and the material must reflect the local geology and natural sources of sediment to the beach. The Environment Agency and Natural England agreed a Dungeness Gradient Curve to inform shingle recharge operations. Copies available from Natural England and Environment Agency Previous EA Coastal Flood Management Schemes at Littlestone and Lydd Ranges are a source of information on	See Extent attribute for references

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			sediment recharge and suitable gradient curves including guidance on the % of fines. Too high a fine % can have a detrimental influence on the functioning of the sediment and the type of plant species colonising the recharged shingle Copies of Beach Management Plans held by EA and EDF Energy will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities	
Structure and function (including its typical species)	**Vegetation community composition**	Maintain the component vegetation communities of the feature to the following characteristic type(s); • Annual vegetation of drift lines See Annex 1 for further information on the shingle vegetation classification used at Dungeness SAC.	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. 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).	Ferry, Lodge and Waters (1990) The Dungeness Shingle Survey. Unpublished report to Nature Conservancy Council (NCC) This sets out a site specific vegetation classification system for Dungeness
Structure and function (including its typical species)	**Vegetation structure: zonation and transitions**	Maintain or restore the natural patterns of zonation across the drift line and between this and vegetation of more stable shingle landward that reflect the coastal processes and substrate type typical of the site.	This habitat is only generally found in a narrow fringing strip at and above MHW, but individual sites will show different patterns depending on the morphology of the site, and it can occur with perennial vegetation such as Crambe maritima. Where there is a fringing beach with not stable shingle to landward, other transitions may be present and these need to be identified. The Dungeness shingle beach is the largest flint shingle beach in Britain, composed primarily of material that was eroded during the last glaciation and then washed eastwards along the south coast. The Dungeness cuspate foreland displays an eroding southern coastline with overwash and shingle fans and saline lagoons whereas the east facing coastline is accreting displaying newly formed ridges and ephemeral features such	Annual vegetation surveys - conducted on behalf of the Environment Agency and EDF Energy in connection to coastal management operations and Beach management Plans within the SAC

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			as flying spits that are formed by winter storms.	
Structure and function (including its typical species)	**Vegetation: undesirable species**	Maintain the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they 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/acceptable components or even dominants. There is limited data on invasive undesirable species of this habitat type. The planting of species such as Tamarisk in an attempt to stabilise foreshores is detrimental to this habitat type.	
Supporting processes (on which the feature relies)	**Aeolian (wind-blow) processes**	Maintain the operation of natural sedimentary processes within the site	Within a site, providing the continuity of the natural beach system will promote a favourable status by maximising opportunities for the establishment of the habitat. These processes will also allow the movement of seed around the site.	
Supporting processes (on which the feature relies)	**Beach morphology and structure**	Maintain a natural profile, elevation and slope of the beach and foreshore within the site Maintaining coastal processes underpins the function of the Annex I habitat annual vegetation of drift lines	This is important as the shape and form of the beach provides optimum conditions for the establishment and completion of the annual cycle of flowering, fruiting and seed dispersal of the feature's typical component species The action of longshore drift, storms and open coastline responding to these are key to spreading seed, creating suitable growing conditions through sorting and placement of the shingle on the foreshore.	Eddison, J. (1983a and b) Ellis, N.V. (ed.) *et al.* (1996) May, K.J. & Hansom, J.D. (2003) Long, A., Plater, A. & Waller, M (2006)
Supporting processes (on which the feature relies)	**Conservation measures**	Maintain 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	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. Direct habitat management of this feature would typically take the form of preventing disturbance	NATURAL ENGLAND, 2014. Site Improvement Plan: Dungeness SIP 068 Natural England's Views about the Management Dungeness, Romney Marsh and Rye Bay SSSI which underpin this SAC

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			and the removal of non-organic tidal litter. The principle management measure on this site are • Prevent intentional and unintentional human damage through visitor management Controlling vehicle access to a minimum and for essential operations only • Controlling fishing fleet activities to agreed designated areas • Controlling leisure activities • Removal of non-organic litter	
Supporting processes (on which the feature relies)	**Functionality and sediment supply including connectivity with the wider coastal sediment system**	Maintain adequate sediment supplies to and across the site from source (the beach, offshore deposits, eroding cliffs etc)	This recognises the potential need at this site to ensure the continuous supply of sediment (from features such as soft eroding cliffs, dunes, offshore sand banks) to conserve this qualifying Annex I habitat feature. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. Sediment will be transported to the beach ridges by wave action and storms. Longshore drift will move sediment through a system and activities outside a site can have an impact on site integrity if inputs are reduced.	Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory
Supporting processes (on which the feature relies)	**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 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 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.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Table 2: Supplementary Advice for Qualifying Features: H1220 Perennial vegetation of stony banks

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 feature at approximately 2200ha across five distinct beaches.	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. 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, this habitat may form overlapping transitions with H1210 Annual Vegetation of drift lines at the seaward extent. Increases in extent at the seaward edge due to accretion of sediment may occur, the spatial extent objective must allow for natural changes: increase at the seaward edge does not mean that losses can occur elsewhere.	Ferry, Lodge & Waters (1990) The Dungeness Shingle Survey. Unpublished report for Nature Conservancy Council (NCC). This sets out a site specific vegetation classification system for Dungeness Joint Nature Conservation Committee. 2007. Article 17 reporting on Perennial Vegetation of Stony Banks Fuller, R.M. 1989.
Extent and distribution of the feature	Future extent of habitat within the site and ability to respond to seasonal changes	Maintain] the ability to respond to natural seasonal or longer term changes in extent of habitat	This recognises the need to allow for natural fluctuations in the extent and the distribution of this habitat feature, often during particular seasons and usually as a result of natural coastal processes. This habitat depends on supplies of shingle at the seaward edge and the maintenance of older deposits at the landward edge. Systems can be dynamic with new ridges, bars or spits forming or re-forming, so features may migrate beyond designated boundaries, but still form the Annex I feature	See references in Extent attribute in table 1. Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Observatory Annual Management Reports produced in support of EDF Energy operations within the Dungeness Borrow Pit provides analysis of beach monitoring data
Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain the distribution and continuity of the habitat and its natural transitions within the site that enable the full succession from older to younger ridges to be represented	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. 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.	See references in Extent attribute in table 1. Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory Annual Management Reports produced in support of EDF Energy operations within the Dungeness Borrow Pit provides analysis of beach monitoring data
Structure and function (including its typical species)	Functionality and sediment supply including connectivity with the wider coastal sediment system	Maintain adequate sediment supplies to and across the site from source (the beach, offshore deposits, eroding cliffs etc)	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 outside of the designated site boundary which are either important for the continuous supply of sediment (such as soft eroding cliffs, dunes, offshore sand banks) or 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	Key References that detail site specific coastal geomorphology of the Dungeness coastline and its wider context Eddison, J. (1983a and b) Ellis, N.V. (ed.) *et al.* (1996) May, K.J. & Hansom, J.D. (2003) Long, A., Plater, A. & Waller, M (2006)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. Sediment will be transported to the beach ridges by wave action and storms. Longshore drift will move sediment through a system and activities outside a site can have an impact on site integrity if inputs are reduced. The Dungeness shingle beach is the largest flint shingle beach in Britain, composed primarily of material that was eroded during the last glaciation and then washed eastwards along the south coast. The Dungeness cuspate foreland displays an eroding southern coastline with overwash and shingle fans and saline lagoons whereas the east facing coastline is accreting displaying newly formed ridges and ephemeral features such as flying spits that are formed by winter storms.	Copies of Beach Management Plans held by EA provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory Annual Management Reports produced in support of EDF Energy operations within the Dungeness Borrow Pit provides analysis of beach monitoring data See references in Extent attribute in table 1.
Structure and function (including its typical species)	Key structural, influential and distinctive species	Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature Constant and preferential species of the vegetation communities types present. Annex 1 sets out the Shingle vegetation classification system used at Dungeness SAC and the	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; • 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	Ferry, Lodge and Waters (1990) The Dungeness Shingle Survey. Unpublished report to Nature Conservancy Council (NCC) This sets out a site specific vegetation classification system for Dungeness Sneddon, P. & Randall, R.E. 1993 and 1994

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		main community types present. Populations of notable species maintained including Uncommon moss *Antitrichia curtipendula* in unit 28 Lesser water plantain *Baldellia ranunculoides* (margins of Long Pits and Castle Water). Dodder *Cuscuta epithymum* in A1 and A2 communities Autumn ladies-tresses *Spiranthes spiralis* on Dungeness and Rye Harbour Shepherd's cress *Teesdalia nudicaulis* on Dungeness and Rye Harbour	(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. 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.	Other vegetation survey references Ferry, B. & Lodge, N. 1991 Dungeness Bird Observatory. 1985 Dungeness Bird Observatory. 2003 Shardlow, M. & Gilliland, P. 1998 Leyshon, O. 2001 Harmes, Spiers and Sussex Botanical Recording Society. 2003 Smith & Thomas.1983
Structure and function (including its typical species)	Nutrient availability	Maintain the low nutrient status of the sediment and soils that support the specialised vegetation communities	The combination of inorganic and organic substrate is an important precurser to the development of this habitat and its successful establishment of its component vegetation. Both elements will be regulated by coastal processes.	Annual vegetation surveys that include record of tidal litter are conducted on behalf of the Environment Agency and EDF Energy in connection with coastal management operations within the SAC
Structure and function (including its typical species)	Sediment size range and type	Maintain the availability and size range of those sediments typical of the feature at the site	Sediment size influences the establishment of vegetation and types of vegetation. The amount of fine material determines vegetation composition: this should be allowed to develop naturally and not have any additions of soil or other fine material or organic matter The Environment Agency and Natural England agreed a Dungeness Gradient Curve to inform shingle recharge operations. Copies available from Natural England and	Copies of Beach Management Plans held by EA will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Environment Agency Previous EA Coastal Flood Management Schemes at Littlestone and Lydd Ranges are a source of information on sediment recharge and suitable gradient curves including guidance on the percentage of fines. Too high a fine percentage can have a detrimental influence on the functioning of the sediment and the type of plant species colonising the recharged shingle Copies of Beach Management Plans held by EA and EDF Energy will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities. Further information available from Natural England	
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 vegetation types. • Permanent vegetation on stony banks See Annex 1 for further information on the shingle vegetation classification used at Dungeness SAC.	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. 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). Losses of mature shingle vegetation to coastal processes should not be a reason to stabilise these locations.	Ferry, Lodge and Waters (1990) The Dungeness Shingle Survey. Unpublished report to Nature Conservancy Council (NCC) This sets out a site specific vegetation classification system for Dungeness Sneddon, P. & Randall, R.E. 1993 and 1994
Structure and function (including its typical species)	Vegetation structure: patterns of vegetation with naturally bare ground	Maintain temporal and spatial zonation of vegetation that reflects pattern of beach ridges across the site, from the active beach ridge, to recently accreted ridges and through to the different-aged more stable ridges and the ongoing natural	Patterns of vegetation that are related to the underlying geomorphology and sediment size are important aspects of this habitat. Some sites have this more clearly defined than others, with Dungeness probably having the most well-described sequence of vegetation development that can be clearly seen on older to younger deposits	Ferry, Lodge and Waters (1990) The Dungeness Shingle Survey. Unpublished report to Nature Conservancy Council (NCC) This sets out a site specific vegetation classification system for Dungeness

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		succession of these communities over time.		Sneddon, P. & Randall, R.E. 1993 and 1994
Structure and function (including its typical species)	Vegetation structure: zonation and transitions	Maintain the range of vegetation communities and transitions characteristic of this feature with other habitats present on the site (such as saltmarsh, wetland, lagoons)	The coastal shingle ecosystem has a characteristic range of natural features, representing different stages of natural succession. The full representation of these stages should be maintained or where appropriate restored. Transitional habitats between shingle and other habitats can have distinctive characteristics due to the more freely draining underlying shingle. These can support some of the rarer species associated with this habitat type.	
Structure and function (including its typical species)	Vegetation: undesirable species	Maintain the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread	This will include undesirable weed species indicative of changes in the physical and chemical properties of the substrate, nutrient enrichment, and introduction or expansion of non-natives and garden escapees (including *Lupinus arboreus, Centranthus ruber, Tamarix gallica*) Undesirable species include: *Centranthus ruber,* Red Valerian*; Hippophae rhamnoides* Sea Buckthorn*; Ceratium tomentosum* Snow in Summer*; Polygonum baldschuanicum* Russian Vine*; Buddleia davidii* Buddleia*; Yucca sp; Tamarix gallica* Tamarix	
Supporting processes (on which the feature relies)	Air quality	Maintain 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. 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 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.	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)
			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.	
Supporting processes (on which the feature relies)	Conservation measures	Maintain 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	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. Many of the areas that support the H1210 Annex 1 habitats may require little or no management intervention as they are maintained naturally by active coastal processes, such as the evolution of the cuspate foreland, an underpinning SSSI feature. However, there are situations where active management may be required, including those cases where natural processes have been interrupted or modified by human activities. Direct habitat management of this feature would typically take the form of preventing disturbance, removal of non-organic tidal litter and selective removal of invasive species. The principle management measure on this site are • Prevent intentional and unintentional pedestrian damage through visitor management techniques • Prevent and manage intentional and unintentional fire damage • Controlling vehicle access to a minimum and for	NATURAL ENGLAND, 2014. Site Improvement Plan: Dungeness SIP 068 Natural England's Views about the Management Dungeness, Romney Marsh and Rye Bay SSSI which underpin this SAC Copies of Beach Management Plans held by EA will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/damaged through beach management activities and public access Findon, RA, 1985. Banks, B 2018 Folkestone and Hythe District Council 2018 Dungeness Sustainable Access and Recreational Management Strategy (SARMS)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			essential operations only • Controlling fishing fleet activities to agreed designated areas • Controlling leisure activities • Removal of non-organic litter	
Supporting processes (on which the feature relies)	Hydrology	At a site, unit and/or catchment level (as necessary, 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. Natural freshwater wetlands in shingle are probably limited to Dungeness. Artificial creation of wetland by excavation on shingle sites will result in unfavourable condition. Water level management across the SAC is carried out by EA and the Romney Marsh Area IDB, A drinking water aquifer on Denge Beach is managed by Affinity Water.	Ferry, B. & Waters, Stephen J.P. 1980.
Supporting processes (on which the feature relies)	Sedimentary processes	Maintain the natural sedimentary processes that sustain the form of the shingle structure, including the natural supply of sediment from outside the site Maintaining coastal processes underpins the function of the H1220 Annex I habitat.	Small differences or changes in elevation and topography (eg just centimetres in elevation) may affect many marsh functions, from flooding and nutrient cycling to draining of the marsh interior. This micro-topography is critical for the development and maintenance of this habitat feature and its typical species, as are the wider sedimentary processes that influence this topography. The action of longshore drift, storms and open coastline responding to these are key to spreading seed, creating suitable growing conditions through sorting and placement of the shingle on the foreshore.	Key References that detail site specific coastal geomorphology of the Dungeness coastline and its wider context Eddison, J. (1983a and b) Ellis, N.V. (ed.) *et al.* (1996) May, K.J. & Hansom, J.D. (2003) Long, A., Plater, A. & Waller, M (2006)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Copies of Beach Management Plans held by EA will provide information on beach profiles year on year and indicate the changes in the foreshore as a result of storm action and where areas have been disturbed/ damaged through beach management activities Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory Annual Management Reports produced in support of EDF Energy operations within the Dungeness Borrow Pit provides analysis of beach monitoring data
Supporting processes (on which the feature relies)	Shingle morphology	Maintain the natural surface morphology and elevation of the shingle structure	Alteration to the surface morphology and elevation will disturb and mix the sediments and alter the ratio of coarse to fine material. This can bring the water table closer to the surface and affect the species composition. The typical species of the habitat feature may be replaced by others with higher nutrient and water demands and which are less characteristic of the feature.	Key References that detail site specific coastal geomorphology of the Dungeness coastline and its wider context Eddison, J. (1983a and b) Ellis, N.V. (ed.) *et al.* (1996) May, K.J. & Hansom, J.D. (2003) Long, A., Plater, A. & Waller, M (2006) Copies of Beach Management Plans held by EA will provide information on beach profiles year on year and indicate the

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				changes in the foreshore as a result of storm action and where areas have been disturbed/ damaged through beach management activities Channel Coastal Observatory - Southeast Regional Coastal Monitoring Programme holds reports, data and conducts coastal monitoring across the SE coastal region Channel Coastal Observatory Annual Management Reports produced in support of EDF Energy operations within the Dungeness Borrow Pit provides analysis of beach monitoring data
Supporting processes (on which the feature relies)	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 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 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.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Table 3: Supplementary Advice for Qualifying Features: *S1166 Great crested newt Triturus cristatus*

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 is above whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. Mean peak count of 116 animals over three years in Dungeness SAC This threshold is 20% of the mean newt count recorded on monitoring visits between 1999 and 2005 (583 newts). Banks, B. 2009.	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. The population estimate given is the mean peak count of 116 animals over three years in Dungeness SAC and is 20% of the mean newt count recorded on monitoring visits between 1999 and 2005 (583 newts). Banks, B. 2009. The newts breed in a large number of ponds stretching across the shingle from the RSPB reserve to Lydd Airport, and in a smaller number of more isolated ponds at Lydd Ranges and Romney Warren. They also use ditch habitats, providing they are free of fish which are significant predators of the larvae. Within the Dungeness SAC the numbers are taken from two metapopulations, one at Lydd Ranges MoD training ranges and the second at Dungeness RSPB reserve and Lydd Airport. Population estimates for other parts of the SAC, the larger Ramsar site and wider SSSI are available but will be subject to further analysis and refinement. Given the likely fluctuations in numbers over time, any impact-	Banks, B. 1995 – 2006 Banks, B. 2010.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. 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. Estimating the average size of the GCN population will normally be based on the peak count of adults undertaken in the known peak season for the area, and in-year weather conditions; likely to be Mid-April to Mid-May in central areas. NB Dungeness is known for an early season (mid Jan onwards) particularly in mild winter weather. The peak count is derived by summing the counts across the site on 'best' night for each season. Considerable natural between-year variation in population counts is frequent.	
Population (of the feature)	**Population viability**	Maintain the presence of great crested newt eggs in breeding ponds at/to a level which is likely to restore the abundance of the population at or above its target level.	A "breeding pond" is defined as a pond in which egg-laying and successful metamorphosis (e.g the pond doesn't dry up too soon) is likely to occur at least once every three years. The optimum time to survey for eggs on Dungeness depends on weather conditions. Often in mild winters eggs have been found as early as January and through to mid-May in colder years. Presence of eggs can be recorded by day or night visits and	Banks, B. 1995 – 2006 Banks, B. 2010.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			surveys should be combined with visits for the adult component.	
Population (of the feature)	**Supporting metapopulation**	Maintain the connectivity of the SAC population to any associated metapopulations (either within or outside of the site boundary)	Great crested newts often exist in metapopulations. A metapopulation is a group of associated populations made up of newts which breed in, and live around, a cluster of ponds. There will be some interchange of newts between these populations, even though most adults consistently return to the same pond to breed, and so it will be important to avoid the isolation of these populations from each other. A metapopulation associated with a SAC may occur outside of the designated site boundary. The connectivity of the wider local landscape to the SAC may therefore be important as this may help to ensure the survival of the overall population even if sub-populations are temporarily affected by, for example, pond desiccation or fish introductions. The particular combination and distribution of aquatic and terrestrial habitats in Dungeness SAC provides breeding, foraging and hibernation conditions for great crested newts. The SAC contains two metapopulations of great crested newts within the Dungeness area at the MoD Lydd Training Ranges and at RSPB Dungeness and Lydd Airport. Another metapopulation outside the SAC is at Romney Warren which falls within the wider Ramsar site designation. The wider SSSI also contains a wide ranging variety of suitable aquatic and terrestrial supporting habitats for GCN.	
Supporting habitat: extent and distribution	**Distribution of supporting habitat**	Maintain 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	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,	Banks, B. 2010

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. The particular combination and distribution of aquatic and terrestrial habitats in Dungeness SAC provides breeding, foraging and hibernation conditions for great crested newts. The SAC contains two metapopulations of great crested newts within the Dungeness area at the MoD Lydd Training Ranges and at RSPB Dungeness and Lydd Airport. Another metapopulation outside the SAC is at Romney Warren. In addition to the internationally important metapopulations of great crested newts at Dungeness and Romney Warren, there are also scattered populations within the SAC site and across the wider Walland Marsh and at Rye Harbour.	
Supporting habitat: extent and distribution	**Extent of supporting habitat**	Restore the total extent of the aquatic and terrestrial habitats which support the great crested newt Core habitats include freshwater ponds for breeding, and vegetated shingle, grasslands, scrub, woodland and associated deadwood and shingle/ rubble/brick structure habitat for hibernacula and connections.	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. The fresh water ponds used by the two metapopulations in the Dungeness SAC sit within extensive areas of vegetated shingle, grassland, scrub and woodland and associated lying deadwood and occasional shingle/rubble/brick structure habitat for hibernacula and connections. These areas incorporate sufficient suitable terrestrial habitat for foraging and hibernation by the great crested newts from each pond cluster.	Banks, B. 2010
Supporting habitat: structure/fun	**Cover of macrophytes**	Maintain a high cover of macrophytes, typically between 50-80%, within ponds	Marginal and emergent vegetation are important components of a great crested newt pond as they provide excellent egg-laying sites. Good plants for this purpose include water forget-	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
ction			me-not *Myosotis scorpioides*, flote/sweet grass *Glyceria fluitans* and great hairy willowherb *Epilobium hirsutum.* They are, however, an integral part of the natural successional change of a waterbody and whilst it is preferable to have a good range and area of marginal plants, they should not extend across the entire water surface. In most circumstances it will be desirable to retain a fringe of marginal and emergent vegetation around at least half of a pond's edge. Where the marginal vegetation is particularly invasive, and provides no specific benefit to crested newts, it may be decided that its complete removal is necessary.	
Supporting habitat: structure/function	**Overall Habitat Suitability Index score**	For this SAC, restore an overall Great Crested Newt Habitat Suitability Index score of no less than 0.8.	The Habitat Suitability Index provides a measure of evaluating habitat quality and quantity for Great Crested Newts. The Index score lies between 0 and 1, with 1 representing optimal GCN habitat. In general, the higher the index score the more likely the site is to support great crested newts. The HSI methodology is documented in ARG-UK Advice Note 5 (May 2010). The HSI should not be used as a substitute for more detailed surveys and consideration of other attributes where necessary.	UK AMPHIBIAN AND REPTILE GROUPS (ARG-UK) Advice Note 5 on the Great Crested Newt Habitat Suitability Index (May 2010).
Supporting habitat: structure/function	**Permanence of ponds**	Maintain the h of water within ponds present within the site - levels should be high enough in late winter through to mid-summer to maintain breeding habitat but can drop considerably or dry out altogether to eliminate potential predatory fish populations from establishing	Ponds to include breeding ponds as well as non-breeding ponds, since the latter may be used for foraging or sustaining prey populations. Ponds should have a high degree of permanence (they never or rarely dry out other than though natural drought) and this may be adversely affected by changes in the supply or flow of water (from either surface water and/or groundwater sources] to the ponds.	
Supporting habitat: structure/function	**Presence of fish and wildfowl**	Ensure fish are absent in all ponds.	At high densities waterfowl (i.e. most water birds such as ducks, geese and swans but excluding moorhen) can remove all aquatic vegetation, adversely affect water quality and create turbid pondwater conditions. Some may also actively hunt adult GCNs and their larvae. Similarly fish can be significant predators of GCN larvae. The presence of waterfowl and fish can reduce habitat suitability. These should be wholly absent form sites which support fewer	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			than 5 ponds.	
Supporting habitat: structure/function	**Presence of ponds**	Maintain the number or surface area of ponds present within the site No net loss of ponds. At least some ponds persisting through summer drought period	Ponds to include breeding ponds as well as non-breeding ponds, since the latter may be used for foraging or sustaining prey populations. The surface area of a pond is taken from when water reaches its highest level (excluding flooding events), which will usually be in the spring. At least some ponds persisting through summer drought period	
Supporting habitat: structure/function	**Shading of ponds**	Ensure pond perimeters are generally free of shade (typically no more than 60% cover of the shoreline)	Shading from trees and/or buildings (not including emergent pond vegetation) can negatively affect the abundance of marginal vegetation in ponds, water temperature and the rate of hatching and development of great crested newt eggs and larvae.	
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	**Supporting terrestrial habitat**	Maintain the quality of terrestrial habitat likely to be utilised by Great Crested Newts, with no fragmentation of habitat by significant barriers to newt dispersal.	Great crested newts need both aquatic and terrestrial habitat. Good quality terrestrial habitat, particularly within 500m of the breeding ponds, provides important sheltering, dispersing and foraging conditions and can include all semi-natural habitat along with meadows, rough tussocky grassland, scrub, woodland, as well as 'brownfield' land or low-intensity farmland. Good quality terrestrial habitat for great crested newts has structural diversity which can be provided by features such as hedges, ditches, stone walls, old farm buildings, loose stone/rocks, rabbit burrows and small mammal holes. Good habitat provides a range of invertebrates, such as earthworms, insects, spiders and slugs, on which newts are known to feed. Fragmentation refers to significant barriers to great crested newt movement such as walls and buildings, but not footpaths	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			or tracks. Newts disperse over land to forage for food, and move between ponds. The distances moved during dispersal vary widely according to habitat quality and availability. At most sites, the majority of adults probably stay within around 250m of the breeding pond but may well travel further if there are areas of high quality foraging and refuge habitat extending beyond this range. The particular combination and distribution of aquatic and terrestrial habitats in Dungeness SAC provides breeding, foraging and hibernation conditions for great crested newts. The SAC contains two metapopulations of great crested newts within the Dungeness area at the MoD Lydd Training Ranges and at RSPB Dungeness and Lydd Airport. Another metapopulation outside the SAC is at Romney Warren. In addition to the internationally important metapopulations of great crested newts at Dungeness and Romney Warren, there are also scattered populations within the SAC site and across the wider Walland Marsh and at Rye Harbour.	
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	This recognises the increasing likelihood of supporting 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. 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/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,	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)
			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. 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.	
Supporting processes (on which the feature and/or its supporting habitat relies)	**Air quality**	Maintain concentrations and deposition of air pollutants at or below the site-relevant Critical Load or Level values given for the feature's supporting habitat on the Air Pollution Information System (www.apis.ac.uk).	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 the habitat's 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. 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. 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	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)	**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.	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.	NATURAL ENGLAND, 2014. Site Improvement Plan: Dungeness SIP 068 Natural England's Views about the Management Dungeness, Romney Marsh and Rye Bay SSSI which underpin this SAC
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, 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. 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. Water level management across the SAC is carried out by EA and the Romney Marsh Area IDB, A drinking water aquifer on Denge Beach is managed by Affinity Water and the abstraction licence has been through HRA process. This aquifer is rainwater fed.	Ferry, B. & Waters, Stephen J.P. 1989.
Supporting processes (on which the feature or its supporting	**Water quality**	Maintain the quality of pondwaters within the site as indicated by the presence of an abundant and diverse invertebrate community.	As the clarity and chemical status of water bodies supporting GCNs can be subjective, the presence of an abundant and diverse community of freshwater invertebrates can be indicative of suitable water quality standards. Invertebrate groups present should include groups such as mayfly larvae and water	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
habitat relies)			shrimps. This will ensure ponds support a healthy (mainly invertebrate) fauna to provide food for developing GCN larvae and adults.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Annex 1 Summary of Shingle Vegetation Classification at Dungeness

Three systems can be used to classify shingle vegetation communities;

- The Corine Biotopes Project Habitat Classification, a European vegetation classification used for selecting Habitats Directive sites.
- The National Vegetation Classification (NVC), and
- The Dungeness Shingle Survey prepared for the Nature Conservancy Council (NCC) by Ferry, Lodge and Waters (1990).

All three systems have strengths and weaknesses and none of them is perfect. A significant problem with classifying shingle vegetation communities is that the habitat is nationally and globally rare. The shingle beaches on Romney Marsh appear to have a greater diversity of shingle vegetation communities than is found in other parts of the UK and in Europe, and if this is not captured in classification schemes parts of the vegetation succession are not recognized. When the Corine and NVC systems were devised they were intended as broad-brush classifications and were based on a limited number of recorded quadrats on shingle that did not cover the full extent of variability of the habitat at Dungeness, and therefore some natural plant communities were not described.

Corine misses this variability particularly badly, identifying just two communities (as per the SAC designation), annual drift line vegetation and perennial vegetation of stony banks. The latter vegetation "community" is actually a whole series of successional perennial communities described in section 2.2, grouped together as one.

The National Vegetation Classification identifies many of the vegetation communities found on the Dungeness shingle, however some fit only weakly or are not described at all.

Given that it describes the variation found on the Dungeness shingle most successfully the Dungeness Shingle Survey is the system that is recommended for use on Dungeness SAC. This classification includes the annual drift-line vegetation in one community, (part of the Crambe community), with perennial pioneer vegetation such as sea kale *Crambe maritima*, yellow horned poppy *Glaucium flavum* and sea beet *Beta vulgaris* subsp. *maritima*. Because of the significance of the Habitats Directive, annual drift line vegetation needs to be mapped separately, where such vegetation occurs.

Shingle vegetation communities	**NVC equivalent**	**Habitats Directive Annex I habitat**
Annual driftline vegetation	*Atriplex glabriuscula*	AVDL
C – strand line communities	SD1 *Rumex crispus – glaucium flavum* shingle community; MC6 *Atriplex prostrata – Beta vulgaris* ssp. *maritima* seabird cliff comunity	PVSB
B3 – *Arrhenatherum elatius* grassland	MG1 *Arrhenatherum elatius* mesotrophic grassland; coastal and a few non-coastal stands fit MG1a *Festuca rubra* sub-community closely	PVSB
A1 – *Cytisus scoparius* scrub	W23 *Ulex europaeus – Rubus fruticosus* underscrub community; some affinity with W23b *Rumex acetosella* sub-community	PVSB
A2 – calcifuge grassland	U1 *Festuca ovina – Agrostis capillaris – Rumex acetosella* calcifuge grassland community; a close fit to U1a *Cornicularia aculeata – Cladonia* sub-community	PVSB
A3 – slightly mesotrophic calcifuge grassland	U1 *Festuca ovina – Agrostis capillaris – Rumex acetosella* calcifuge grassland community; some affinity with U1f *Hypochaeris radicata* sub-community.	PVSB
A2S – shingle margin calcifuge grassland	U1 *Festuca ovina – Agrostis capillaris – Rumex acetosella* calcifuge grassland community; no obvious affinity with any sub-community	PVSB
B1 – mesotrophic vegetation	U1 *Festuca ovina – Agrostis capillaris – Rumex acetosella* calcifuge grassland community; in part a good fit to U1d *Anthoxanthum odoratum – Lotus corniculatus* sub-community	PVSB
I – *Ilex aquifolium* scrub	No described NVC category	PVSB
E – *Sambucus nigra* scrub	No described NVC category	PVSB
IE – *Ilex aquifolium/ Sambucus nigra* scrub	No described NVC category	
P – *Prunus spinosa* scrub	No described NVC category	PVSB
U – *Ulex europaeus* scrub	No described NVC category	PVSB

B2 – wetlands	W24 *Rubus fruticosus – Holcus lanatus* underscrub; M23 *Juncus effusus – Galium palustre* mire	PVSB
B2S – wetlands with *Salix cinerea*	W1 *Salix cinerea – Galium palustre* woodland community	PVSB
A2F – *Festuca rubra* grassland/ G – *Geranium robertianum* community (coincides very closely with distribution of A2F)	A2F matches: MC8 *Festuca rubra – Armeria maritima* maritime cliff community; close to MC8a typical sub-community; also MC5 *Armeria maritima – Cerastium diffusum* therophyte communities. No described NVC category for G.	PVSB
Bare shingle		PVSB (if lichen component in bare shingle)

Ferry, B.W., Lodge, N. & Waters, S.J.P. 1990

In addition to the above communities Ferry Lodge and Waters refer to one other community which is usually related to gross disturbance, B1. In reality this community is derived from a number of very different events, occurring on areas where soil has been spread on the shingle, enriched road side margins, and recently burnt A2 communities. These require more work to differentiate between them as some communities are probably permanently damaged (areas where soil has been spread for instance) whereas others may recover, reverting through A3 type vegetation to A2 once more, for instance after fires on areas previously dominated by A2 vegetation. B1 communities are dominated by ruderal species

References

Akers, P. 2003. *Dungeness RSPB reserve management plan 2002/3 – 2006/7*. RSPB

Banks, B. 1995 – 2006. Great Crested Newt Ponds Surveys. Unpublished records.

Banks, B. 2010. Great Crested Newt Survey at Dungeness. Swift Ecology report for Natural England.

Banks, B. 2018 *Dungeness Vegetation Management Impact of Boardwalks Draft report.* Natural England

Collins, T. 2006 Dungeness Geomorphology – Jury's Gap to Camber. English Nature

Culley, J., Livingstone, D., Duane, W., Waller, M.P. & Yates, B. 2004. Rye Explorer Database

Dungeness Bird Observatory. 2003. *Vascular Plants of Dungeness Bird Observatory Recording Area*. Dungeness Bird Observatory

Dungeness Bird Observatory. 1985. *Plants of Dungeness Bird Observatory Recording Area*. Dungeness Bird Observatory

East Kent Engineering Partnership (EKEP) 2017 *Romney Sands to St Mary's Bay Main Report – April 2018 re-issue* Regional Coastal Monitoring Programme contact Environment Agency

Eddison, J.1983a. Flandrian barrier beaches of the coast of Sussex and south-east Kent. *Quaternary Newsletter* **39**: 25-29. Quaternary Research Association

Eddison, J. 1983b.The evolution of the barrier beaches between Fairlight and Hythe. *Geographical Journal* **149**: 39-53. Royal Geographic Society

Ellis, N.V. (ed.), Bowen, D.Q., Campbell, S., Knill, J.L., McKirdy, A.P., Prosser, C.D., Vincent M.A., & Wilson, R.C.L. 1996*. An Introduction to the Geological Conservation Review. Geological Conservation Review Series*. Joint Nature Conservation Committee

Environment Agency (2007 – 2018 and ongoing) Denge Beach Management Plan

Ferry, B. & Lodge, N. 1991. *A survey of the lichens and bryophytes associated with the blackthorns at Dungeness*. English Nature

Ferry, B. & Waters, Stephen J.P. 1989. *Botanical Journal of the Linnean Society **101***, 59-67 "Shingle Based wetlands at Dungeness" The Linnean Society of London

Ferry, B.W. & Waters, S.J.P. 1985. *Dungeness Ecology and Conservation, Focus on Nature Conservation Number 12*. Nature Conservancy Council

Ferry, B.W. and Lodge, E. 1996. *The Lichenologist* **28**:129-143 "Studies on the Cladonia Chlorophaea Complex at Dungeness, England ". Cambridge University Press

Ferry, B.W. and Pickering, M. 1989. *The Lichenologist* **21**:67-77 "Distribution and Succession of Lichens Associated with Prunus Spinosa at Dungeness, England". Cambridge University Press

Ferry, B.W., Lodge, N. & Waters, S.J.P. 1990. *Dungeness: a vegetation survey of a shingle beach*. English Nature

Folkestone and Hythe District Council 2018 *Dungeness Sustainable Access and Recreational Management Strategy (SARMS).* Link to F&H DC Sustainable Access & Recreation Management Strategy

Fuller, R.M. 1989. *Dungeness vegetation survey: mapping* (Final report). English Nature

Green, R.D. 1968. *Soil Survey of Great Britain. Bulletin No. 4. Soils of Romney Marsh*. Cranfield Soil and Agrifood Institute

Harmes, Spiers and Sussex Botanical Recording Society. 2003. *Lydd Ranges Botanical Survey*. Sussex Botanical Recording Society

Henderson, K.L. & Henderson, A.C.B. 1984. *Biological survey of Lydd Ranges*

Hubbard, J.C.E 1970. *The Journal of Ecology*, Vol. **58,** No. 3 pp. 713-722. British Ecological Society

Jacobs 2016. *Denge Beach Reprofiling – Vegetation Monitoring Study 2016 Denge Beach Management*. Contact Environment Agency

Jacobs 2017. *Denge Beach Reprofiling – Vegetation Monitoring Study 2017 Denge Beach Management.* Contact Environment Agency

Jacobs 2018. *Denge Beach Reprofiling – Vegetation Monitoring Study 2018 Denge Beach Management.* Project no. 657261CH. Contact Environment Agency

Joint Nature Conservation Committee. 2007. Second Report by the UK under Article 17 on the implementation of the Habitats Available from: www.jncc.gov.uk/article17

Directive from January 2001 to December 2006. Peterborough: JNCC. Available from: www.jncc.gov.uk/article17

Directive from January 2001 to December 2006. Peterborough: JNCC.

Leyshon, O. 2001. *A survey of Sea Pea (Lathyrus japonicus) populations on Dungeness National Nature Reserve*.

Long A.J., Plater A.J., Waller M.P., Roberts H., Laidler P.D., Stupples P. and Schofield

E. 2004. *The Depositional and Landscape Histories of Dungeness Foreland and the Port of Rye: Understanding Past Environments and Coastal Change.* University of Durham, ISBN 13560557.

Long, A., Plater, A. & Waller, M. 2006. *Geomorphological interest features at Dungeness, Kent.* English Nature.

May, V.J. & Hansom, J.D. 2003. Coastal Geomorphology of Great Britain. *Geological Conservation Review Series* Volume **28**. Joint Nature Conservation Committee.

Natural England 2013. Natural England Report 449 NCA Profile 123 Romney Marshes NE 449 NCA Profile 123 Romney Marshes

NATURAL ENGLAND, 2014. Site Improvement Plan: Dungeness SIP 068

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

Shardlow, M. & Gilliland, P. 1998. *Notes of Survey of Saline Lagoons and Ponds, Lydd Ranges, Dungeness.*

Smith & Thomas.1983. *Shingle plant communities and their general ecology at Dungeness,* Kent.

Sneddon, P. & Randall, R.E. 1993. *Coastal vegetated shingle structures of Great Britain:* main report. Joint Nature Conservation Committee.

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

Sussex Biodiversity Records Centre. 2006. Sussex Biodiversity Records Centre Reports.

UK AMPHIBIAN AND REPTILE GROUPS (ARG-UK) (2010) Advice Note 5 on the Great Crested Newt Habitat Suitability Index (May 2010).

WSP Jan 2017. *EDF Energy ANNUAL MANAGEMENT REPORT 2016 Dungeness Shingle Recycling* Project No 4840517135 (WSP Ref No. 70013144-T05) Contact EDF Energy

WSP Jan 2018. *EDF Energy ANNUAL MANAGEMENT REPORT 2017 Dungeness Shingle Recycling* Project No 4840517135 (WSP Ref No. 70013144-T05) Contact EDF Energy