

# A303 Amesbury to Berwick Down

TR010025

## 6.3 Environmental Statement Appendices

### Appendix 8.26 Outline Landscape and Ecology Management Plan

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed  
Forms and Procedure) Regulations 2009

October 2018



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# 1 Introduction

- 1.1.1 This Outline Landscape and Ecology Management Plan (OLEMP) provides a framework for achieving the 'vision' of the Environmental Masterplan (ES Figures 2.5 A-O) and Illustrative Cross Sections (ES Figures 2.5 P-S) (Ref 1.1) for the A303 Amesbury to Berwick Down scheme (the Scheme).
- 1.1.2 The Scheme is set within a sensitive landscape consisting of ecological designations, a Special Landscape Area and part of the Stonehenge, Avebury and Associated Sites World Heritage Site ((WHS) Stonehenge section only). The OLEMP forms part of the strategy for successfully integrating the Scheme within this landscape, and also mitigating many of the related impacts identified within the Environmental Statement (ES).
- 1.1.3 The OLEMP should be read in conjunction with Appendices 30/1 to 30/11 of the Manual of Contract Documents for Highway Works (MCHW) Specification for Landscape Works (Ref 1.2).
- 1.1.4 It is anticipated that the main works contractor would prepare their own Landscape and Ecology Management Plan (LEMP), having regard to this indicative outline, for approval prior to construction under the landscaping scheme requirement in the DCO.
- 1.1.5 For the initial five year period following completion of construction, the detailed landscape management proposals shall be set out by the main works contractor in a Handover Environmental Management Plan (HEMP), responsibility for which will taken on by the maintenance authority.<sup>1</sup>
- 1.1.6 The HEMP would then be subject to a process of ongoing review and amendment during the lifetime of the Scheme to ensure it remains relevant. Highways England's 'Landscape Management Handbook' (Ref 1.3) states that the landscape management plans should be updated annually and formally reviewed every five years.
- 1.1.7 The OLEMP should be read in conjunction with the following:
- a) Highways England Routine and Winter Service Code (Ref 1.4);
  - b) Highways England Network Management Manual (Ref 1.5);
  - c) Highways England DMRB (Vol10 Section 1) Integration with Rural Landscapes (Ref 1.6);
  - d) Highways England DMRB (Vol10 Section 3 Part 2) Landscape Management Handbook (Ref 1.3); and
  - e) Highways England DMRB (Vol10 Section 3 Part 1) Wildflower Handbook (Ref 1.7).

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<sup>1</sup> As defined in the Outline Environmental Management Plan (Application Document 6.3)

- 1.1.8 This document begins by setting out the vision, principles of stakeholder engagement and landscape and ecological context for the scheme. Three sections then discuss the various areas of calcareous grassland to be created across the Scheme from ground preparation to long-term management. The remaining chapters of the document discuss other areas of habitat creation and planting including woodlands, waterbodies and wildlife structures.

## 2 Vision

- 2.1.1 The Scheme offers the opportunity to create an attractive setting for the dual carriageway, reflecting valued landscape characteristics which would integrate the Scheme within the landscape and respect the character of the WHS and the objectives of the WHS Management Plan (Ref 2.1). Biodiversity conservation and enhancement is also a core objective of the Scheme.

- 2.1.2 Highways England's 'The Road to Good Design' (Ref 2.2) outlines ten design principles for roads. Design principle no.4 – 'fits in context' states:

*"The aesthetic quality of a road and its design in relation to the places through which it passes, is integral to its function and the experience of those that use it. Good road design demonstrates sensitivity to the landscape, heritage and local community, seeking to enhance the place while being true to structural necessities. It builds a legacy for the future."*

- 2.1.3 This OLEMP has been developed to ensure that the Scheme would reflect the existing open and rolling landscape character and context of this part of the A303, whilst accommodating mitigation principles established within the ES, with the vision of:

*"an exemplar highways landscape scheme, successfully integrated into its context, via a suite of chalk downland habitats, which will enhance the sense of place for visitors and tourists to the WHS, recreational users and local residents, as well as increasing biodiversity and wildlife opportunities."*

- 2.1.4 The overarching objectives of the OLEMP are:

- a) To promote the conservation, protection and improvement of the physical, natural and historic environment within the Scheme and its setting, and to ensure the Scheme is appropriately softened and integrated. The landscape framework should be seen as part of the infrastructure of the Scheme.
- b) To diversify ecological value through the retention, so far as reasonably practicable, of the existing hedgerows and trees and to enhance these through restoration and creation of diverse habitats offering greater botanical and faunal interest to the Scheme.
- c) To produce design and maintenance of landscape and biodiversity components that preserve and enhance the character of the landscape and local distinctiveness through creation of new chalk grassland.

- d) To protect, where reasonably practicable, the hedgerows which cross the Scheme.
- e) To create new structural planting which links with existing habitats and to take account of species that are locally appropriate.
- f) To use native indigenous species of local provenance wherever appropriate.
- g) To provide landscape amenity enhancement through the introduction and appropriate management of vegetation and open space areas.
- h) To provide a variety of foraging, nesting and roosting opportunities for protected and notable species, including bats, badgers, invertebrates, amphibians, reptiles and birds.
- i) To create floristically rich habitats, to support a greater assemblage of species and give rise to enhanced foraging opportunities.
- j) To provide a framework for monitoring and reviewing the landscape implementation and establishment.

2.1.5 The contractor or maintenance authority will be free to propose an alternative measure, or measures, from those set out in the OLEMP, subject to obtaining the written approval of The Authority prior to implementing any alternative measure or measures and in so doing, shall demonstrate to The Authority that the use of the alternative measure or measures does not lead to any materially new or materially worse adverse environmental effects compared to those presented in the ES.

### 3 Stakeholder engagement

#### 3.1 General

3.1.1 Prior to commencing construction, the contractor shall establish an independent Landscape Steering Group (LSG) to provide independent advice on the development of the LEMP.

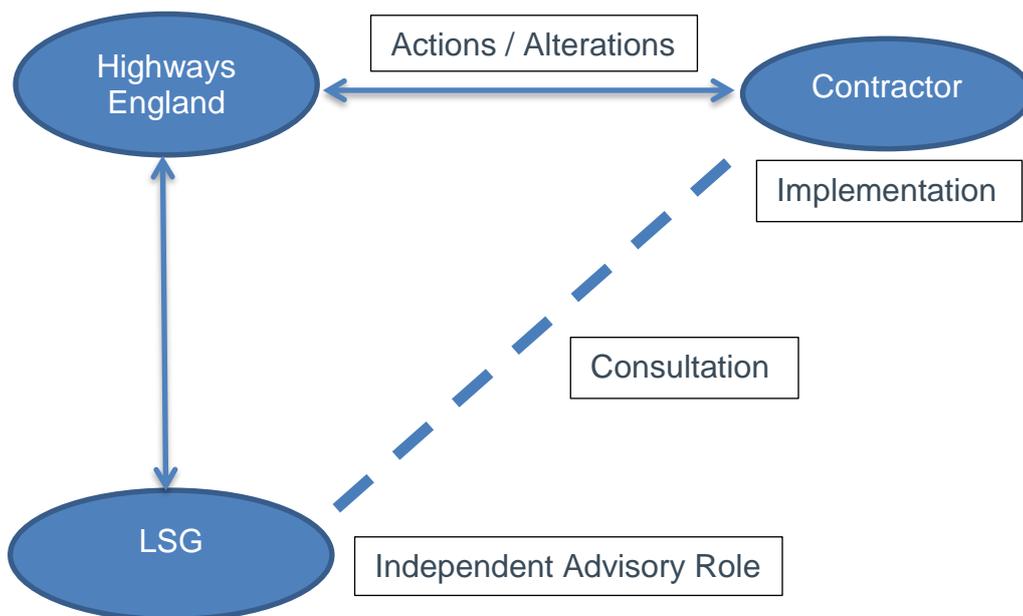
3.1.2 The LSG will likely involve Natural England, the National Trust, RSPB, Wiltshire Council and representatives of affected landowners.

3.1.3 The LSG's role would be:

- a) To advise on any alternative proposals to the Environmental Masterplan and the alignment of the proposals with the vision and objectives of the Environmental Masterplan.
- b) To work with Highways England to develop the methods for survey and monitoring of the establishment of the landscaping and ecological habitat creation.
- c) To liaise with Highways England to identify any requirements or actions needed to achieve the successful establishment of the landscaping and ecological habitat creation.

3.1.4 The suggested organisational structure between Highways England, the contractor and the Landscape Steering Group is outlined in Figure 3.1:

**Figure 3.1: Proposed Organisation Structure**



## **4 Landscape and ecological context of the Scheme**

4.1.1 The contractor shall satisfy themselves as to the location of the following landscape, ecology and arboricultural designations and ensure that the necessary protection measures / permits are in place prior to the commencement of any works.

### **4.2 Landscape**

4.2.1 The Scheme is set across a Special Landscape Area and part of the WHS.

4.2.2 The Nile Clumps, within the WHS, are covered by a Tree Preservation Order (TPO). There are Conservation Areas at Winterbourne Stoke and Amesbury where trees are also provided the equivalent protection to a TPO.

### **4.3 Ecology**

4.3.1 The statutory ecological designations within, or bordering, the Scheme are:

- a) Salisbury Plain Special Area of Conservation (SAC) and River Avon SAC;
- b) Salisbury Plain Special Protection Area;
- c) Parsonage Down Site of Special Scientific Interest (SSSI), Yarnbury Castle SSSI, River Avon System SSSI, River Till SSSI and Salisbury Plain SSSI; and
- d) Parsonage Down National Nature Reserve.

4.3.2 There are also eight non-statutory designated sites (County Wildlife Sites or RSPB reserves) within 500m of the Scheme: Countess Cutting CWS, Parsonage Down CWS, Luxenborough Banks CWS, Countess Farm Swamp CWS, Stonehenge Down CWS, Normanton Down RSPB Reserve, Vinies Farm Meadow CWS and Cow Down CWS.

### **4.4 Arboriculture**

4.4.1 The contractor should refer to the Arboricultural Impact Assessment Report, submitted with the ES, which provides indicative tree groups, species and root protection areas.

## 5 Calcareous grassland ground preparation

### 5.1 Objectives

- 5.1.1 The objective for the proposed areas of calcareous grassland is to provide diverse mosaics of the early stages of successional calcareous grassland communities, ranging from sparsely vegetated bare ground and rock through to closed, species-rich swards, such as the more open calcareous grasslands traditionally present in areas of Salisbury Plain and Parsonage Down. Some early successional scrub would be allowed to develop selectively within the area east of Parsonage Down, associated with planted areas.
- 5.1.2 In general, however, management within the soft estate is to arrest the development of dense scrub and instead maintain the grassland.
- 5.1.3 Experimental studies and past precedents from habitat creation (such as the Weymouth relief road) indicate that it is possible to establish acceptable calcareous grassland on bare dug chalk with little to no soil, provided a suitable tilth is achieved. This has the advantage of avoiding an existing competitive seedbank or excessive nutrient status. Where no soil is used at all, there is also a potential disadvantage regarding the length of time involved in building up sufficient nutrients for growth and/or an adequate population of arbuscular mycorrhizal fungi (AMF) (Ref 5.1). Areas to which small quantities of soil are applied can be used in combination with areas without soil to create mosaics of vegetation that establish at different rates, and hence diversity of composition and structure beneficial for biodiversity.
- 5.1.4 Excavated chalk material differs in composition and structure from exposed chalk subsoil and may require treatment after placement, to provide suitable conditions for the development of calcareous grassland. Nonetheless, chalk arisings from the Channel Tunnel Rail Link, produced from chalk marl, were used to create calcareous grassland on 30ha at Samphire Hoe in Kent, in more difficult conditions than will be present on the Scheme. The scale of the work to the area to the east of Parsonage Down and its connection to Parsonage Down SSSI/NNR mean there is more scope for long-term, adaptive management, a wider range of successional stages of chalk habitats, and grazing with cattle as well as sheep.

### 5.2 Soil characteristics general to calcareous grassland

- 5.2.1 Calcareous grasslands typically develop on chalk and limestone soils, which are rich in calcium carbonate. Seedbed preparation techniques for calcareous grassland will vary depending upon whether the soil profile is intact and whether the soil is:
- physically unsuitable (for example, compacted and/or poorly draining);
  - chemically unsuitable (for example, inappropriate pH or high phosphate, organic matter or nitrogen content); or
  - biologically unsuitable (for example, with a high proportion of undesirable arable weeds (Ref 5.2) in the seedbank).

5.2.2 The latter two issues are a particularly high risk where there is a history of arable management.

5.2.3 Forest Research has produced guidance for calcareous grassland creation (Ref 5.3) which summarises the characteristics of soils suitable for calcareous grassland establishment.

**Table 5.1: Characteristics of soils suitable for calcareous grassland (Ref 5.4)**

<b>Drainage</b>	Moderate to rapid
<b>pH</b>	Alkaline to strongly alkaline (pH 7.8–8.5)
<b>Available phosphorus (Ref 5.5)</b>	25 mg l <sup>-1</sup> (5–10 mg l <sup>-1</sup> )
<b>Organic matter (Ref 5.6)</b>	4% (6–19%)
<b>Total nitrogen</b>	0.2% (0.30–1.16%)

5.2.4 The remainder of this section sets out the different substrate preparation requirements for each type of calcareous grassland habitat creation exercise.

### 5.3 Verges, including those adjacent to Public Rights of Way (PRoWs)

5.3.1 Where the soil meets the requirements outlined in Table 5.1, *in situ* soil can be used as a seedbed. In this situation, the existing vegetation would be sprayed off with herbicide and the dead material removed. The top 50mm of the planting medium will then be raked to prepare a fine tilth for the seedbed. The raking will occur immediately before sowing.

5.3.2 Where the soil does not meet the requirements, the Contractor is to spray the area off with a herbicide and remove the dead material. The Contractor is then to add a layer of a chalk up to a maximum of 150mm depth. The chalk is to be mixed with topsoil stripped from elsewhere along the Scheme at a ratio of three parts dug chalk to one part topsoil (Ref 5.7).

5.3.3 The soil will be physically screened before use to ensure that no clods of material are present and that all stones and other alien material (such as plastics and metals) above 50mm in size are removed. No clay soils will be used and only soil with a high pH (above pH7) will be used. The top 50mm will then be raked to prepare a fine tilth for the seedbed. The raking will occur immediately before sowing. This is to avoid disturbing the existing substrate and potential archaeology.

### 5.4 Calcareous grassland on bunds

5.4.1 Bunds are provided in a number of forms along the Scheme. The bund core will consist of uncompacted chalk which permits drainage. Dug chalk of all grades and particle sizes should be used to prevent soil and seed being lost in the interstices between chalk fragments.

5.4.2 The top 150mm of chalk will be mixed with topsoil stripped from elsewhere along the Scheme at a ratio of three parts dug chalk to one part topsoil (Ref

5.7). The soil will be physically screened before use to ensure that no clods of material are present and that all stones and other alien material (such as plastics and metals) above 50mm in size are removed. No clay soils will be used and only soil with a high pH (above pH7) will be used. The top 50mm will then be raked to prepare a fine tilth for the seedbed. The raking will occur immediately before sowing.

## **5.5 Embankments, cuttings, green bridges, tunnel portals and redundant paved surfaces**

5.5.1 It is assumed that all embankments, cuttings, green bridges and tunnel portals will be covered with a layer of chalk. Similarly, redundant paved surfaces will have the surface punctured and covered with a layer of chalk, rather than having the road surface entirely removed. The layer should be at least 100mm in depth and dug chalk of all grades and particle size should be used as this will prevent soil and seed being lost in the interstices between chalk fragments.

5.5.2 The chalk layer will be made up of a ratio of three parts dug chalk to one part topsoil (Ref 5.7). The soil will be physically screened before use to ensure that no clods of material are present and that all stones and other alien material (such as plastics and metals) above 50mm in size are removed. No clay soils will be used and only soil with a high pH (above pH7) will be used. The top 50mm will then be raked to prepare a fine tilth for the seedbed. The raking will occur immediately before sowing.

## **5.6 Calcareous grassland to the east of Parsonage Down**

5.6.1 The land to the east of Parsonage Down is currently primarily arable and the soil is not likely to meet the nutrient requirements of Table 5.1.

5.6.2 Excavated material from the tunnel boring process will be deposited on this area directly on top of the existing topsoil. This is to avoid disturbing the existing substrate and potential archaeology. Prior to the deposition of excavated material, the contractor is to spray the area off with a herbicide and remove the dead material.

5.6.3 Given the poor structure and expected almost complete absence of available nutrients, it is considered likely that the excavated material from the tunnel boring process will need working including mixing with other soil from other parts of the Scheme to achieve a suitable structure for chalk grassland.

5.6.4 The top 150mm of any deposition area shall therefore comprise of chalk mixed with topsoil stripped from elsewhere along the Scheme, at a ratio of three parts dug chalk to one part topsoil (Ref 5.7).

5.6.5 The soil will be physically screened to ensure that no clods of material are present and that all stones and other alien material (such as plastics and metals) above 50mm in size are removed. No clay soils will be used and only soil with a high pH (above pH7) will be used. The top 50mm will then be raked to prepare a fine tilth for the seedbed. The raking will occur immediately before sowing.

## 6 Calcareous grassland seeding and planting

### 6.1 Grassland mix

- 6.1.1 It is considered most appropriate to select a single calcareous grassland seed mix that will be sown at all locations to be put down to chalk grassland. According to the SSSI citation the existing calcareous grasslands at Parsonage Down have particular affinity to the sheep's fescue (*Festuca ovina*) – meadow oat grass (*Avenula pratensis*) (CG2) community identified in the National Vegetation Classification (Ref 6.1) and shown in Table 6.1. Calcareous grassland structure and community composition is strongly affected by management such that maintaining an early successional community is dependent as much (if not more) on the short-term and long-term management of the grassland as the species mix which is initially sown.
- 6.1.2 The existing vegetation at Parsonage Down is deliberately managed to be quite tall and dense to benefit invertebrates. Where new grassland is created, this will be shorter, and with a more open sward. A seed mix with affinity to CG2 grassland would, with appropriate management, meet these requirements; such grasslands are commonly found in closely rabbit grazed situations where a fine turf with high forb species richness is achieved. Appropriate management, replicating the heavy rabbit grazing normally experienced by shorter more diverse CG2 swards, will keep the sward in its earlier successional stages. Predominant among the grasses are fine leaved species such as *Festuca ovina*, *Avenula pratensis*, *Briza media* and *Koeleria macrantha*. In practice the low fertility nature of the substrate used will also assist in keeping the sward open.
- 6.1.3 Windblown calcareous seed will also arrive but will not be relied upon as this will take too long to establish and in the meantime more invasive windblown species, typical of bare substrates, are likely to have colonised. Consideration has been given to harvesting species from existing calcareous grassland but given the total area requiring seeding this is not considered appropriate (as seed harvesting must be undertaken with care to avoid damaging the donor site) and harvested seed can have highly variable viability such that the mix one collects does not necessarily resemble what germinates. Purchased seed will therefore be used for all areas to be put down to calcareous grassland. An exception to this will be turf fragments/soil to be taken from a disused breeding plot for stone curlew at Parsonage Down, which will be used to make an early start to habitat creation to the east of Parsonage Down in an area which will not receive excavated chalk.

6.1.4 Species which are reported from Parsonage Down include:

**Table 6.1: Recorded species at Parsonage Down (Ref 6.2)**

Seed Type	Latin Name	Common Name
Grasses	<i>Festuca ovina</i>	Sheep's fescue
	<i>Avenula pratensis</i>	Meadow oat-grass
	<i>Festuca rubra</i>	Red fescue
	<i>Avenula pubescens</i>	Downy oat-grass
	<i>Carex humilis</i>	Dwarf sedge
	<i>Carex flacca</i>	Glaucous sedge
	<i>Danthonia decumbens</i>	Heath-grass
	<i>Trisetum flavescens</i>	Yellow oat-grass
	<i>Koeleria macrantha</i>	Crested hair-grass
Wildflowers	<i>Serratula tinctoria</i>	Saw-wort
	<i>Succisa pratensis</i>	Devil's-bit scabious
	<i>Stachys officinalis</i>	Betony
	<i>Rhinanthus minor</i>	Yellow rattle
	<i>Filipendula vulgaris</i>	Dropwort
	<i>Gentianella anglica</i>	Early gentian
	<i>Thesium humifusum</i>	Bastard-toadflax
	<i>Polygala calcarea</i>	Chalk milkwort
	<i>Cuscuta epithimum</i>	Dodder
	<i>Senecio integrifolius</i>	Field fleawort
	<i>Sanguisorba minor</i>	Salad burnet
	<i>Campanula glomerata</i>	Clustered bellflower
	<i>Orchis ustulata</i>	Burnt orchid
	<i>Orchis morio</i>	Green-winged orchid
<i>Coeloglossum viride</i>	Frog orchid	

6.1.5 A seed mix is proposed which draws upon those aspects of the Parsonage Down species composition in Table 6.1 that are commercially available and are most likely to maintain the short, open early successional grass swards that are desired. The seed mix shown within Table 6.2 is an example of a suitable commercial seed mix. Commercial suppliers usually recommend a relatively high rate of 40 kg/ha (Ref 6.3) but this is primarily for those who wish to establish a tight closed sward quickly. Where a more open sward is desirable a lower rate of 30 kg/ha can be used (Ref 6.4), although for 100% wildflower mixtures some seed suppliers identify a sowing rate of 15 kg/ha.

6.1.6 Establishment of a grassland sward on very nitrogen poor substrates can also be aided by the inclusion of suitable nitrogen fixing (Ref 6.5) legumes within the seed mix, such as kidney vetch (*Anthyllis vulneraria*). These species would be likely to be the first to establish and will normally be expected to establish a

flush of growth in the first few years before dying back and achieving a more even balance with the other species. The inclusion of an appropriate legume may be particularly important in the otherwise relatively hostile substrate to be used to the east of Parsonage Down.

- 6.1.7 Ready-made commercial meadow mixtures have been examined but it is considered that a bespoke mix is more advisable as this will omit the coarse grasses and include a greater proportion of wildflowers with low growth forms suitable for short, open grassland (refer to Table 6.2). The mixture could for instance be based on a 100% calcareous grassland wildflower mixture, combined with a bespoke grass mixture of fine low growing grasses. The two mixes will be combined and sown at a rate of 15kg/ha. Due to their tall stout growth form the following plants should be removed from any wildflower seed mix: *Centaurea nigra*, *Centaurea scabiosa*, *Leucanthemum vulgare* and *Knautia arvensis*.

**Table 6.2: Typical Wildflower seed mixture**

Seed Type	Percentage	Latin Name	Common Name
Wildflowers	10	<i>Anthyllis vulneraria</i>	Kidney Vetch
	7.5	<i>Clinopodium vulgare</i>	Wild Basil
	7.5	<i>Daucus carota</i>	Wild Carrot
	10	<i>Galium verum</i>	Lady's Bedstraw
	5	<i>Leontodon hispidus</i>	Rough Hawkbit
	5	<i>Lotus corniculatus</i>	Birdsfoot Trefoil
	2	<i>Origanum vulgare</i>	Wild Marjoram
	5	<i>Plantago media</i>	Hoary Plantain
	10	<i>Poterium sanguisorba</i> - ( <i>Sanguisorba minor</i> )	Salad Burnet
	10	<i>Primula veris</i>	Cowslip
	10	<i>Prunella vulgaris</i>	Selfheal
	2	<i>Ranunculus acris</i>	Meadow Buttercup
	8	<i>Ranunculus bulbosus</i>	Bulbous Buttercup
8	<i>Scabiosa columbaria</i>	Small Scabious	

**Table 6.3: Typical Grass seed mix**

Seed Type	Percentage	Latin Name	Common Name
Grasses	5	<i>Briza media</i>	Quaking grass
	5	<i>Carex flacca</i>	Glaucous sedge
	40	<i>Festuca ovina</i>	Sheep's fescue
	40	<i>Avenula pratensis</i>	Meadow oat grass
	5	<i>Koeleria macrantha</i>	Crested hair-grass
	2	<i>Phleum bertolonii</i>	Smaller cat's-tail
	3	<i>Trisetum flavescens</i>	Yellow oat-grass

6.1.8 In addition to seed sowing, the calcareous grassland to the east of Parsonage Down and on Green Bridge One will be planted with 1,500 wildflower plugs evenly distributed between the following species: wild thyme (*Thymus serpyllum*), rock rose (*Helianthemum nummularium*), squinancywort (*Asperula cynanchica*), dropwort (*Filipendula vulgaris*) and hairy violet (*Viola hirta*). These species have been selected for their compatibility with the area and because they are difficult to establish from seed but have also been recently planted as plugs at the RSPB Winterbourne Downs reserve.

## **6.2 Scattered scrub planting and mix**

6.2.1 The areas of grassland to the east of Parsonage Down, on bunds, cuttings and on the green bridges will be planted with scattered pockets of low-competitive shrub species typical of calcareous downland. Juniper (*Juniperus communis*) is the most representative shrub species of such habitat, is characteristic of Salisbury Plain (Ref 6.6) and is declining nationally. Discussion would be required with Natural England and Defence Infrastructure Organisation as to whether to source the juniper locally. Research has indicated that there is in fact greater genetic variation within local populations than between populations. There is therefore less concern about issues relating to maintaining genetic diversity, than ensuring that a healthy population capable of successful regeneration is maintained (Ref 6.7). This will therefore be planted as individual specimens in selected locations across the sown areas.

## 7 Calcareous grassland management and monitoring across the Scheme

### 7.1 Short-term management (0-5 years)

- 7.1.1 Immediately after the seeds have been sown, the ground should be left undisturbed. It is not necessary to water the seeds as the grassland regeneration should be a natural process.
- 7.1.2 In the first few years of establishment, the grassland (excluding shrub planted areas) **may** need to be mown between two and four times at even intervals throughout the growing season to control the more competitive species and allow the newly sown less competitive species to establish. The vegetation growth will be visually inspected every month during the growing season and this mowing regime will be set up if it appears that certain species are at risk of out-competing the establishing seedlings. Mowing, if required at all, should be to a height of approximately 50-75mm.
- 7.1.3 Grazing should be prevented for the first three years to allow seedlings to establish sufficient root systems. Cut vegetation will be removed from the grassland area and taken to a composting location; this can and should be located near to each main area of cutting to avoid the need for material to be moved long distances. Nearby scrub and woodland areas would be ideal. This will limit the deposition of nutrients, controlling the initial flush of weeds and promoting root establishment of grasses and wildflowers.
- 7.1.4 Control of spear thistle (*Cirsium vulgare*), blackgrass (*Alopecurus myosuroides*), creeping thistle (*Cirsium arvense*), broad-leaved dock (*Rumex obtusifolius*) and ragwort (*Senecio jacobaea*) may be required as these common weeds could colonise the site naturally and potentially dominate the vegetation if not controlled. This control can be achieved in a targeted manner using a weed wiper, targeted spraying or by hand weeding. Volunteer (self-sown) cereals should also be identified and removed.
- 7.1.5 Rabbit proof fencing is not currently proposed for sown areas. Rabbit grazing is characteristic of short-sward open grassland communities but excessive grazing before seedlings have established can be harmful to the vegetation. This situation will be monitored to determine if management action is required.

### 7.2 Long-term management (over 5 years)

- 7.2.1 Given the nature of the substrate (particularly to the east of Parsonage Down) it is likely to take at least five years for the grassland to develop into a stable community and even then there are likely to remain numerous sparsely vegetated areas; this variation is desirable as it provides valuable structural diversity.
- 7.2.2 The long-term management of PRoWs within the Scheme will vary depending on the landowner. With reference to the Environmental Masterplan, some PRoWs (WST06B) will go through grazing units and receive the same management as adjacent fields. Management will be essential to maintain an

early successional community for the long-term. Without management the community will (at varying rates depending upon the nutrient availability of the substrate) progress naturally through the later successional stages and become tall, dense and grass-dominated and ultimately develop extensive scrub encroachment. A regime of cutting and/or grazing is required to prevent domination of the sward by scrub or aggressive grass species.

- 7.2.3 Mowing must be undertaken in the appropriate conditions, i.e. when the ground is dry to prevent poaching of the grassland. Where grazing is to be undertaken, water trough locations will need to be selected carefully as the areas immediately around the troughs are likely to be poached. Grazing is generally preferable to mowing as it is less labour intensive and the action of grazing helps to spread seeds, opens up small areas of bare ground and reduces the build-up of leaf litter. Grazing is most likely to be achievable to the east of Parsonage Down, due to the expanse of land and gradients. In contrast, narrower verges to PRowS and bunds on green bridges will require mowing at an appropriate frequency.
- 7.2.4 Once an even sward is established (i.e. one not dominated by a small number of competitive species) mowing will only be needed once or twice a growing season. Ideally this should only take place in autumn after the grasses and wildflowers have set seed, to allow for new growth of species the next season. Arisings will be left in-situ for 24hrs to encourage seed drop, before being removed to the designated composting location. Where required, litter picking should take place prior to each grass cut and all stones and debris removed.
- 7.2.5 The Environmental Impact Assessment for the Scheme identifies a need to maintain the newly created areas of grassland within the soft estate in a manner that is suitable for reptiles. Where this habitat is to be grazed the variable vegetation removal and trampling that will arise from relatively low grazing intensity will create this sward variation naturally. Where it is to be mown suitable habitat will be created by only mowing once or twice a growing season and by ensuring that mowing is not undertaken to a uniform height across the estate. Rather, mowing height should be varied such that some locations (amounting to c. 20% of the entire mown area) are closely cut to c. 50mm while other areas are cut to only 100 to 150mm. The areas to be cut to each height should be varied randomly in each cutting season. In addition, once the turf closes the vegetation, 10% of the estate should be 'scalped' to produce patches of bare ground to provide basking areas. Any given patch should be no more than c. 600mm by 600mm in area.
- 7.2.6 Some areas of grassland along the meadow margins adjacent to woodland and hedgerows should be left for a year or more between cuts in order to provide dense ground level cover for reptiles, small mammals and invertebrates.
- 7.2.7 These management requirements will need to be adjusted in response to changes in the vegetation as time progresses.

## 7.3 Monitoring

- 7.3.1 Monitoring will be required to confirm that creation of calcareous grassland has been successful. At the same time, it is not the intention to be over-prescriptive as to exactly which calcareous grassland community is most desirable. The broad target is for a species-rich short-turf relatively open calcareous grassland community with little scrub encroachment and areas of sparsely vegetated ground, typically vegetated with butterfly attracting species such as kidney vetch.
- 7.3.2 With that broad objective in mind, monitoring criteria will be adapted from the condition assessment checklist for CG2 grassland as set out in the Common Standards Monitoring Guidance (Ref 7.1) for Lowland Grassland Habitats produced by the JNCC (2004). Target states for species richness, percentage bare ground and sward height (for example) for different areas of grassland will be developed in consultation with the Landscape Steering Group and are therefore not specified in this document. Features of the grasslands will be recorded yearly by a suitably qualified ecologist. Features including the extent, sward composition (grass:herb ratio), positive and negative indicator species, local distinctiveness and sward structure will be recorded against the agreed targets to determine the success of the calcareous grassland creation.

## **8 Woodland and scrub**

### **8.1 Introduction**

- 8.1.1 Blocks of woodland and scrub are proposed in a number of locations including to the north of Scotland Lodge Farm, on the approach embankments to the River Till viaduct, around Longbarrow Junction and at Countess Roundabout.
- 8.1.2 Woodland is not particularly characteristic of the thin soils of Salisbury Plain but pockets are found such as at Scotland Lodge Farm and within the WHS.
- 8.1.3 Woodland and scrub are appropriate habitats both for mammal mitigation and for visual screening (such as on the false cutting to the north of Scotland Lodge Farm, to the east of Parsonage Down, near Winterbourne Stoke).

### **8.2 Planting bed preparation**

- 8.2.1 The contractor will remove rubbish, concrete, metal, glass, decayed vegetation and any contaminated or deleterious matter from site. Stones exceeding 50mm in any one direction will also be removed. Contamination includes substances injurious to plant growth including subsoil, rubble, fuel, and lubricants. Large roots will be grubbed up and disposed of without undue disturbance of soil and adjacent areas.
- 8.2.2 The depth of soil for planting will range between 150mm to 300mm. Where woodland and scrub areas border grassland, the 3m edge of the woodland and scrub area will have a reduced depth of soil, such that the depth transitions evenly to match the depth of the soil in the grassland area.
- 8.2.3 Soil for cultivating and planting will be moist, friable and not waterlogged.
- 8.2.4 The contractor will undertake the work while soil and weather conditions are suitable. Planting will not be carried out during periods of frost or strong winds or any other climatic condition deemed to be inclement, including drought, waterlogged, frozen or snow covered conditions
- 8.2.5 Bare root trees and shrubs will be planted from November to March (inclusive) although waterlogged conditions which are more likely in January and February will be avoided. Planting of bare root plants will take place immediately after delivery, unless weather conditions are poor, or inclement as identified above.
- 8.2.6 Storage of plants will be in accordance with best practice and industry guidelines.
- 8.2.7 Excavation of pits will be in accordance with best practice and industry guidelines.

### **8.3 Woodland planting mix**

- 8.3.1 Planting will take place in the first available planting season. The area will initially be fenced in an appropriate manner to protect young trees during their establishment from browsing rabbits and deer.

8.3.2 Trees and shrubs will be planted at 2m spacing's.

8.3.3 Thinning will be required as the trees mature. The following indicative and approximate tree and shrub species will form the basis of the woodland mixes (refer to Table 8.1), as they reflects local species. A mixture of age classes has also been included to avoid a single-aged stand.

**Table 8.1: Indicative woodland planting mix**

Latin Name	Common name	Form/ Girth cm	Size mm	Root	Percentage
<b>Trees</b>					
<i>Betula pendula</i>	Silver birch	Transplant	900 - 1200	BR	15%
<i>Salix alba</i>	White willow	Transplant	400 - 600	BR	2.5%
<i>Salix caprea</i>	Goat willow	Transplant	400 - 600	BR	2.5%
<i>Quercus robur</i>	Pedunculate oak	Transplant	400 - 600	BR	2.5%
<i>Fagus sylvatica</i>	Beech	Transplant	400 - 600	BR	7.5%
<i>Acer campestre</i>	Field maple	Transplant	400 - 600	BR	15%
<i>Taxus baccata</i>	Yew	Transplant	400 - 600	BR	1%
<i>Sorbus aria</i>	Whitebeam	Transplant	400 - 600	BR	2%
<i>Sorbus aucuparia</i>	Rowan	Transplant	400 - 600	BR	2%
<i>Alnus glutinosa</i>	Alder	Transplant	400 - 600	BR	5%
<b>Shrubs</b>					
<i>Prunus spinosa</i>	Blackthorn	Transplant	600 - 900	BR	2%
<i>Crataegus monogyna</i>	Hawthorn	Transplant	600 - 900	BR	15%
<i>Corylus avellana</i>	Hazel	Transplant	600 - 900	BR	15%
<i>Cornus sanguinea</i>	Dogwood	Transplant	600 - 900	BR	5%
<i>Euonymus europaeus</i>	Spindle	Transplant	600 - 900	BR	2%
<i>Viburnum lantana</i>	Wayfaring tree	Transplant	600 - 900	BR	2%
<i>Rosa canina</i>	Dog rose	Transplant	600 - 900	BR	2%
<i>Ilex aquifolium</i>	Holly	Transplant	600 - 900	BR	2%

## 8.4 Scrub planting

8.4.1 Dense scrub in the Salisbury Plain area includes hawthorn, purging buckthorn, dogwood *Cornus sanguinea*, wayfaring tree *Viburnum lantana* and other species characteristic of the type. This has informed the proposed species selection for dense scrub planting.

8.4.2 Areas of dense shrub planting are proposed particularly on the bunds on Green Bridge Two (as a bat commuting feature), Green Bridge Three and to the east of Parsonage Down, as well as at the entrances to mammal tunnels. The indicative and approximate planting mix is shown within Table 8.2 and includes a mixture of shade tolerant thorny and native species. During the first three years of establishment the planting must be suitably protected from grazing and planted at one per square metre.

**Table 8.2: Indicative scrub planting mix**

Latin Name	Common name	Form	Size mm	Root	Percentage
<i>Crataegus monogyna</i>	Hawthorn	Transplant	600 - 900	BR	20%
<i>Cornus sanguinea</i>	Dogwood	Transplant	600 - 900	BR	12%
<i>Rhamnus cathartica</i>	Purging buckthorn	Transplant	600 - 900	BR	12%
<i>Viburnum lantana</i>	Wayfaring tree	Transplant	600 - 900	BR	10%
<i>Corylus avellana</i>	Hazel	Transplant	600 - 900	BR	12%
<i>Euonymus europaeus</i>	Spindle	Transplant	600 - 900	BR	12%
<i>Ligustrum vulgare</i>	Wild privet	Transplant	600 - 900	BR	12%
<i>Rosa canina</i>	Dog rose	Transplant	600 - 900	BR	10%

## 8.5 Immediate aftercare

### Watering

- 8.5.1 Watering of trees, shrubs and hedgerows will take place immediately after planting, thoroughly and without damaging or displacing plants or soil. The soil will then be lightly firmed around plants and forked and/or raked, without damaging roots, to a fine tilth with gentle cambers and no hollows.

### Mulch

- 8.5.2 A 75mm depth application of well composted FSC certified bark mulch will be applied to each plant following watering. For trees and shrubs mulch will be applied, in accordance with best practice, and as a guide, in 1000mm diameter rings for trees and 500mm wide strips to hedgerow lines.

### Staking and protection

- 8.5.3 Feathered trees will be tied to a single stake installed on the windward side of the tree at an angle of 45 degrees. Stakes will be FSC certified softwood, peeled chestnut, larch or oak, straight, free from projections, large and edge knots and with a pointed lower end. Stakes will be a minimum of 1.8m long x 75mm diameter. Trees to be tied to the stake with a buckle type tree tie or reinforced rubber belting and rubber spacer fixed to prevent chaffing of the stem.
- 8.5.4 Heavy standard and extra heavy standard trees will be double low staked and tied to a cross bar. Stakes will be FSC certified softwood, peeled chestnut, larch or oak, straight, free from projections, large and edge knots and with a pointed lower end. Minimum stake sizes to be 1.8m x 75mm diameter. Trees to be tied to cross bar with a flat back rubber block spacer located between the tree and cross bar and secured with reinforced rubber belting crossed over and fixed onto cross bar with nails.

8.5.5 To protect all trees, shrubs and hedgerow plants from strimming and animals following planting, individual clear recycled plastic spiral guards (600 mm high x 63 mm diameter) will be fitted to each plant or tree. Where spiral guards are fitted to shrubs they will be supported using a bamboo cane. Mesh shrub guards (600mm high x 250mm diameter) will be fitted around each Holly (*Ilex aquifolium*) and fixed to a FSC certified softwood stake (750mm long x 25mm square) with two ratchet ties. Spiral and mesh guards will be installed, checked and straightened monthly (where required) so that they do not impede natural movement of trees or restrict growth.

## **8.6 Short-term management (0-5 years)**

8.6.1 During the first five years following the planting of new trees, shrubs and woodland areas, the following actions will be undertaken:

- a) The trees and shrubs will be checked on a quarterly basis and maintained as weed free at all times around their bases to a diameter of 1000mm. Bramble and other scrub growth will be cut to ground level so as not to suppress newly planted material.
- b) Any dead or damaged trees/ shrubs will be replaced with matching species of the same size during the next planting season after failure.
- c) Soil around roots will be re-firmed as necessary to ensure plants are supported and upright especially following periods of extreme winds.

## **8.7 Long-term management (over 5 years)**

8.7.1 Between seven and ten years after planting, woodland areas will be reviewed and thinned out as necessary, removing poor or weak specimens to allow the best specimens to flourish and give space for trees to establish. Up to 30% of the brash and timber arisings can be kept on site in the form of brash and wood piles for reptiles and invertebrates. Wood will be stacked neatly in piles not exceeding 1m high.

8.7.2 Trees adjacent to the PRoW will require ongoing monitoring and management for health and safety reasons and to maintain access.

### **Watering**

8.7.3 The contractor will wet the full depth of topsoil, applying water evenly and without damaging or displacing plants or soil. Watering will be as necessary to ensure establishment and continued thriving of planting. If the water supply is or is likely to be restricted by emergency legislation, planting will not be carried out until instructed. If planting has been carried out, the contractor is to obtain instructions on watering.

### **Weed control**

8.7.4 At all times, weed cover will be kept to a minimum. A 1000mm diameter area around each new plant will be kept weed free at the start of the growing season

and will be maintained until planting is established. The method used should be appropriate to the location and will either be by hand or spot treatment.

- 8.7.5 Hand weeding will involve the removal of weeds entirely, including roots. Disturbance to soil, plants and mulched surfaces will be minimised as much as possible. Upon completion, the area will be raked to a neat, clean condition, and any mulch reinstated to original depth.
- 8.7.6 Spot treatment of weeds may be appropriate within rough grass areas. All broad leaved weeds and injurious weed species listed in the Weeds Act 1959 and Wildlife and Countryside Act 1981 will be treated with a suitable herbicide. Weed killing will achieve total die-back of weeds. Following treatment weeds will be left to die and then removed from site.
- 8.7.7 The use of herbicides and pesticides will be in strict accordance with current legislation and industry best practice. All operators applying chemicals will hold a recognised Certificate of Competence.
- 8.7.8 Trees, shrubs and woodland will so far as reasonably practicable be kept in a good and safe condition, commensurate with their naturalistic context and amenity value to neighbouring residents and public. Any plant which presents a risk to neighbouring properties or to the health and safety of staff and visitors will be dealt with appropriately.
- 8.7.9 Where appropriate, any tree work will be carried out by an approved member of the Arboricultural Association, and will be undertaken in accordance with BS 3998 British Standard for Tree Work (Ref 8.1) and HSE 'Forestry and arboriculture safety leaflets' (Ref 8.2).
- 8.7.10 Tree felling and limb management will be undertaken in line with the Forestry Commission guide 'Common Sense Risk Management of Trees' (Ref 8.3).

## **8.8 Monitoring**

- 8.8.1 Landscape monitoring of newly planted woodland areas will be undertaken for the first five years by a suitably qualified ecologist or landscape architect to ensure the successful establishment of the planting.
- 8.8.2 After the initial five-year establishment period, areas of tree planting will be periodically reviewed, weed clearance relaxed and a natural order established with reduced maintenance regime. The understorey of new woodland areas will be coppiced as required for good woodland management, which will be undertaken in stages to reduce any disturbance of wildlife habitat.
- 8.8.3 After the first five years monitoring will consist of annual checks with recommendations made to ensure the maintenance is adjusted to suit the establishing habitat.

## 9 Waterbodies

### 9.1 Introduction and objectives

- 9.1.1 Waterbodies refers to drainage treatment areas to be constructed as part of the Scheme.
- 9.1.2 The primary purpose of the waterbodies is control of Scheme drainage; to avoid increasing flood risk and to maintain or improve the quality of water infiltrating groundwater. An additional purpose is to provide benefits for biodiversity, creating wetland and grassland habitats.
- 9.1.3 Drainage from the Scheme is routed via pipes to infiltration areas. These comprise:
- a) main infiltration basin, which will be intermittently inundated grassland over a relatively flat surface of the proprietary filter-treatment material (Remedi8 or similar approved) above free-draining chalk; and
  - b) shallow basin at the inlet end, which will be a pond with an impermeable lining holding some water permanently.
- 9.1.4 The main infiltration basin is likely to contain water for only short periods (hours to a few days) and is therefore expected to support predominantly dry grassland. To provide biodiversity it will be established and managed as a chalk wildflower grassland.
- 9.1.5 The shallow basin at the inlet end is expect to develop as intermittently inundated grassland with poor drainage, plus an area of standing water for variable periods, depending on climatic conditions. It will have grassland and pond margins. It is not intended to be planted with tall, vigorous species that would form dense swamp vegetation. Instead the aim is to produce vegetation with a resemblance to the semi-improved pastures of the local winterbournes such as the River Till, with associated marginal and aquatic plants (e.g. watercress, brooklime, water forget-me-not, water mint, fool's watercress and pond water-crowfoot).

### 9.2 Habitat creation

- 9.2.1 Excavation will be carried out after any measures required for the protection of species and archaeology have been implemented in accordance with the Outline Environmental Management Plan (OEMP) (Appendix 2.2) and DCO Requirements.
- 9.2.2 The inundation area and its surroundings will be seeded as chalk wildflower grassland with the minimum of topsoil. The depth of topsoil within the main inundation area may be increased if it is required to cover the proprietary treatment medium but is not expected to exceed 150mm. Locally appropriate species of pond margins are likely to be most effectively introduced either as transplanted material from a local source concurrently with seeding, or as stock planted in and around the shallow basin in the second year. Management in the first year will be mowing as for calcareous grassland establishment with

repeated cuts. Pond margin species are not expected to require mowing in the first year.

### **9.3 Management**

9.3.1 After the establishment year, the preferred management is for periodic, management of the infiltration basin and its surroundings by grazing at low intensity under a regime similar to the requirements of higher-tier agri-environment schemes. Cattle grazing is the preferred management, or in combination with sheep, but sheep grazing alone will also be acceptable. Where necessary, protection (e.g. electric fencing, other fencing or tree-shelters) will be used to prevent browsing of planted shrubs or trees.

9.3.2 If the infiltration areas cannot be managed by grazing, management of the grassland will be carried out by mowing plus removal of arisings. To provide diversity of structure, margins of the shallow basin that have wetland species will be mowed less frequently than other areas. No areas will be left for more than two years without mowing (or grazing). Natural regeneration of willow (*Salix*) or other woody species will be controlled as necessary to keep cover of woody vegetation to less than 5% of the area.

9.3.3 To maintain the drainage function the proprietary treatment medium will require removal and replacement every 15 years or as otherwise required for its continued effective functioning. Grassland will be reinstated by replacement of turf or seeding after each replacement. The shallow basin or forebay pond and associated emergent vegetation will tend to trap silt, and may require more frequent maintenance to maintain a combination of open water and marginal emergent vegetation.

### **9.4 Monitoring**

9.4.1 These areas will be monitored to identify any accumulations of litter monthly and after a major storm event in accordance with Highways Agency 103/6 (Ref 9-1).

9.4.2 Monitoring for non-native plant species shall occur at least annually, and when identified non-native species shall be removed as soon as practicable.

9.4.3 Monitoring of condition of vegetation shall occur not less than annually in the first five years and every two years thereafter. Remedial maintenance will be carried out as necessary after monitoring, including control of undesirable species (e.g. control of ragwort to protect livestock). If dense emergent vegetation extends across more than 80% of the regularly wet area of the shallow basin, up to 30% of vegetation will be removed from that area.

## 10 Hedgerows

### 10.1 Existing Hedgerows

- 10.1.1 During construction existing hedgerows shall be protected, retained and inspected by measures set out by the Contractor's Arboricultural Mitigation Strategy.
- 10.1.2 This will also include managing the structure and integrity of the hedgerows during the construction period, with any trimming undertaken outside of the bird breeding season.

### 10.2 Proposed Hedgerows

- 10.2.1 Best practice horticultural techniques should be used in the planting of hedgerow vegetation to ensure rapid early growth. Rapid attainment of effective screening would be achieved through the autumn planting of both hedgerow and hedgerow with trees with a healthy root structure, including a mix of 40-60cm and 60-80cm transplants of blackthorn, hazel, hawthorn and holly, depending on species, and feathered hedgerow trees of beech, wild cherry and oak of 150-175cm and 200-250cm, depending on species. Fruit and nut bearing species would provide a food source for birds and small mammals.
- 10.2.2 The ground below the hedgerow planting will be maintained as bare ground in the first two to three years after establishment. Depending upon establishment of trees, these areas would then be seeded with a low-vigour native wildflower seed mix suitable for hedgerows. The ground flora should be maintained through annual cutting and manual removal of vigorous weed species. Once established, new hedgerow planting should be subject to the same maintenance work as for the rest of the existing hedgerows.
- 10.2.3 Specific management operations include:
- a) Non-desirable woody species should be removed during management operations and at other times as necessary, where this does not prejudice screening requirements.
  - b) In order to fulfil the management objectives, each hedgerow should be managed as appropriate, i.e. by trimming, laying, coppicing, bulking up, etc.
  - c) If managed by laying, this should be on a rotational basis. This is a traditional management technique and seeks to retain the structural integrity of hedgerows and maintain connections with other habitats. Cutting should be carried out at the end of the winter in February, thereby retaining berries through the winter months for wildlife, and avoiding the bird breeding season.
  - d) Where trimmed, hedges should, wherever possible, be managed on a three year rotation with only one side cut a year to help develop the desired tall bushy structure.

- e) Cutting back undergrowth, overgrowing or overhanging shrubs and minor tree branches from any pathways to maintain an unobstructed width of at least 2m or the existing width of the pathway, whichever is the greater.
- f) Reporting to landscape manager, following routine maintenance visits, on the existence and location of any hedgerow trees or parts of trees which are suffering from visible defects likely to cause danger, potential danger, obstruction or nuisance to users of adjoining properties, pathways and roadways.
- g) Retaining dead, over-mature or dying hedgerow trees wherever possible, but those which are considered dangerous for health and safety reasons, for example adjacent to public footpaths or residences, to be felled or lopped as appropriate to maintain safety, and in accordance with protected species constraints.
- h) In the interests of wildlife, hand weeding, where feasible, should take precedence over the use of herbicides in hedgerows. However, in certain instances, herbicide may be the most effective measure to take in relation to unwanted species.
- i) Where herbicide application is needed for the removal of unwanted species, it is recommended that an appropriate herbicide is applied in July - August in small controlled areas around the tree base.

## 11 Other Structures and Habitats

### 11.1 Bat structures

- 11.1.1 The Scheme includes the provision of two bat hibernacula, one near Vespasian's Camp within the site of a farm underpass and the other west of the River Till. Both areas recorded relatively high levels of bat activity during the 2016 and 2017 surveys. These will be designed to provide suitable roosting features for all species identified within the study area.
- 11.1.2 The two structures are not expected to require regular internal maintenance but they will need periodic internal inspection of structure to ensure that it is still sound. The best time for such an inspection is late summer/early autumn when bats will not be hibernating. Since the intention is that these structures will be used by roosting bats, they will be legally protected through the provisions of the Conservation of Habitats and Species Regulations 2017 and any structural inspection visit shall be accompanied by a person who holds a Natural England licence to disturb bats.
- 11.1.3 The exterior of the structure shall be inspected at least twice per year to ensure no vandalism, damage or blockage of the access has occurred. Since these visits will be strictly exterior they can take place at any time of year and a licensed bat worker will not need to be present. Any damage or blockage shall be rectified as soon as possible. Management of vegetation will be carried out around the entrances as necessary to ensure a clear flight path for bats and maintain access to the structure for interior inspections.
- 11.1.4 The underground bat structures will be monitored to check for the uptake of these structures by roosting bats and to inform any further management if required. During the first five years after construction there will be a winter inspection to check for usage by hibernating bats. Summer usage will be recorded by static detection methods or activity survey. Frequency of bat usage monitoring will be annual winter inspection and a survey period in summer during the first five years. Results including usage of interior fittings will be reviewed after five years and if necessary improvements to interior fittings will be carried out to encourage usage.

### 11.2 Mammal tunnels

- 11.2.1 Mammal tunnels will be incorporated into the Scheme, as near as practicable to known badger paths. Where tunnels cannot be aligned with existing badger paths or field boundaries badger fencing will be installed to help guide badgers and other species to the tunnels in so far as this can be done without conflicting with other Scheme requirements including access.
- 11.2.2 These mammal tunnels will require little maintenance other than an annual check to confirm that the entrances are draining appropriately, and are not becoming impassably overgrown or being deliberately blocked. If they are, the vegetation will need to be cut back and any blockages impeding drainage or access removed.

- 11.2.3 Ecological monitoring will also be undertaken to determine whether mammal tunnels and green bridges are in use post-construction.

### **11.3 Stone curlew plots**

- 11.3.1 A stone curlew plot is to be created at Parsonage Down. This will need to be maintained relatively free of vegetation during the growing season. This will normally consist of occasional scarification in period from October to March. It is understood that Natural England will encompass the management of this stone curlew plot in their normal management programme for Parsonage Down. A second stone curlew plot is being sought on land owned by RSPB. If this is secured it will require similar management. It is assumed that RSPB would encompass the plot management into their normal management regime.
- 11.3.2 All stone curlew plots will require annual condition inspection and ecological monitoring of usage by stone curlew. Given the locations of these plots (in Parsonage Down and potentially on land owned by RSPB) it is expected that these organisations will encompass this monitoring into their existing stone curlew plot monitoring programme for the area. A review will be carried out of the usage of these plots, any other plots created off-site and those within 500m of the Scheme.

## 12 Surfacing

12.1.1 The Scheme incorporates a variety of PRowS and Private Means of Access (PMA), with associated surfacing.

12.1.2 To provide clean, safe attractive and functional areas the routes:

- a) shall remain clear and accessible; and
- b) have a high quality surfacing.

12.1.3 To achieve these objectives, the following measures will be undertaken twice a year or additionally as the need arises, in addition to the routine sweeping and de-littering of surfacing:

- a) cutting back undergrowth, overgrowing or overhanging shrubs, hedges and minor tree branches from any pathways to maintain an unobstructed width of the pathway
- b) removal of weeds by hoeing, pulling or (as a last resort) use of approved herbicide
- c) inspection of any defects and potential dangers to the surface, and undertake remedial works at the earliest opportunity

## 13 Handover of maintenance obligations

- 13.1.1 During the construction phase the contractor shall prepare detailed landscape management proposals within the landscaping scheme required under the DCO.
- 13.1.2 For the initial five year period following completion of construction, the detailed landscape management proposals shall be set out by the contractor in a Handover Environmental Management Plan (HEMP).
- 13.1.3 Whilst the nature of the maintenance operations set out will typically be repeated year on year, the frequency of such operations should be considered to be flexible in order that response can be made to any change in circumstances necessary to achieve the target outcomes. The maintenance schedule will therefore need to be reviewed on an annual basis to determine the exact requirements to suit the longer term management objectives.
- 13.1.4 To achieve the objectives of the OLEMP, the landscaping scheme and the HEMP shall incorporate, where appropriate, the detailed requirements set out in Highway England's DMRB Volume 1 Series 3000 Landscape and Ecology Series and accompanying appendices:
- a) Appendix 30/2 Weed Control;
  - b) Appendix 30/3 Control of Rabbits and Deer;
  - c) Appendix 30/5 Grass Seeding, Wildflower Seeding and Turfing;
  - d) Appendix 30/6 Planting;
  - e) Appendix 30/7 Grass, Bulbs and Wildflower Maintenance;
  - f) Appendix 30/8 Watering;
  - g) Appendix 30/9 Establishment Maintenance for Planting;
  - h) Appendix 30/10 Maintenance of Established Trees and Shrubs; and
  - i) Appendix 30/11 Management of Waterbodies.
- 13.1.5 In some instances departure from standard specifications may be needed to achieve the target outcomes and advice should be sought from Highways England and the Steering Committee.
- 13.1.6 The indicative landscape management requirements during the construction (year 1-5) and operations (Year 5 onwards) phases are summarised in the following table:

**Table 13.1: Indicative landscape management requirements**

Action	Frequency																						
	Year 1-5												Year 5 onward										
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
<b>Existing Retained Vegetation</b>																							
Carry out quarterly inspections to identify any significant deterioration in tree or hedgerows health.			X			X			X			X			X			X			X		
Remove litter, rubbish and debris.	X		X		X		X		X		X		X		X		X		X		X		X
Replant where necessary to ensure desired species composition and replace any lost trees and whose loss is a direct result of the works. All woodland re-planting (if required) is to be carried out between November and March.	X	X	X							X	X	X	X	X								X	X
Invasive and undesirable weed species shall be monitored and controlled by appropriate direct management methods and through the application of an approved herbicide up to four times annually during maintenance period			X		X		X		X					X		X		X		X			
Undertake grass cuts to verges and within planting areas, where required.				X				X							X				X				
Remove emerging scrub from verges.								X											X				
<b>LE1.3 Species Rich Grassland</b>																							
Monitor development of the grass sward.			X			X			X			X			X			X			X		
Remove litter, rubbish and debris.			X			X			X			X			X			X			X		
Spot treat invasive and undesirable weed species.				X	X				X						X	X				X			
Hand-pulling of Common Ragwort (where required).						X		X									X		X				
Undertake grass cuts.				X					X											X			
Undertake grass cuts for visibility splays where required.				X		X		X		X					X		X		X		X		
Remove emerging scrub.								X											X				
<b>LE1.4 Exposed Chalk Cutting / rock/ scree</b>																							
Monitor development of the grass sward.			X			X			X			X			X			X			X		
Remove litter, rubbish and debris.			X			X			X			X			X			X			X		
Spot treat invasive and undesirable weed species.				X	X				X						X	X				X			
Hand-pulling of Common Ragwort (where required).						X		X									X		X				
Undertake grass cuts.				X					X											X			
Undertake grass cuts for visibility splays where required.				X		X		X		X					X		X		X		X		
Remove emerging scrub.								X											X				
<b>LE2.1 Woodland</b>																							
Remove litter, rubbish and debris.	X		X		X		X		X		X		X		X		X		X		X		X
Spot treat undesirable species.				X	X				X						X	X				X			
Hand-pulling of Common Ragwort (where required).						X		X									X		X				
Grass cuts to amenity and open grass within plots.				X				X							X				X				
Grass cuts to wildflower grass within plots.				X				X							X				X				

Action	Frequency																						
	Year 1-5												Year 5 onward										
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Re-firm plants as and when required.			X			X			X					X			X			X			
Inspect and adjust stakes, guards and ties, particularly after strong winds.			X						X					X						X			
Apply herbicide to plant circles as appropriate.			X			X			X					X			X			X			
Remove emerging scrub within plots in August.								X											X				
Check and record failing, dead or defective plants in the first five years.									X											X			
<b>LE2.4 Individual Trees</b>																							
Remove litter, rubbish and debris.	X		X		X		X		X		X		X		X		X		X		X		X
Spot treat undesirable species.				X	X				X						X	X				X			
Hand-pulling of Common Ragwort (where required).						X		X									X		X				
Grass cuts to wildflower grass within plots.				X					X											X			
Re-firm plants as and when required.			X			X			X					X			X			X			
Inspect and adjust stakes, guards and ties, particularly after strong winds.			X						X					X						X			
Apply herbicide to plant circles as appropriate.			X			X			X					X			X			X			
Remove emerging scrub within plots.								X											X				
Check and record failing, dead or defective plants.									X											X			
Replacement of failing, failed or defective plants should be planted.	X	X	X								X	X	X	X	X							X	X
Water plants during establishment for at least two years following PC.				X	X	X	X	X	X							X	X	X	X	X	X		
<b>LE2.6 Shrubs</b>																							
Remove litter, rubbish and debris.	X		X		X		X		X		X		X		X		X		X		X		X
Spot treat undesirable species.				X	X				X						X	X				X			
Hand-pulling of Common Ragwort (where required).																							
Establishment and subsequent cuts to amenity and open grass within plots				X				X							X				X				
Establishment and subsequent cuts to wildflower grass within plots.				X					X						X					X			
Re-firm plants as and when required.			X			X			X					X			X			X			
Inspect and adjust stakes, guards and ties, particularly after strong winds.			X						X					X						X			
Apply herbicide to plant circles as appropriate.			X			X			X					X			X			X			
Remove emerging scrub within plots in August.								X											X				
Check and record failing, dead or defective plants.									X											X			
Replacement of failing, failed or defective plants should be planted.	X	X	X								X	X	X	X	X							X	X
Fill water bowser and check irrigation system.				X	X	X	X	X	X							X	X	X	X	X	X		
<b>LE 3.1 Amenity Trees and Shrub Planting</b>																							
Remove litter, rubbish and debris.	X		X		X		X		X		X		X		X		X		X		X		X
Spot treat undesirable species.				X	X				X						X	X				X			
Hand-pulling of Common Ragwort (where required).						X		X									X		X				
Grass cuts to wildflower grass within plots.				X					X											X			

Action	Frequency																						
	Year 1-5												Year 5 onward										
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Re-firm plants as and when required.			X			X			X					X			X			X			
Inspect and adjust stakes, guards and ties, particularly after strong winds.			X						X					X						X			
Apply herbicide to plant circles as appropriate.			X			X			X					X					X			X	
Remove emerging scrub within plots.								X												X			
Check and record failing, dead or defective plants.									X											X			
Replacement of failing, failed or defective plants should be planted.	X	X	X							X	X	X	X	X								X	X
<b>LE4.2 Native Species Hedges</b>																							
Spot treat undesirable species				X		X			X				X		X			X					
Hand-pulling of Ragwort (if required)					X	X	X	X						X	X	X	X						
Re-firm plants			X			X			X			X			X					X			
Inspect and adjust stakes, guards and ties			X						X			X								X			
Apply herbicide to hedge base				X		X			X						X			X			X		
Trim hedge / formative pruning																							
Replacement of failed/failing plants									X	X	X	X	X	X							X	X	X
Remove stakes and guards																							
<b>LE6.1 Water Bodies and Associated Plants</b>																							
Remove litter, rubbish and debris	X				X				X			X					X				X		
Spot treat undesirable species				X																			
Removal of weeds (including non-native invasive weeds)																				X			
Herbicides to be used in accordance with the Environment Agency																				X			
Replacement of failed/failing plants									X	X	X	X	X	X							X	X	X
<b>LE6.2 Banks and Ditches</b>																							
Remove litter, rubbish and debris	X				X				X			X					X				X		
Spot treat undesirable species				X																			
Removal of weeds (including non-native invasive weeds)																				X			
Herbicides to be used in accordance with the Environment Agency																				X			
Replacement of failed/failing plants									X	X	X	X	X	X							X	X	X

## 14 References

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Samphire Hoe, Kent, UK – the reclamation platform created during the building of the Channel tunnel between France and the UK. Biodiversity and Conservation, vol. 11, pp. 39-58

- Ref 5.2: Some traditional arable weeds such as pheasant's eye (*Adonis annua*) are now rare species but in this context 'arable weeds' means common and widespread highly competitive species such as blackgrass (*Alopecurus myosuroides*) and creeping thistle (*Cirsium arvense*) which would be likely to swiftly outcompete chalk grassland seedlings if they were present in the seedbank in large numbers.
- Ref 5.3: Forest Research. 2014. Best Practice Guidance Note 18: Lowland Calcareous Grassland Creation and Management in Land Regeneration
- Ref 5.4: Values in parentheses are primary data collected from example sites – Aston Rowant, Oxfordshire (SSSI) and Saltbox Hill, Kent (SSSI).
- Ref 5.5: Acceptable upper limit. A level of available phosphorus of less than 10 mg kg<sup>-1</sup> is ideal to maximise floristic diversity within unimproved, semi-natural grassland communities (Marrs and Gough, 1989). While values of 11 to 25 mg kg<sup>-1</sup> have potential, expect reduced floral diversity and increased risk of competition from rank and pioneer species.
- Ref 5.6: Acceptable lower limit. While values for upper limits are not available the values in parentheses serve as a useful guide.
- Ref 5.7: Important Note: this ratio may be adjusted before works in the light of experimental studies investigating different substrate proportions
- Ref 6.1: Rodwell JS, et al.1992. British Plant Communities Volume III: Grasslands and Montane Communities
- Ref 6.2: Derived from the SSSI citation
- Ref 6.3: <https://wildseed.co.uk/mixtures/view/7> - Emorsgate Seeds
- Ref 6.4: This is the rate identified for calcareous grassland in DMRB Volume 10 (Environmental Design and Management) Section 3 (Landscape management) Part 1 HA 67/93: The Wildflower Handbook
- Ref 6.5: Biological nitrogen fixation is the process that changes inert nitrogen gas (N<sub>2</sub>) into biologically useful ammonia (NH<sub>3</sub>). This process is mediated in nature only by 'nitrogen fixing' rhizobia bacteria. Legumes (members of the pea family) contain these bacteria in root nodules and therefore have a competitive advantage over other plants in nitrogen poor soils. The other plant

species then benefit when the bacteria die and release nitrogen into the soil.

- Ref 6.6: where it occurs predominantly in a single large stand, of approximately 11,000 bushes on Beacon Hill to the south east of Bulford but is also found scattered in the grasslands
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