

Appendix E Revised Landscape and Mitigation Management Plan (LMMP)



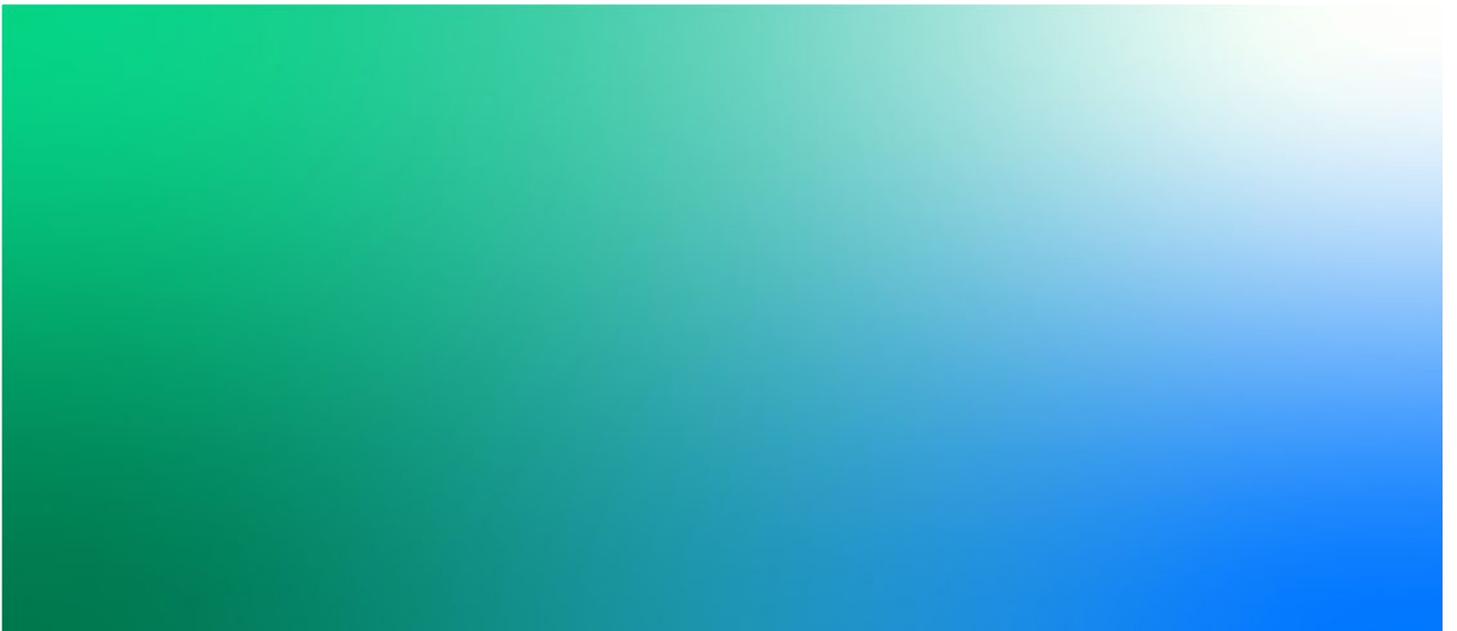
**River Sowy and King's Sedgemoor Drain Enhancements Scheme:
Phase 1**

Landscape Maintenance and Management Plan

ENVRES1001353-CH2-ZZ-400-PL-EN-1096

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Environment Agency



River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1

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Contents

Executive Summary iii

1. Introduction..... 1

2. Scheme overview 2

2.1 The existing site and context 2

2.2 The proposed scheme..... 2

3. Landscape design and management 3

3.1 Landscape works proposals..... 3

3.2 Landscape management and maintenance proposals..... 3

3.3 Grass seeding 4

3.3.1 Maintenance of grassland during the grassland establishment aftercare / maintenance period..... 4

3.4 Marginal wetland habitat..... 6

3.4.1 Maintenance of marginal wetland and associated planting during the marginal planting establishment aftercare / maintenance period 6

3.4.1.1 Weed control 6

3.4.1.2 Pruning..... 7

3.4.1.3 Other operations 7

3.4.1.4 Bird protection fencing..... 7

3.5 Wet scrub..... 7

3.5.1 Maintenance of wet scrub planting during the planting establishment aftercare / maintenance period 7

3.6 Tree planting 8

3.6.1 Maintenance of tree planting during the planting establishment aftercare / maintenance period..... 8

3.6.1.1 Weed control 8

3.6.1.2 Watering 8

3.6.1.3 Fertiliser application and pruning 8

3.6.1.4 Replacement of dead trees..... 9

3.6.1.5 Staking and plant protection 9

3.6.1.6 Protection fencing around trees 9

3.6.1.7 Coppicing of erosion control planting..... 9

4. Management responsibilities..... 10

4.1 Responsibility for works 10

4.2 Health and safety..... 10

5. Landscape management operations..... 11

6. Landscape management clauses 13

Appendix A. Landscape Masterplans

Executive Summary

This Landscape Maintenance and Management Plan (LMMP) sets out the work requirements to enable successful establishment, future monitoring and efficient and effective maintenance works of the landscape works implemented as part of the River Sowey and King's Sedgemoor Drain Enhancements Scheme: Phase 1. It covers both the initial establishment aftercare and rectification period following implementation (to be undertaken by the Contractor), and subsequent longer-term management (to be undertaken by the Environment Agency Area operational team).

1. Introduction

This document covers the landscape maintenance and management operations required for the soft landscape elements associated with the River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1 engineering works over a 5-year establishment aftercare period following implementation, and subsequent long-term management. It should be read in conjunction with the Landscape Masterplan which comprises ten drawings that are included in Appendix A.

The LMMP incorporates all the elements of the planting and grass seeding works included in the Scheme and indicates the type of operation required and frequency of maintenance visits. Each element has a corresponding specification clause summarising the maintenance and management works as set out in Section 6 of this LMMP. Further reference should be made to the Landscape Specification for Landscape Works Implementation and Establishment Aftercare Works which provides detailed and full specification clauses for landscape maintenance works during the establishment aftercare period.

Sections 2 and 3 of the LMMP include a brief scheme overview and outline of the design and management philosophy of the various planting zones in the Scheme for those involved in the future management of the site that have not been involved during the design and construction phases.

Management responsibilities are set out in Section 4 to record the agreed transfer of responsibility from the Contractor following initial establishment maintenance to the Environment Agency. Any areas of management responsibility still to be agreed at the time of issue are highlighted and management plan will be updated as appropriate as and when notable changes occur.

Details of plant and grass species and nursery stock specifications are included on the Landscape Masterplan drawing number ENVRESW001353-CH2-XX-400-DR-EN-5438 included in Appendix A.

2. Scheme overview

2.1 The existing site and context

The Sowy and King's Sedgemoor Drain (KSD) corridor is in the Somerset Levels and Moors, part of the coastal plain and wetland area which contains the Parrett catchment. The Sowy and KSD are man-made embanked flood relief channels, which carry excess water from the Parrett.

The Levels and Moors are the largest area of lowland wet grassland and associated wetland habitat remaining in Britain, covering about 60,000 hectares in the floodplains of the rivers Axe, Brue, Parrett, Tone and their tributaries. As such, the area has several international ecological designations such as the Somerset Levels and Moors Special Area of Conservation (SAC), Somerset Levels and Moors Special Protection Area (SPA) and Somerset Levels and Moors Ramsar site. The majority of the area is only a few metres above mean sea level. This is a landscape of rivers and wetlands, artificially drained, irrigated and modified to allow productive farming.

The Sowy/KSD corridor is approximately 21km long, mostly comprising agricultural land with a relatively low density of residential properties, and several access roads across the associated river corridor. Land towards the western (downstream) end of the Sowy system and its confluence with the KSD has a number of international nature conservation designations, principally due to wetland habitat value and overwintering birds.

Originally built in the 1960s, the Sowy acts as a flood water relief channel for the Parrett, joining it to the KSD. The Sowy and KSD take diverted water from the Parrett downstream from Langport, discharging into the tidal section of the Parrett at Dunball downstream of Bridgwater. This creates capacity in the channel of the Parrett so that more flood water can be pumped from the moors, reducing the extent and duration of flooding across a wide area.

When the Parrett reaches a pre-determined operational level, water flows over spillways near Langport (Aller Moor and Beazley's Spillways) and into the Sowy which conveys it to the KSD. Water can also be actively diverted from the Parrett into the Sowy via the Monk's Leaze Clyce – a sluice near Aller and Langport.

There are no statutory landscape designations within 1km of the study area.

2.2 The proposed scheme

The Proposed Scheme aims to reduce the flood risk from the Parrett to people and properties in the Somerset Levels and Moors downstream of Langport, via increased high flow conveyance down the River Sowy and the KSD.

Phase 1 of the River Sowy and King Sedgemoor's Drain Enhancements Scheme (referred to as the Scheme) focusses on capacity enhancements between Monk's Leaze Clyce on the Sowy and Parchey Bridge on the KSD. These include:

- (i) raising existing flood embankments adjacent to the Sowy and KSD where these are low;
- (ii) channel 'widening' through the creation of seven Water Framework Directive (WFD) enhancement features (three embayments, three lengths of two-stage channel and one back water); and
- (iii) raising the headwall of two existing water control structures on the KSD (Cossington Right Outfall and Chilton Right Outfall) and replacement of the existing sheet piled wing walls.

3. Landscape design and management

3.1 Landscape works proposals

The planting design aims to assist to integrate the proposed works into the existing landscape and provide long-term, low-maintenance native tree and scrub cover on the backwater island, tree planting on the banks of the KSD and Sowy at appropriate locations, marginal wetland habitat within the WFD enhancement features and grassland on the raised flood embankments which reflect the existing vegetation and habitat types.

The combined planting and seeding works are required to mitigate vegetation losses likely to occur during the construction of the required flood defence improvement works. They include replacement tree planting and the restoration of a grass sward with an erosion control function on the raised flood embankments. The provision of new marginal wetland and wet scrub habitat associated with the WFD enhancement features will provide additional environmental improvements.

All the combined landscape elements will contribute to improving biodiversity and enriching landscape character and visual amenity.

The implementation of the proposed landscape works shall be undertaken by the Contractor via the appointment of a landscape sub-contractor registered with the British Association of Landscape Industries (BALI).

3.2 Landscape management and maintenance proposals

Following completion of the landscape implementation works, the landscape works shall be maintained and managed by the Contractor via the appointed landscape sub-contractor who undertook the implementation works, for the duration of an establishment aftercare / maintenance period which will coincide with the rectification or defects period. The length of the establishment aftercare / maintenance / rectification period is as follows:

1. All grass seeding works: 18 to 24 months following Practical Completion of seeding depending on how long the seeded sward takes to establish sufficiently to enable the grassland to be returned to full grazing.
2. Marginal planting works associated with the WFD enhancement features: 12 months following Practical Completion of marginal planting.
3. Tree planting works: 60 months following Practical Completion of planting.
4. Wet Scrub planting works on backwater islands: 0 months. Wet Scrub planting will not be maintained following the implementation works in order to minimise disturbance of these wildlife refuges.

Practical Completion for grass seeding works shall be defined as when all seeding works are fully completed, seed germination is complete and satisfactory, the sward is free of all weeds and the sward has been subject to two initial grass cuts (see specification for details).

Practical Completion for planting works shall be defined as when all planting works are fully completed, all planting stock is healthy and correctly located and all planting areas shall be weed free and in a clean and tidy condition.

These seeding and planting implementation and management / maintenance works shall be undertaken as set out below.

3.3 Grass seeding

Upon completion of the flood embankment re-profiling and raising works and WFD enhancement features excavation works, the following areas will be seeded with the following seed mixes after pre-seeding preparatory works (including weed control and cultivation):

- a) Along the KSD, the raised flood embankments, (totalling approximately 2.82ha), will be seeded with a bespoke neutral wet grassland (NWG) mix containing 100% grass species with a soil-stabilising function.
- b) Along the Lower Sowy, the raised flood embankments (totalling approximately 3.83ha), will be seeded with the NWG mix containing 100% grass species with a soil-stabilising function.
- c) Newly created channel banks associated with the WFD enhancement features and any maintenance access routes which require creation or reinstatement will be subject to pre-seeding preparatory works and seeded with the NWG mix, as above.
- d) All working areas, haul routes and other areas disturbed during construction which comprised grassland prior to the commencement of the works will be subject to pre-seeding preparatory works and seeded with the NWG mix, as above.

3.3.1 Maintenance of grassland during the grassland establishment aftercare / maintenance period

The duration of the proposed establishment aftercare / maintenance period for grassland shall comprise a period of **eighteen to twenty-four months** following Practical Completion of seeding, depending on how long the seeded sward takes to establish sufficiently to enable the grassland to be returned to full grazing. If, after the first 18 months, the sward is sufficiently established to enable a return to full grazing and is a condition acceptable to the Environment Agency and other respective landowners, a shorter establishment aftercare / maintenance period may be agreed with the Environment Agency. Otherwise, the period shall extend to cover twenty-four months. During establishment aftercare / maintenance period, however long it is, all grass seeded areas and any existing grassland areas within the temporary protective fencing erected to protect newly seeded areas shall be maintained by the Contractor as follows:

Grass cutting

Newly seeded areas

In the first year after sowing, following two initial establishment cuts to be undertaken after seeding and germination, the newly seeded grassland areas (comprising the raised flood embankments and reinstated working areas and haul routes) shall be subject to 5 cuts evenly spread out through the growing season (e.g. cuts in April, May/June, July, August and October, assuming an autumn sowing in the previous year). The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed.

In the second year after sowing, the newly seeded grassland areas (comprising the raised flood embankments and reinstated working areas and haul routes) shall be subject to 3 cuts evenly spread out through the growing season (e.g. a spring cut in April, a main hay cut in late July/ early August and an autumn cut in October). The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed. Should the grassland be sufficiently established to enable a return to grazing after 18 months or more, the second year cuts should be omitted as appropriate.

In subsequent years (year 3 onwards), it is expected that the grassland areas will be managed by grazing, but should this not happen, then the grassland areas should be cut as per the second year.

Areas of existing grassland

Grassland areas on the:

- Left banks of the KSD and Sowy between the temporary protective fencing and the river channels;
- Right bank of the KSD between the river channel and the drain which runs parallel to the KSD some 30m away;
- Grassland areas on the right bank of the Sowy between the river channel and the Langacre Rhyne

shall be subject to 3 cuts evenly spread out through the growing season (e.g. a spring cut in early April, a main hay cut in late July/ early August and an autumn cut in October) throughout the one to two-year establishment aftercare / maintenance period. The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed.

In subsequent years (year 3 onwards), it is expected that the grassland areas will be managed by grazing, but should this not happen, then the grassland areas should be mown as per the second year.

All grassland areas

Mown clippings shall be boxed or raked up and disposed of a suitable composting facility or, where suitable, may be dried and baled as hay. Prior to cutting, areas to be cut shall be checked for ground nesting birds by an experienced ecologist and cutting delayed in areas where nesting birds are present, until the end of the nesting season (March to August inclusive).

Weed control

Grassland shall be maintained substantially free of broad leaved, injurious and invasive weeds by the application of a suitable herbicide by spot treatment or weed wiping or removal by hand. Injurious weeds are those listed in the Weeds Act 1959 and Wildlife and Countryside Act 1981 and include the following: spear thistle, creeping or field thistle, curled dock, broadleaved dock and common ragwort. Invasive weeds include giant hogweed, Himalayan balsam and Japanese knotweed. However other weeds which threaten infestation and / or disfigure the sites appearance may also be targeted including, but not necessarily restricted to; stinging nettle, fat hen, redshank, volunteer oil seed rape, gorse, rush and bramble.

Other operations

Stone picking, rolling, scarifying, harrowing, hollow tining, levelling, surface decompaction, fertiliser application and pest control to be undertaken if required and as directed by the Site Supervisor to maintain the health and growth of the sward.

Protection fencing of newly seeded areas

Newly seeded areas on the left bank of the KSD and Lower Sowy will be protected from grazing stock by the retention of temporary stock proof fencing installed at the commencement of construction. In addition, the two small areas of bank raising on the Upper Sowy near Oath will be protected from grazing stock by the erection of temporary stock proof fencing installed on completion of the bank raising works. Temporary stock proof fencing shall be retained and maintained until such time as the sward is considered sufficiently established to withstand a return to grazing. This may be up to two years after seeding. During this period, the temporary protective fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times. Temporary protective fencing will not be required on the right banks of the KSD and Lower Sowy because grazing will cease on the right bank from the commencement of construction until such time as the sward is considered sufficiently established to withstand a return to grazing. This may be up to two years after seeding to protect newly seeded areas from stock shall be maintained throughout the maintenance period.

At the end of the proposed two-year establishment aftercare / maintenance period (or earlier if it is agreed that the sward is sufficiently well established to resume grazing), it is intended that the seeded grass areas will be handed over to the respective landowners (private landowners and the Environment Agency) for on-going management, which is most likely to be by grazing. At this point, the temporary stock proof fencing along the left banks of the KSD and Sowy and around the two areas of bank raising on the Upper Sowy shall be removed by the Contractor.

3.4 Marginal wetland habitat

Upon completion of WFD enhancement features excavation works, all newly created marginal shelves on the embayments, two-stage channels and the backwater channel will be planted with appropriate marginal wetland species introduced by:

- a) Installing pre-vegetated coir rolls along the riverside edge of the marginal shelves in the embayments and two-stage channels and along the new channel edge of the marginal shelves in the backwater channel;
- b) Planting marginal wetland plug plants (230cc root trainers) in a one metre wide strip closer to the landward edge of the marginal shelves in the embayments and two-stage channels and in a 0.5m wide strip along the marginal shelves in the backwater channel;
- c) Re-planting any existing marginal plants (lifted from the channel edges at WFD enhancement locations prior to excavation and stored on site in suitable locations) on the newly created marginal shelves.

The planted wetland plants shall not be protected from bird predation by the installation of temporary protective post and wire mesh fencing for the duration of the establishment aftercare period. Protective fencing was initially proposed but has since been omitted from the works in order to save costs.

Planting will be also undertaken at WFD enhancement feature locations, comprising erosion control willow planting at both ends of all backwaters, embayments and sections of two-stage channels and wet scrub planting on the two backwater islands. These are covered in more detail in Sections 3.5 and 3.6 below.

3.4.1 Maintenance of marginal wetland and associated planting during the marginal planting establishment aftercare / maintenance period

Wetland habitat established by means of the installation of pre-vegetated coir rolls, the planting of wetland marginal plug plants, the translocation of existing vegetation from within the construction area and natural regeneration will rely on establishment maintenance initially with monitoring and management to ensure preferred habitat develops throughout these areas. By simple management during the establishment of vegetation cover, species prevalent within the existing site will be encouraged to develop, providing ecological benefit by reducing the number of undesirable species brought into the site.

For the duration of the proposed establishment aftercare / maintenance period for marginal planting, which shall comprise a period of **one year** following Practical Completion of planting all marginal planting areas shall be maintained by the Contractor as follows. All maintenance works in wetland areas shall comply with the required biosecurity measures as specified in Specification clause Q35/875.

3.4.1.1 Weed control

Wetland areas, including the pre-vegetated coir rolls and pallets, shall be regularly inspected for and maintained free of injurious and invasive weeds by hand pulling, digging out of roots or by herbicide application¹, depending on the species. Injurious weeds are those listed in the Weeds Act 1959 and Wildlife and Countryside Act 1981 and include the following: Parrots feather, Himalayan balsam, Japanese knotweed, *Crassula helmsii*, Floating pennywort and Water fern. However other plant species which threaten infestation and / or disfigure the sites appearance may also be targeted including, but not necessarily restricted to; *Typha latifolia*, docks, creeping and

spear thistle. Physical techniques are often inadvisable for non-native invasive species and the control method should be selected in accordance with the Environment Agency document "Managing invasive non-native plants" (April 2010 https://www.gov.im/media/62585/ea_invasive_plants.pdf).

All plant debris must be removed from the water or surface of the marginal area after any cutting operations. Advice should be sought from the Environment Agency on the disposal of non-native invasive plant arisings as these may be considered 'controlled waste'.

3.4.1.2 Pruning

Wetland plants shall be pruned as required to remove dead, damaged or diseased material to promote healthy growth and natural shape. Cut ends exceeding 25mm diameter shall be dressed with fungicidal sealant.

3.4.1.3 Other operations

Wetland areas shall be kept clear of litter and artificial debris. Coir roll stakes shall be checked for integrity and firmness. Any tree or shrub species that start to grow in the marginal wetland areas shall be removed by hand-pulling, digging up or by suitable herbicide application¹ (ensuring that the work is undertaken by competent operatives from a safe and secure access point), and in accordance with clause Q35/125 of the *Landscape Specification for EA Landscape Works Implementation and Maintenance Works*.

3.4.1.4 Bird protection fencing

As stated above, no fencing to protect marginal planting from bird predation is proposed. However, should levels of bird predation prove to be such that temporary protective fencing is required to be installed at a later stage, any installed fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

At the end of the proposed one-year establishment aftercare / maintenance period when it is intended that the wetland areas will be handed over to the Environment Agency for on-going management, a decision will be made to either remove any installed fencing or delay its removal until such time as the marginal planting has established sufficiently to be able to withstand bird predation.

3.5 Wet scrub

The backwater islands will be planted with appropriate wet scrub species to provide biodiversity habitat value for a range of species and to assist with long-term stabilisation of the banks. The wet scrub species (**WS** mix) will comprise *Betula pubescens*, *Crataegus monogyna*, *Rosa canina*, *Rubus fruticosus*, *Salix alba*, *Salix caprea*, *Salix cinereal* and *Sambucus nigra*.

3.5.1 Maintenance of wet scrub planting during the planting establishment aftercare / maintenance period

To prevent disturbance of these wildlife refuge areas and to avoid the safety risks involved in accessing the islands, the wet scrub planting will not be subject to maintenance works following planting. All wet scrub plants will be fitted with a fully biodegradable mulch mat on planting which will provide weed control benefits for a period of up to 36 months. No rabbit guards or shelters will be fitted unless the islands are planted in advance of the excavation of the backwater channels, in which case spiral rabbit guards will be temporarily fitted until the completion of the backwater channel excavation works.

¹ Use of herbicide in or near water will require prior agreement from the Environment Agency and must be carried out by a suitably skilled, qualified and knowledgeable person. <https://www.gov.uk/government/publications/application-to-use-herbicides-in-or-near-water>

3.5.2 Scrub planting protection fencing

Wet scrub planting shall be protected from damage from grazing stock by temporary post and wire stock proof fencing erected on the landward side of the backwater channel. The fencing and the associated pedestrian maintenance access gate shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times. The fencing shall be retained in place until the scrub planting is considered sufficiently mature to withstand damage from grazing stock, at which time it should be removed. Unless otherwise agreed with the Environment Agency, the temporary fencing and associated pedestrian access gate should be removed 5 years after the completion of the works and taken to suitable recycling facility.

3.6 Tree planting

Tree planting will be undertaken as follows:

- a) Replacement tree planting for trees removed to accommodate the proposed flood embankment raising works. This comprises the planting of 65 nr. bare-root Selected standard trees, 10 to 12 girth size, in a number of locations adjacent to the KSD and Lower Sowey. Species comprise *Betula pubescens*, *Salix alba*, *Salix caprea* and *Salix fragilis*.
- b) A variety of willow species will be planted as bare-root feathered stock or cuttings on the riverbank at both ends of every backwater, embayment and section of two-stage channel where the new wetland bank re-joins the existing riverbank to provide erosion control at the juncture. Species comprise *Salix cinerea*, *Salix caprea* and *Salix viminalis*.

Tree planting shall be protected from damage from grazing stock by permanent stock proof fencing.

3.6.1 Maintenance of tree planting during the planting establishment aftercare / maintenance period

For the duration of the proposed establishment aftercare / rectification period for tree planting, which shall comprise a period of **five years** following Practical Completion of planting, all tree planting areas shall be maintained by the Contractor as follows.

3.6.1.1 Weed control

An area of one metre diameter around each tree shall be maintained free of weeds and vegetation for the duration of the aftercare period. Weed control shall be undertaken either by hand weeding or with a non-residual glyphosate-based herbicide up to twice per month between March and October as required. Remove all weeds from site. Pernicious weeds (e.g. thistle, nettle, dock, bindweed) may require additional spot treatment. Strimming of vegetation should be avoided unless agreed with the site supervisor as this can lead to damage of plants and does not reduce the uptake of water and nutrients by weeds. Mulch mats shall be re-pegged or replaced as required to ensure that the mulch mats remain effective for a minimum of 36 months after planting.

3.6.1.2 Watering

Water trees during the establishment period as required sufficiently to maintain healthy growth.

3.6.1.3 Fertiliser application and pruning

Apply slow release fertiliser to all trees in March or April in accordance with the manufacturer's recommendations. Prune trees in accordance with good horticultural and arboricultural practice to remove dead, damaged or diseased material and promote well balanced form and growth pattern.

3.6.1.4 Replacement of dead trees

For the 5-year duration of the establishment aftercare / maintenance / rectification period, any trees which are dead, dying or otherwise defective must be replaced by approved equivalent trees during the next suitable planting season unless otherwise instructed. The numbers of trees that require replacement will be agreed in September/October before leaves drop, with the site supervisor. Dead trees will be removed from the site and replaced with new in accordance with the Landscape Specification before the end of the following March, ideally in November or December to ensure the highest success rates. The size and species of plants to be in accordance with the planting schedules unless otherwise agreed with the site supervisor.

3.6.1.5 Staking and plant protection

Guards, stakes and ties should not rub against the tree as this can damage the bark and lead to infection. Check condition of stakes, ties, guys and guards to ensure healthy establishment of the trees at each maintenance visit.

Broken or missing items to be replaced, ties adjusted to accommodate growth, loosened soil around trees/shrubs to be gently firmed, leaning trees to be straightened and any damaged bark to be cut back neatly with sharp knife to prevent further damage. Guards and stakes should be removed 5 years after the completion of the works and taken to suitable disposal facility.

3.6.1.6 Stock protection fencing around trees

Newly planted trees will be protected from grazing stock by permanent stock proof fencing. The fencing and associated pedestrian maintenance access gates shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

3.6.1.7 Coppicing of erosion control planting

When sufficiently well established, erosion control willow plants shall be coppiced to maintain vigour, form and function of plants to provide long-term erosion control. Arisings shall be removed from site. Allowance should be made for coppicing in Year 5 following planting and thenceforth every 5 years, subject to review of growth and need.

4. Management responsibilities

4.1 Responsibility for works

The Contractor (via their appointed landscape sub-contractor) will be responsible for:

1. All grass seeding works: **18 to 24** months post construction establishment maintenance and rectification following Practical Completion of seeding.
2. Marginal planting works associated with the WFD enhancement features: **12 months** post construction establishment maintenance and rectification following Practical Completion of marginal planting.
3. Tree planting works (excluding WS plots on backwater islands): **60 months** post construction establishment maintenance and rectification following Practical Completion of planting.
4. Post and wire planting protection fencing and access gates: **60 months** post construction maintenance following Practical Completion of planting.

At the end of these periods, the responsibility for the management and maintenance will revert to the Environment Agency and private landowners as follows. Replacement for any plant failures will be the responsibility of whoever has the management responsibility during that time period.

1. All grass seeding works: The Environment Agency on areas within EA ownership, private landowners on all other areas.
2. Marginal planting works associated with the WFD enhancement features: the Environment Agency.
3. Tree planting works: the Environment Agency.
4. Post and wire stock protection fencing and access gates: the Environment Agency.

The Environment Agency Area team responsible for River Sowy and KSD will review the long-term requirements for regenerative treatment of planting and seeding as and when necessary. However, on the basis that adequate establishment maintenance is undertaken and planting is allowed to fully establish and develop, the proposed planting should provide long-term functionality and wildlife cover with limited regular management works and without the need for supplementary planting.

4.2 Health and safety

Prior to any landscape maintenance and management activities being carried out, the parties involved will have an obligation to ensure that all health and safety implications have been identified, all necessary risk assessments have been made, a safe system of work is in place and that operatives are properly trained and provided with appropriate personal protective equipment (PPE). Risks and proposed mitigation measures are provided in the Designer's Risk Assessment for the Proposed Scheme (document number: ENVRESW001353-CH2-DL-400-RA-C-1023).

5. Landscape management operations

Table 1. Schedule of Landscape Management Operations

NOTE: Locations are given as Section numbers as set out on the Landscape Masterplans.

CLAUSE No	CLAUSE TITLE	No OF VISITS (MINIMUM)
TREE AND SHRUB PLANTING (excluding Wet Scrub plots on backwater islands):		
Locations: Sections 2, 3, 4, 5, 6, 7, 8 and 9.		
1.	Check/adjust stakes, ties and guards	4 per year (years 1-5 unless removed earlier)
2.	Weed control	4 per year (years 1-5 subject to establishment)
3.	Water to field capacity	as required to ensure healthy growth (years 1-5)
4.	Slow release fertilizer application	1 per year (years 1-5 subject to establishment)
5.	Cleaning out and dead wooding	1 per year
6.	General pruning operations	1 per year (years 1-5)
7.	Replacement planting	1 per year if necessary (first 5 years only)
8.	Hand weeding of tree and shrub guards	4 per year (first 3 years only)
9.	Straighten plants and re-firm around roots	4 per year (first 5 years only)
10.	Remove stakes, ties and guards	1 no. visit (before or at end year 5 subject to establishment)
11.	Inspect and maintain temporary stock fencing and gate along KSD back water.	4 per year (years 1-5).
12.	Inspect and maintain permanent stock fencing and gates around tree planting	4 per year (years 1-5, thenceforth 2 per year).
13.	Thin / coppice tree and shrub planting	1 no. visit (at end year 5 subject to establishment, thenceforth every 5 years subject to review)
GRASSLAND – NEWLY SEEDED AREAS		
Locations: Sections 2, 3, 4, 5, 6, 7, 8, 9 and 14.		
14.	Mowing of newly sown grassland areas	5 cuts in Year 1, 3 cuts in Year 2 unless grazed. Thenceforth 3 cuts per year if not grazed.
15.	Spot herbicide weed treatment.	As necessary within grassed areas as per spec
16.	Other operations (stone pick, roll etc)	As necessary within grassed areas as per spec
17.	Temporary stock proof fence – inspect/maintain	4 per year (year 1 and year 2 if not grazed)
18.	Temporary stock proof fence – remove	1 per year (year 1 or year 2 if not grazed)
19.	Scrub removal in grassland areas	5-year cycle long term
GRASSLAND – EXISTING AREAS TO BE MAINTAINED		
Locations: Sections 1, 2, 3, 4, 5, 6, 7, 8, and 9.		
20.	Mowing of existing grassland areas	3 cuts per year (year 1 and year 2 if not grazed) thenceforth 3 cuts per year if not grazed.
21.	Spot herbicide weed treatment.	As necessary within grassed areas as per spec
22.	Other operations (stone pick, roll etc)	As necessary within grassed areas as per spec
MARGINAL WETLAND HABITAT		
Locations: Sections 3, 4, 5, 6, 8, and 9.		
23.	Algae and noxious weed control	As necessary within grassed areas as per spec

24.	Spot herbicide weed treatment	As necessary within grassed areas as per spec
25.	Scrub removal and control	
26.	Removal of litter and checking of stakes	4 per year (years 1-2) (removal of litter - annual cycle long term)
27.	Inspect and maintain bird protection fencing	4 per year (years 1-2)
28.	Remove bird protection fencing	End of year 2 unless extension required
ALL AREAS		
29.	Litter collection	At every maintenance visit
30.	Cleanliness	At every maintenance visit

NOTES:

1. The operations above will be carried out for the full 1 year (marginal wetland habitat), 1.5-2 year (newly seeded and reinstated grassland) or 5- year (planting) period as specified. Some will be pertinent to the longer-term management of the site (extended in 5 year cycles from year 5 onwards for thinning and coppicing cycles for example). Some operations such as vegetation control, litter picking, and site cleanliness will be subject to resource availability and revenue costs in the long term and may vary depending on the future operational requirements of the Environment Agency or use of the site. Future variations should be recorded in the LMMP to register changes in management operations.

2. The number of visits indicated for the establishment period maintenance (years 1 to 5) is to be taken as a minimum, the contractor is to ensure enough additional visits or combine operations to ensure compliance with the clauses in Appendix A. The frequency of visits may also be adjusted as a result of subsequent agreement between the Contractor/ landscape contractor and the Environment Agency (and its agents in determining maintenance responsibilities and approach over the first 5-year period. No adjustment to the frequency of visits should result in less than 4no. visits per year in total, for the maintenance years 1-5.

3. Changes in management operations arising from change in construction approach or resulting from changes as vegetation establishes in particular areas of the site should be recorded in the LMMP in order to inform ongoing and future management operations and requirements.

4. Due to the nature and characteristics of the site, maintenance and management approaches need to be flexible with due consideration for overlap in vegetation/habitat types within the respective planting zones illustrated on the masterplans. The landscape management operations set out in Table 1 provide a guide for overall requirements, but maintenance work should be programmed appropriately by those responsible for undertaking the work at any stage in the site's development.

5. Changes on site should be monitored and recorded in order that the LMMP can be adapted to respond to changes in habitat establishment or development.

6. Landscape management clauses

Landscape management and maintenance operations during the 2 /5 year aftercare establishment periods shall be undertaken in accordance with the Landscape Specification for Landscape Works Implementation and Establishment Aftercare Works. These specification requirements are summarised below for reference but should not be considered exhaustive and further reference should be made to the full specification in undertaking the works. To be read in conjunction with the Landscape Management Operations table on the previous page.

NATIVE STANDARD AND FEATHERED TREES AND SHRUBS (EXCLUDING WET SCRUB PLANTING)

1. TREE STAKES AND TIES; TREE SHELTERS

Inspect and carry out the following:

Check stakes for looseness, breaks and decay and replace as necessary to original specification. If a tree with a defective stake has grown sufficiently to become self-supporting, inform the Contract Administrator (henceforth referred to as CA) and, if instructed, remove stake(s) and fill the hole(s) with lightly compacted soil.

Adjust, re-fix or replace loose or defective ties as necessary.

Remove redundant tapes, tags, ties, labels and other encumbrances.

Check all tree and shrub guards at regular intervals to ensure that they are secure. Notify CA of number of missing or damaged guards and obtain instructions for replacement. Replacement guards to comprise:

- Feathered trees (erosion control planting): Tubex Mesh Shrub Shelterguard, 0.6m high x 144-200mm dia, Olive Green colour, oxo-biodegradable polypropylene.
- Standard trees: Green-tech Rainbow Treebio Biodegradable Spiral rabbit guards, 0.6m high x 68mm dia, Polylactic Acid with UV stabilisation system.

2. WEED CONTROL

Use a suitable herbicide to maintain a weed free zone 0.5m radius around the base of each tree. One of the applications per year to be winter applied residual herbicide to provide residual cover for early spring growth.

Herbicide to be applied by a certified user in accordance with the manufacturer's instructions. Where work is near water, drainage ditches or land drains, comply with the DEFRA guidelines for the use of herbicides on weeds in or near watercourses and lakes. No herbicide may be applied on or near water without a valid herbicide application licence issued by the Environment Agency, allow sufficient time to obtain approval for this application. Proof of consent for each licence application must be provided to the CA prior to each herbicide application. Take special care to prevent spray drift into water bodies and adjoining land.

Mulch mats shall be re-pegged or replaced as required to ensure that the mulch mats remain effective for a minimum of 36 months after planting.

3. WATER TO FIELD CAPACITY

Water as necessary to field capacity to ensure the continued thriving of all planting.

4. SLOW RELEASE FERTILIZER APPLICATION

In March or April, evenly spread and incorporate 15:15:15, N:P:K granular slow release fertilizer at a rate to suit manufacturer's instructions within native scrub planting stations only. No fertilizer to be applied in sensitive habitat areas including field layer planting, species rich grassland or marginal / aquatics.

5. CLEANING OUT AND DEADWOODING

Remove:

- Dead, dying, or diseased wood, broken branches and stubs.
- Fungal growths and fruiting bodies.
- Wind-blown or accumulated rubbish in branch forks.

6. GENERAL PRUNING OPERATIONS

Do not prune natural form of feathered trees unless damaged, diseased or deadwood present.

Do not prune during the late winter/early spring sap flow period, unless specified otherwise.

Prune in accordance with good horticultural practice.

Thin, trim and shape appropriately to each species, location, season, and stage of growth, leaving a well-balanced natural appearance.

Use clean sharp secateurs, hand saws or other tools approved by the CA.

Trim off ragged edges of bark or wood with a sharp knife.

Remove branches without damaging or tearing the stem.

Keep wounds as small as possible and cut cleanly back to sound wood. Make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.

Prune larger branches neither flush nor leaving a stub but using the branch bark ridge or branch collar as a pruning guide.

Notify the CA of any disease or fungus. Do not apply growth retardants, fungicide or sealant unless instructed by the CA.

Inform CA if any growth is encroaching onto paths, tracks, structures etc.

7. REPLACEMENT PLANTING

Inform CA of any trees which are dead or dying and obtain instructions for replacement. Replacement trees to be the same species and of a comparable size with the surrounding trees (where practical to do so) or default to original specification (if site constraints reduce viability of planting larger nursery stock). Additional watering and fertilizer applications are to be undertaken, sufficient to ensure the successful establishment of the tree. Do not undertake replacement planting in periods of drought or out of season.

8. HAND WEEDING OF TREE AND SHRUB GUARDS

Keep the base of all tree and shrub guards/shelters clear of weeds and grass, by hand weeding to ensure there is no weed or grass growth within the ring spray area (where herbicide ring spraying misses weeds growing close to each tree/shrub). Remove all weeds, including roots, by hand using hoes, trowels or forks, taking care to remove not more than a minimum quantity of soil, causing minimum disturbance to trees and leaving the area in a neat, clean condition.

9. STRAIGHTEN PLANTS AND REFORM AROUND ROOTS

Re-firm soil around any loose plants, without compacting and ensure that all plants are upright after each visit. Ensure any recently replaced planting in remote areas of the site are re-visited to re-firm and straighten as necessary.

10. REMOVE STAKES, TIES AND GUARDS

Once the tree/shrub has successfully established with firm root support and no indications of movement around the root ball, remove the stake, tie and guard from the tree. Bear in mind individual trees may not develop at the

same rate and each tree should be checked independently before removing support. All ties and guards to be removed off site and recycled in appropriate recycling facilities upon removal.

11. INSPECTION AND MAINTENANCE OF STOCK FENCING AND ACCESS GATES

Newly planted trees and shrubs will be protected from grazing stock by temporary and permanent stock proof fencing. The fencing and associated maintenance access gates shall be inspected at regular intervals and repaired or reinstated as required to maintain these elements in a fully functional condition at all times.

12. THINNING/COPPICING

Thinning and coppicing operations to be undertaken at year 5 and subsequently on 5 yearly cycles subject to development of the planting and following a review by the CA or suitably qualified personnel. Thinning and coppicing only to be undertaken to promote healthy vegetation cover, structural/age diversity and to retain preferred species content of the original planting. Where thinning is required treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth. Arisings from thinning or coppicing operations should be either removed from site or either chipped and spread or windrowed (subject to location and sensitivity of ground flora).

GRASSLAND AREAS

13. MOWING NEWLY SOWN NWG GRASSLAND

Preparation: Before each cut remove all litter and debris.

Cutting:

- First year after sowing: Following the two initial establishment cuts to be undertaken after seeding and germination, NWG grassland shall be subject to five cuts evenly spread out through the growing season (e.g. cuts in April, May/June, July, August and October, assuming an autumn sowing in the previous year). Clippings shall be removed by boxing or raking up and disposed of a suitable composting facility, unless growth and arisings are light enough to allow dispersal over the seeded areas but if this creates a mulch, arisings shall be removed from site.
- Second year after sowing: NWG grassland shall be subject to three cuts evenly spread out through the growing season (e.g. a spring cut in April, a main hay cut in late July/ early August and an autumn cut in October). Clippings shall be removed by boxing or raking up and disposed of a suitable composting facility, unless growth and arisings are light enough to allow dispersal over the seeded areas but if this creates a mulch, arisings shall be removed from site.

Minimum height of cut: 75 mm.

14. MOWING EXISTING GRASSLAND

Preparation: Before each cut remove all litter and debris.

Locations:

- left banks of the KSD and Sowy between the temporary protective fencing and the river channels.
- right bank of the KSD between the river channel and the drain which runs parallel to the KSD some 30m away.
- grassland areas on the right bank of the Sowy between the river channel and the Langacre Rhyne.

Cutting: 3 cuts evenly spread out through the growing season (e.g. a spring cut in early April, a main hay cut in late July/ early August and an autumn cut in October). The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed.

Minimum height of cut: 75 mm.

15. SPOT HERBICIDE WEED TREATMENT

Use a suitable herbicide and appropriate method of application to maintain all newly seeded and existing grassed areas predominantly free of noxious and notifiable weeds or other undesirable species. Treatments should ensure that existing grass cover and planting are not detrimentally affected by any such herbicide application. Spot application methods to be utilised to prevent spray drift or kill of required ground cover and vegetation. Herbicide to be applied only by a certified user in accordance with manufacturer's instructions. Re-apply herbicide as necessary to maintain the level of weed control described above. Allow the recommended period before clearing arisings and removing from site.

16. OTHER OPERATIONS

Undertake stone picking, rolling, scarifying, harrowing, hollow tining, levelling, surface decompaction, fertiliser application and pest control to be undertaken if required and as directed by the Site Supervisor to maintain the health and growth of the sward.

17. INSPECTION AND MAINTENANCE OF TEMPORARY STOCK FENCE

Temporary protective fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

18. REMOVAL OF TEMPORARY STOCK FENCE

At the end of the proposed two-year establishment aftercare / maintenance period (or earlier if it is agreed that the sward is sufficiently well established to resume grazing), the temporary stock proof fencing along the left banks of the KSD and Sowy shall be removed off-site by the Contractor for recycling/re-use and post holes infilled with soil or posts cut off at ground level to prevent fall or trip hazards to livestock or people.

19. SCRUB REMOVAL IN GRASSLAND AREAS

Subject to ongoing grassland maintenance beyond year 2 by grazing or cutting, if grassland within Environment Agency ownership is left uncut or ungrazed for any reason, scrub removal may be desirable to maintain the open grassland character and prevent loss of habitat to self-seeded scrub and woodland species, particularly on the flood embankments. If this is desirable in terms of long-term management of the site, scrub removal should be undertaken on a 5 yearly cycle starting in year 5. Where thinning is undertaken treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth. Remove any arisings from thinning operations from site.

MARGINAL WETLAND VEGETATION

20. ALGAE AND NOXIOUS WEED CONTROL

Control algal blooms and aquatic weeds developing in the water body as necessary to maintain a balanced mix of preferred/desirable species. Control measures and method statement to be agreed prior to treatment.

21. SPOT HERBICIDE WEED TREATMENT

Use a suitable herbicide and appropriate method of application to maintain all-natural regeneration marginal areas predominantly free of noxious and notifiable weeds or other undesirable species. Treatments should ensure that existing grass cover and vegetation are not detrimentally affected by any such herbicide application. Spot application methods to be utilised to prevent spray drift or kill of required ground cover and vegetation. Use of herbicide in or near water will require prior agreement from the Environment Agency and must be carried out by a suitably skilled, qualified and knowledgeable person in accordance with manufacturer's instructions. Re-apply herbicide as necessary to maintain the level of weed control described above. Allow the recommended period before clearing arisings and removing from site.

22. SCRUB REMOVAL AND CONTROL IN AND AROUND MARGINAL WETLAND

Remove self-sown tree and shrub species (e.g. willow, alder, birch and hazel) from within marginal wetland areas by hand pulling, digging up or by suitable herbicide application.

Control self-sown tree and shrub species establishing on the banks around marginal wetland areas by thinning or coppicing as required. Thinning and/or coppicing operations to be potentially undertaken at year 5 and subsequently on 5 yearly cycles subject to development of scrub around the margins of the water body and following a review by the CA or suitably qualified personnel. Thinning and coppicing only to be undertaken to promote healthy vegetation cover around the margins of the water body and discourage scrubbing over of the water body to retain preferred species. Where thinning is required treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth. Remove any arisings from thinning operations from site.

23. INSPECTION AND MAINTENANCE OF TEMPORARY BIRD PROTECTION FENCE

Not currently required. If it subsequently becomes required and is installed, temporary bird protection fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

24. REMOVAL OF TEMPORARY BIRD PROTECTION FENCE

Not currently required. If it subsequently becomes required and is installed, at the end of the proposed one-year establishment aftercare / maintenance period (or earlier if agreed with the Environment Agency) the temporary bird protection fencing used to protect newly planted marginal vegetation within the KSD and Sowy shall be removed off-site by the Contractor for recycling/re-use.

LITTER PICKING**25. LITTER COLLECTION**

Collect and remove all extraneous rubbish detrimental to the appearance of the site, including paper, packaging materials, bottles, cans, and similar debris from all planted and grassed areas, particularly immediately prior to mowing and/or strimming grass.

26. CLEANLINESS

Remove extraneous soil, grass cuttings and other arisings from all surfaces and leave the works in a clean, tidy condition after all maintenance operations.

VEGETATION CONTROL**27. SPOT HERBICIDE WEED TREATMENT**

Over and above any specific weed treatment specified in previous clauses, use a suitable herbicide and appropriate method of application to maintain the site predominantly free of noxious and notifiable weeds or other undesirable species. Treatments should ensure that general grass cover and vegetation established is retained and adjacent grass cover and planting are not detrimentally affected by any such herbicide application. Spot application methods to be utilised as necessary to prevent spray drift or kill of adjacent areas of vegetation. Herbicide to be applied only by a certified user in accordance with manufacturer's instructions and all current guidelines and codes of practice as relevant to the species to be treated. Re-apply herbicide as necessary to maintain the level of weed control described above. Allow the recommended period before clearing arisings and removing from site. Where appropriate a wider scale, more intensive vegetation control programme or management strategy may be required to address specific weed issues within the site. Where work is near water, drainage ditches or land drains, comply with the Defra guidelines for the use of herbicides on weeds in or near watercourses and lakes. No herbicide may be applied on or near water without a valid herbicide application licence issued by the Environment Agency, allow sufficient time to obtain approval for this application. Proof of

consent for each licence application must be provided to the CA prior to each herbicide application. Take special care to prevent spray drift into water bodies and adjoining land.

Appendix A. Landscape Masterplans

See Appendix D of the ES Addendum