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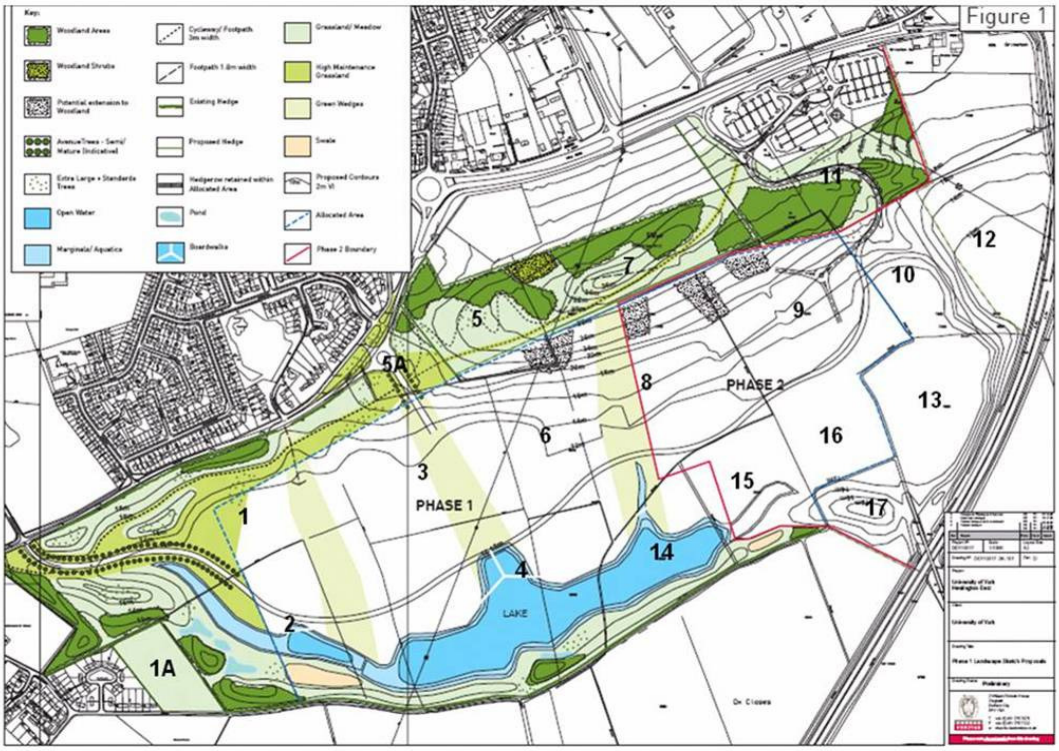


# HESLINGTON EAST ENVIRONMENTAL SITE MANAGEMENT PLAN

| *Version* | *Date* | *Prepared by* | *Comments* |
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**Heslington East Development**
**Environmental Site Management Plan**

Contents

## 1 Introduction

This Environmental Site Management Plan has been prepared by the University of York with expert input from Bureau Veritas (formerly Cassella Stanger) and White Young Green.

Within the Secretary of State's decision letter of 27th June 2007, Condition 15 states:

> "Before the commencement of development, an Environmental Site Management Plan shall be submitted to and approved in writing by the Local Planning Authority. The ESMP shall include:
>
> (i) provision for protection of water resources during construction activities and thereafter during the operation of the site;
> (ii) proposals for the interim use of land prior to its development;
> (iii) implementation and future management of the proposed ecological mitigation measures;
> (iv) implementation and future management of proposed habitat and species enhancement measures;
>
> These measures shall be implemented in accordance with an agreed programme, unless otherwise agreed in writing with the Local Planning Authority. The Environmental Site Management Plan shall be reviewed every five years, from first approval, and any amendments agreed in writing with the Local Planning Authority. Any alterations to the measures in the approved Environmental Site Management Plan during any interim period shall be subject to the prior written approval of the Local Planning Authority."

This document addresses this requirement. It should be noted that there is considerable overlap between environmental, landscaping and land management issues and this document should be read in conjunction with the following Heslington East documents:

- The Master Plan and Strategic Design Brief and Landscape Master Plan (Conditions 11 and 12)
- The Landscape Management Plan (Condition 13)
- The Construction Environmental Management Plan (Condition 14)

To support the objectives contained within this plan it is proposed to establish an Educational Field Study Centre in the south west edge of the site. This can be accessed by a range of interest groups and a number of projects initiated as part of the Centre's remit. The exact details of this Centre have to be finalised.

## 2 The Proposed Ecological Mitigation and Enhancement Measures

### *2.1 Planning Background*

Within the Environmental Impact Assessment included as part of the Outline Planning Application, information was provided on the baseline ecology of the Heslington East site against recognised national guidelines. This assessment concluded that "within the site, there are two ecological features that can be considered as of national importance. These are the hedgerows and the bats that are of importance due to their national conservation status. There are a further five features of local importance, namely aquatic invertebrates, breeding barn owl and kingfisher, water voles and badgers."

The findings of this study were checked in supplementary surveys carried out by Bureau Veritas in March 2006 and presented to the Heslington East public inquiry in 2006. These concluded that:

- None of the hedgerows qualify as important under the 'wildlife and landscape' criteria of The Hedgerows Regulations 1997.
- No barn owls breed within the site
- Water Voles can safely be assumed to be absent from the site
- There are no badger setts within the site or a 30m buffer zone, and no signs of other activity within the site have been encountered

Within his report the Heslington East Planning Inspector concludes:

> "703 The site is mostly arable farmland with field boundaries, including hedgerows, ditches and some mature trees. Similar farmland habitat can be seen to the south and east of the site…… It is intended to create areas of biodiversity within the site including areas of wetland, species rich grassland and native woodland, and the boundary of the site would consist of new and retained ancient and/or species rich hedgerows.
>
> 704 …..The proposed development would have some negative impact on species that thrive on open agricultural land. Those species include Corn Bunting, Grey Partridge and Sky Lark. Golden Plover have also been seen on the site, as have Brown hares. However the habitats created as part of the development would benefit other species such as Bullfinch, Linnet, Reed Bunting, Song Thrush, Spotted Flycatcher, Barn Owls and Kingfishers and Pipistrelle, Brown Long-eared, Daubenton's and Noctule Bats. Eutrophic standing water, lowland meadow and lowland mixed deciduous woodland habitats would also be created.
>
> 705 There would be no negative impacts on any site of international, national or local biodiversity interest and no negative impacts on any species listed as specifically protected under the Habitats Directive and the

Wildlife and Countryside Act 1981. I therefore find the proposal to be in conformity with the advice in PPS9."

In summary, the mitigation of existing flora and fauna will focus on:

- The protection and preservation where possible of existing hedgerows and compensation by replacement planting where loss is inevitable
- The protection where possible of existing habitats for bats and the inclusion of additional appropriate habitats within the development
- The protection where possible of habitats for kingfishers and the inclusion of additional appropriate habitats within the development
- The protection where possible of habitats for aquatic invertebrates and the inclusion of additional appropriate habitats within the development

As referenced within the Inspector's conclusions the development will create additional character habitats. This ESMP identifies the species that could be encouraged by this increase in habitat diversity. It should be noted that it is not intended to artificially introduce any animal species to the Heslington East site. Habitats will be created that support certain species however it cannot be guaranteed that they will migrate to the site and become established.

This ESMP should be read in conjunction with the document "Design Guidelines – Heslington East Landscape Master Plan" dated November 2006. This provides an overview of the landscape character areas within which the habitats described within the ESMP will be created.

## *2.2 Mitigation of Impacts of Existing Flora and Fauna*

The following approaches will be taken to mitigate the above impacts:

### *2.2.1 Hedgerows*

It has been accepted that hedgerows will be lost particularly as a consequence of the development, however to compensate for this the following principles will be adopted:

- where hedgerows are lost there will be compensation in the planting of additional locally appropriate native trees and shrubs
- hedgerows around the perimeter of the application site will be reinforced, made good and diversified.
- where possible existing hedgerows will be incorporated within the design of the infrastructure
- where possible the other linked landscape features with hedgerows will be retained maintaining the existing diversity of habitats. This includes ditches and grass verges

In this way the potential impacts arising from the loss of hedgerow habitats are avoided (by retaining the hedgerows) and minimised (by sensitive design of new plantings). Over time this should result in no net loss of hedgerow habitats.

A hedgerow survey has been completed and is included within the Landscape Management Plan. This shows that the existing hedgerows have not been fully maintained and that there are numerous gaps. It also identifies recommended management actions to improve their quality. Implementation of these actions will significantly enhance the hedgerow habitats that will be available.

Removal of hedgerows is to be outside the breeding season and with prior approval

#### *2.2.2 Bats*

During the ecological surveys carried out to provide information for the Environmental Impact Assessment and the Public Inquiry, there was no evidence of any bats roosting in the trees on the site, although there were a number of potential bat roosting sites. The majority of the trees on the site will be preserved and these potential roosting sites protected.

The conclusion of the Biodiversity evidence presented to the Public Inquiry was that the creation of new woodland and wetland habitats will have a positive impact on four species of bat - Pipistrelle, Brown Long-eared, Daubenton's and Noctule. The University will provide a number of bat boxes within the existing mature trees to increase roosting opportunities.

#### *2.2.3 Kingfishers*

It is planned to introduce ponds on the south west side of the lake. These will provide an excellent feeding habitat for kingfishers when populations of small fish such as sticklebacks have been established. Within the detailed design, habitats for breeding pairs of kingfishers will be provided such as banks.

#### *2.2.4 Aquatic Invertebrates*

The ponds on the south west side of the lake will also provide ideal habitats for aquatic invertebrates, as will the marginal plantings, reed beds and shallow water around the lake margin. The landscape plantings and habitats will provide foraging areas for adult dragonflies.

### *2.3 Habitat Enhancement and Creation*

In accordance with the requirements of the development brief and as described within the Outline Planning Application and Public Inquiry, the development will introduce new habitats to the site and particularly grassland, woodland and wetlands around the lake. These will be designed to fit with the York City Biodiversity Action Plan and other strategic conservation plans. A range of habitat opportunities will be available. The

areas for habitat enhancement will focus particularly on the perimeter landscape which will include predominately local native species.
The northern perimeter landscape will be areas for parkland and woodland and include significant areas of grassland; this includes the buffer zone to Badger Hill and the slopes of Kimberlow Hill. The areas to the south and west sides of the lake will include ponds and wetlands. There will be limited access for people to the lake edge and the development of natural eco-systems will be encouraged. The close proximity to the rural landscape to the south of Low Lane will provide a corridor for a range of species to migrate to the site. It is planned that the ponds and wet lands in the south west corner of the site will be part of the Educational Field Study Centre.

The main, high density, development area is not considered primarily for habitat creation; however the green wedges will include grass and native species of tree. The use of bulbs and flowering shrubs will encourage insects which in turn will attract other wildlife.

It should be noted that all animal species will be allowed to colonise naturally.

### *2.4 Range of Species Attracted by New Habitats*

It is intended that the landscape will be developed with a range of new habitat opportunities. Habitat creation is no guarantee that the target species will become established, however the following lists provide indications of the species that may be attracted over time. It is intended that periodic surveys will take place to establish which species have populated the new landscape. This may be an activity to be carried out as part of the Educational Field Study Centre programme.

#### *2.4.1 Parkland Landscape*

The areas within the parkland landscape will be a mix of regularly maintained grassland to infrequently mown areas devoted to nature conservation objectives. The more frequently mown areas will contain groupings of large scale specimen / parkland trees which will be selected for their contribution to parkland character and botanical interest. Groupings of smaller trees, selected for interesting properties of form, bark, autumn colour etc., will form a secondary network, mainly associated with footpaths and cycle ways. These will be augmented with the drift planting of bulbs for seasonal effect.

#### *2.4.2 Species Rich Neutral Grasslands*

This will comprise a diverse sward of grasses with species suited to a circumneutral pH; this will require pre treatment of the existing top soil. The community is to include species such as Red Fescue, Crested Dog's Tail, Common Bird's-foot Trefoil, Ribwort Plantain, Red Clover and Sweet Vernal-grass. It is possible that orchids will eventually colonise the sward naturally. The grassland will provide a naturally colourful display throughout the summer and will support a diverse community of invertebrates, especially butterflies and moths, and grasshoppers and crickets.

Details of this are contained within Appendix 1 – Habitat Creation and Management.

*2.4.3 Mixed Deciduous Woodland*

As well as the slopes of Kimberlow Hill, clumps of woodland will be introduced around the perimeter landscape. Where possible these will incorporate existing mature trees. Particular areas for woodland will be the western entrance into the site which is limited to pedestrian and cycle access and the University Transit System. As well as a range of deciduous trees there will be an under storey of smaller trees such as Downy Birch, Hawthorn, Hazel and Holly. A diverse layer of woodland herbs is likely to develop including species such as Bluebell, Wood Sorrel, Ground Ivy, Primrose and Yellow Archangel.

This is described more fully in Appendix 1 – Habitat Creation and Management.

Projects run as part of the Educational Field Study Centre will look to increase the range of species attracted to the woodland areas. This could include nesting boxes for a range of birds including Barn Owls.

The full details of the species for planting are to be submitted within the landscape reserved matter applications.

*2.4.4 Ponds and Wetlands*

In the south west corner of site there will be an array of ponds and wetlands which will include a range of water depths. Some of these areas will dry out in the summer. The ponds will support a diverse range of aquatic and emergent plant species that will have colonised naturally including species such as Common Reed, Common Reedmace, Branched Bur-reed, Water Starwort and Common Water Milfoil.

This habitat will be suitable for a range of aquatic invertebrates, especially Dragonflies, Damselflies and Water Beetles. It is also suitable for Grass Snakes and birds such as Kingfishers, Sedge Warblers and Reed Buntings. The abundance of invertebrates will provide a quality feeding area for bats, and it should encourage the establishing of water voles on the site. Great crested newts are expected to colonise these within 10 years, especially those that become dry periodically.

The creation of this habitat is described more fully within Appendix 1 – Habitat Creation and Management.

*2.4.5 The Lake*

To maintain a healthy lake it is advisable to include a number of aquatic plants. Because of its function as a balancing regulator the selected aquatic plant species should be able to tolerate variation of water levels and periods of submersion. The exact species will be identified within the reserved matter submission for the lake however current thinking is that there will be an outer perimeter of reed beds of varying widths. These will assist

in protecting the lake side from wild fowl intrusion. Inside the reed perimeter will be a lily fringe which could include emergent species such as Arrow head and Aquatic bistort to assist in the reduction of algal blooms.

There is an over abundance of wildfowl on the existing campus lake which impacts on the opportunities to create a range of bio diverse habitats. The design of the Heslington East lake will aim to deter wildfowl however it is inevitable that the large lake will attract a range of wildfowl species. The lake will have deeper areas of open water to sustain a range of fish species, but the University will not encourage or permit fishing to take place and will take all reasonable measures to ensure it does not take place. It is not proposed to stock the lake but to allow it to be colonised naturally. There will be an ongoing programme of monitoring the development of fish species as one of the Educational Field Study Centre projects.

*2.4.6 Woodlands*

Patches of oak woodland will be created around the site that will be similar to the W10 *Quercus robur-Pteridium aquilinum-Rubus fruiticosus* woodland type. These will be developed around existing mature trees where possible. Pedunculate Oak will be the dominant tree, with an under-storey of smaller trees including Downy Birch, Hawthorn, Hazel and Holly. A diverse field layer of woodland herbs will likely develop once the canopy has developed, including species such as Bluebell, Wood Sorrel, Ground Ivy, Primrose and Yellow Archangel. If Great Crested Newts and Common Toads colonise the site, they would likely use woodland areas close to ponds for foraging and hibernation, as would Common Lizards and Slow-worms. Priority bird species that will almost certainly colonise the woodland at an early stage include Dunnock and Song Thrush, while Spotted Flycatcher and Bullfinch may also soon settle. Barn Owls, which are common in the surrounding area, will soon begin using the nest boxes that will be provided within the mature trees, and a productive breeding pair is expected to become established within five years. A range of bat species will begin to use the woodland for feeding, particularly along the edges where night-flying insects will congregate. Erection of bat boxes in mature trees will also enhance roosting opportunities. Hedgehogs will also likely colonise the woodland, and two artificial badger setts will be provided in this habitat in order to promote the settlement of a small clan.

## 3 The Interim Use of the Land Prior to Development

It is proposed to develop the landscape in two phases; the approach is shown on Figure 1. The phase 1 landscape includes areas within the area allocated for development (the allocation) and the perimeter area.

### *3.1 Phase 1 Perimeter Landscape*

The first landscape phase is associated with the lake, the buffer zones between the built development and the residential areas of Heslington Village and Badger Hill and the slopes of Kimberlow Hill. It is planned to form the structural landscape from the spoil excavated for the lake. This will be used to create the mounding around the western access of the site and the raising of Kimberlow Hill. An overall site wide earthworks balance will be calculated to assess whether any of the lake spoil is required for the phase 2 landscape, if this material is required, it will be stored on the eastern side of the phase 1 area, any spoil heaps will be landscaped and planted in keeping with the surrounding area.

The start of the phase 1 landscaping works is constrained in part by the overhead lines that cross the site and investigation of the areas of archaeological significance. The investigation of the archaeology sites will require the strip back of around 7 hectares of top soil. The overhead lines are due to be removed in the summer of 2008, and work can then start on the structural landscaping with the excavation of the lake and the redistribution of the spoil. The structural landscaping will be the subject of a separate reserved matter planning application.

After the creation of the perimeter structural landscape there will be the progressive planting of the soft landscape, this includes the buffer zone areas, the lake marginals, the area between the lake and Low Lane and Kimberlow Hill. The main elements of the phase 1 perimeter landscape will be completed in this early phase.

The current planned timings for the development of the perimeter landscape are contained within the Landscape Management Plan.

### *3.2 Phase 1 Landscape within the Allocation*

The first landscape phase includes the part of the allocation on which the first buildings will be constructed. The current assessment is that there will not be extensive structural mounding required in these areas and that there is sufficient material within each to accommodate individual area's mounding needs. Within this area the landscape is fixed by a landscape framework comprising:

- The three east to west movement routes: the movement spine to the south, the central pedestrian cycle ribbon and the service road to the north
- The northern edge of the lake
- The central and western vistas

This framework will be established as part of the first phase from the central access vista westwards.

Areas for building development will be set within this framework with the first buildings located to the west of the central access vista. The landscaping associated with these areas will be included with the appropriate reserved matter submissions.

The allocation also includes areas that will be built upon but are not included as part of the first phase of built development. This includes the area between the north of the lake and the movement spine and the area to the west of the western vista. These areas will have a temporary landscape treatment which will be included as part of the perimeter landscape reserved matters.

The remaining area of the allocation that is included within the phase 1 landscape is to the east of the central access vista and is designated for the 2nd phase of building construction. In the interim it provides the route of the haul road and can also be used for contractor's compounds and lay down areas. This location is at a distance from Heslington Village and Badger Hill. This area will be considered for habitat enhancement in the short term.

### *3.3 Phase 2 Landscape*

The phase 2 landscape will be retained in agricultural use until the build programme requires it to be developed. The approach to the phase 2 landscape will be identical to phase 1 and start with the creation of the structural landscape across the whole of the area. The main elements of the perimeter landscape will be established early, this will include the layout of the planned sports pitches on the south east edge of the site. Within the allocation, areas that are not to be built upon in the early stages will be landscaped along with the perimeter landscape and the landscaping of the areas of built development defined with the buildings.

### *3.4 Grimston Bar Park and Ride Extension*

The area that falls outside of both the phase 1 and 2 landscaped areas is the Grimston Bar Park and Ride car park extension. This is because the timing of this part of development is dependent upon car parking requirements which are in turn linked with the growth in staff and students and the release of permitted car parking spaces by CYC. This area will be retained in agricultural use until required and then constructed in one phase. Dependent upon the routing of the University Transit System, it may be necessary to extend the movement spine through the phase 2 landscape area. If this is required prior to the implementation of the phase 2 landscape programme, a corridor will be created for it to pass through to Grimston Bar.

### *3.5 The Land Management Plan*

More details of the management of land prior to and during construction activities can be found within the Heslington East Landscape Management Plan.

# 4 Provision for Protection of Water Resources during Construction Activities

## *4.1 Introduction*

In planning and carrying out the works, precautions must be taken to ensure the complete protection of existing trees, watercourses and groundwater against pollution. Through evidence presented to the Public Inquiry we have identified all of the potential water pollution sources and receptors on the site and can confirm the one potential source of contaminated land that might impact water quality is associated with the Grimston Bar car park extension. As required by the planning conditions the construction works at Grimston Bar will have to show that any risk of water contamination is contained. The long term risk of water source contamination from the built development has been identified and will be recognized within the detailed design. The risk of contamination from construction activities has also been identified. This section of the ESMP outlines the actions that are to be taken to militate against this risk. These actions are to be incorporated within the Construction Environmental Management Plan.

## *4.2 Potential Causes of Water Course Contamination through Construction*

The following activities give rise to potential risks to water course contamination. The proposed mitigating measures against this have been identified.

*a) Deliveries*

Special care is to be taken during deliveries, especially when fuels and hazardous materials are being handled. All deliveries are to be supervised by a responsible person so that storage tank levels are checked before delivery to prevent overfilling and that the product is delivered to the correct tank. Contingency plans are to be agreed and suitable materials available to deal with any incident that occurs. All employees are to be briefed on the actions that are required in the event of a spillage.

*b) Storage*

Many of the materials used in construction operations, such as oil, chemicals, cement, lime, cleaning materials and paint have the potential to cause serious pollution. All fuel, oil and chemical storage must be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of an adequate capacity. Leaking or empty oil drums must be removed from the site immediately and disposed of via a licensed waste disposal contractor. The contents of any tank are to be clearly marked on the tank, and a notice displayed requiring that valves and trigger guns be locked when not in use.

*c) Security*

All valves and trigger guns are to be protected from vandalism and unauthorised interference and turned off and securely locked when not in use. Any tanks or drums are to be stored in a secure container or compound, which is to be kept locked when not in use. Bowsers should be stored within site security compounds when not in use.

### *4.3 Waste Management*

Waste on site is to be minimised. Hazardous waste is to be identified and segregated within secure areas. In addition the following requirements are to be adhered to:

*4.3.1 Waste treatment and storage*

All wastes must be stored in designated areas which are isolated from surface drains. Skips should be covered to prevent dust and litter being blown out and rainwater accumulation and should be regularly inspected and replaced when full. Used chemical containers may need special handling and the manufacturer's instructions should be followed. If plant maintenance is carried out on site, used oil should be stored in a bunded area for collection. Oil and fuel filters should also be stored in a designated bin in a bunded area for separate collection and recycling.

*4.3.2 Waste disposal*

Contractors are required to ensure that any waste contractor who removes the waste is registered with the appropriate authorities. Certain hazardous wastes are defined as being "special wastes" and a more rigorous consignment note system will need to apply to these.

### *4.4 Silt*

Water containing silt is never to be pumped directly into the lake or surface water drains. Silty water can arise from excavations, exposed ground, stockpiles, plant and wheel washing.

*a) Excavations*

Measures are to be taken to prevent water from entering excavations. This could be by the use of cut-off ditches to prevent entry of surface water and well point dewatering or cut-off walls for ground water. Personnel and/or plant are not to disturb water in the excavation. The means of dewatering excavations in the event there is ingress is to be agreed in advance.

*b) Spoil Heaps*

Spoil heaps are to be located and configured in a way that will reduce the risk of contamination of drainage ditches.

*c) Plant and wheel washing*

Wheel washes and plant washing facilities are to be securely constructed with no overflow and the effluent should be contained for proper treatment and disposal. Recycling of water is to be included within the design.

*d) Site roads*

These are to be kept free from dust and mud deposits. In dry weather dust suppression measures may be required.

*e) Dealing with Silty water*

Adequate provision for dealing with silty water is to be agreed in advance. Any planned discharges off the site will require prior approval with the appropriate authorities. (A discharge consent can take up to four months to obtain, or longer for difficult cases). To satisfy this consent suitable treatment may be required, including the use of a settlement lagoon or tank or grassed areas.

### *4.5 Refueling*

The risk of spilling of fuel is at its greatest during the refueling of plant. Mobile plant is to be refueled in a designated area, preferably on an impermeable surface away from any drains or watercourses. A spill kit is to be available in this location. Hoses and valves are to be checked regularly for signs of wear and turned off and securely locked when not in use. Diesel pumps and similar equipment are to be placed on drip trays to collect minor spillages. These should be checked regularly and any accumulated oil removed for disposal.

### *4.6 Concrete*

Concrete is highly alkaline and corrosive and can have a serious impact on watercourses. It is essential to take particular care with all works involving concrete and cement. Suitable provision is to be made for the washing out of concrete mixing plant or ready mix concrete lorries so that washings do not flow into any drain or watercourse.

### *4.7 Emergencies*

In the event of a spillage on site, the material must be contained (using an absorbent material such as sand or soil or commercially available booms). In the event of a significant occurrence the Environment Agency is to be notified immediately.

# APPENDIX 1 - HABITAT CREATION AND MANAGEMENT

## Objective

To retain, enhance and create a diversity of natural habitats that will support a range of species of recognised conservation priority.

## Priority Habitats and species

Habitats and species that will be the focus of wildlife conservation measures are shown in Table 1, which have been chosen with consideration of the local context, national and local conservation priorities, and protected species legislation. The relationship between priority habitats and species is shown in Table 2.

**Table 1.** Priority habitats and species

| Feature | National conservation priority[1] | Local conservation priority[2] | Protected species[3] |
|---|---|---|---|
| *Habitats* | | | |
| Ponds | | X | |
| Lake | X | | |
| Species-rich neutral grassland | X | X | |
| Species-rich hedgerows | X | | |
| Oak woodland copses | X | | |
| Marsh | | X | |
| Dead wood | | | |
| *Amphibians* | | | |
| Great Crested Newt | X | X | X |
| Common Toad | X | | |
| *Reptiles* | | | |
| Common Lizard | X | | X |
| Grass Snake | X | | X |
| Slow-worm | X | | X |
| *Birds* | | | |
| Barn Owl | | | X |
| Bullfinch | X | | |
| Dunnock | X | | |
| Kingfisher | | | X |
| Linnet | X | | |
| Reed Bunting | X | X | |
| Skylark | X | X | |
| Song Thrush | X | X | |

| | | | |
|---|---|---|---|
| Spotted Flycatcher | X | | |
| Yellowhammer | X | | |
| *Mammals* | | | |
| Water Vole | X | X | X |
| Hedgehog | X | | |
| Bats[4] | X | X | X |

[1]Species and habitats of national conservation priority (www.ukbap.org.uk/NewPriorityList.aspx)
[2]Species and habitats listed as conservation priorities under the draft York Biodiversity Action Plan
[3]Species specially protected by wildlife legislation
[4]Most likely to include Brown Long-eared Bat, Common Pipistrelle, Soprano Pipistrelle, Daubenton's Bat, Whiskered Bat and Noctule, but could include other species which may develop usage of the site.

**Table 2.** Relationship between priority habitats and species

| Priority species | Priority habitats | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dead wood | Lake | Marsh | Woodland | Ponds | Hedgerows | Grassland |
| *Amphibians* | | | | | | | |
| Great Crested Newt | X | | X | X | X | X | |
| Common Toad | X | | X | X | X | X | |
| *Reptiles* | | | | | | | |
| Common Lizard | X | | X | X | | X | X |
| Grass Snake | X | X | X | | X | X | X |
| Slow-worm | X | | | X | | X | X |
| *Birds* | | | | | | | |
| Barn Owl | | | | X | | X | X |
| Bullfinch | | | | X | | X | |
| Dunnock | | | | X | | X | |
| Kingfisher | | X | X | | X | | |
| Linnet | | | | | | X | X |
| Reed Bunting | | X | X | | X | | |
| Skylark | | | | | | | X |
| Song Thrush | | | | X | | X | X |
| Spotted Flycatcher | | | | X | | X | |
| Yellowhammer | | | | | | X | X |
| *Mammals* | | | | | | | |
| Water Vole | | X | X | | X | | |
| Hedgehog | X | | | X | | X | |
| Bats | | X | X | X | X | X | |
| | | | | | | | |

Dead wood

Frequent, dense piles of deciduous dead wood will be created within the woodland copses, along hedgebanks and adjacent to ponds. This would provide important habitat for a wide diversity of wood-eating invertebrates and fungi, and would act as good quality foraging habitat and refugia for priority species such as Great Crested Newt, Common Toad, Common Lizard, Grass Snake, Slow-worm and Hedgehog.

Lake

The lake is dealt with separately within this report.

Marsh

An area of marsh will be created near to the south-west boundary of the site, to act as a storm-water retention facility. It will naturally flood during the winter period and may become dry occasionally during the summer. Wetland plant species will soon colonise the area naturally and form a mosaic of vegetation, the structure of which will be governed primarily by local hydrological conditions. Tall, emergent plant species are likely to be prominent, such as Meadowsweet, Purple Loosestrife, Common Reed, Great Willowherb and Yellow Iris. Marshland

breeding birds that could colonise include Sedge Warbler and, most likely, Reed Bunting. Priority amphibians that may begin to use the area include Great Crested Newts and Common Toads. Grass Snakes will likely colonise and Common Lizard could use the periphery of the marsh. If the marsh develops an open character, Kingfishers will almost certainly begin to use the area for feeding once a population of small fish have developed, especially if a suitable perch is provided. Likewise, if Water Vole colonise the site they would also likely make use of the habitat, though the possible presence of Brown Rats and/or American Mink could prevent their colonisation. Almost certainly, an abundance of invertebrates will provide a quality feeding area for bats.

Woodland

Patches of oak woodland will be created around the site that will be similar to the W10 *Quercus robur-Pteridium aquilinum-Rubus fruiticosus* woodland type. These will be developed around existing mature trees where possible. Pedunculate Oak will be the dominant tree, with an under-storey of smaller trees including Downy Birch, Hawthorn, Hazel and Holly. A diverse field layer of woodland herbs will likely develop once the canopy has developed, including species such as Bluebell, Wood Sorrel, Ground Ivy, Primrose and Yellow Archangel. If Great Crested Newts and Common Toads colonise the site, they would likely use woodland areas close to ponds for foraging and hibernation, as would Common Lizards and Slow-worms. Priority bird species that will almost certainly colonise the woodland at an early stage include Dunnock and Song Thrush, while Spotted Flycatcher and Bullfinch may also soon settle. Barn Owls, which are common in the surrounding area, will soon begin using the nest boxes that will be provided within the mature trees, and a productive breeding pair is expected to become established within five years. A range of bat species will begin to use the woodland for feeding, particularly along the edges where night-flying insects will congregate. Erection of bat boxes in mature trees will also enhance roosting opportunities. Hedgehogs will also likely colonise the woodland.

Ponds

A network of ponds of varying size and water regime will be created along the south-west periphery of the site, ranging from those flooded briefly during winter periods to larger pools with a minimum depth of 0.5m during summer. The ponds would support a diverse range of aquatic and emergent plant species that will colonise naturally. Tall emergent species would likely include Common Reed, Common Reedmace, Purple Loosestrife and Yellow Flag, while aquatic species could include Amphibious Bistort, Water Starwort, Rigid Hornwort and

Common Water Milfoil. Plant communities would likely develop rapidly and would soon provide habitat for a diverse range of aquatic invertebrates, especially dragonflies, damselflies and water beetles, and will provide excellent habitat for colonisation by Great Crested Newts, Common Toads and Grass Snakes. They will also provide good quality feeding habitat for Kingfishers and the creation of an earth bank along a margin of one of the larger ponds will provide suitable nesting habitat for this species. Reed Buntings are also likely to settle and if Water Voles still occur in the surrounding agricultural landscape they too may colonise and make use of this habitat. In addition, the dense invertebrate populations that would be supported by the ponds would provide excellent feeding habitat for bats.

Hedgerows

Existing hedgerows will be retained where possible and restored so that they are rich in woody species, dominated by Hawthorn and including frequent Blackthorn, Field Maple, Guelder Rose and Buckthorn. New species-rich hedgerows will be planted along suitable parts of the site boundary that lack existing hedgerows. The dense habitat of the hedgerows will provide valuable nesting habitat for a range of priority bird species, such as Bullfinch, Dunnock, Linnet, Song Thrush, Spotted Flycatcher and Yellowhammer. They will also act as wildlife corridors, in particular by linking patches of woodland. These linkages may be used in particular by feeding bats, commuting Badgers, feeding Barn Owls, small mammals and hedgehogs. They could also form important terrestrial habitat for Great Crested Newts and Common Toads, while reptiles (Grass Snake, Common Lizard and/or Slow-worm) may also make use of the foraging and refugia opportunities along the hedgerow base.

Grassland

Frequent patches and larger expanses of species-rich grassland will be created around the site. This would comprise a diverse sward of grasses and herbs typical of nutrient-poor soil with a circumneutral pH. The species composition would be closest to the MG5 *Cynosurus cristatus-Centaurea nigra* grassland type and would be dominated by species such as Red Fescue, Crested Dog's Tail, Common Bird's-foot Trefoil, Ribwort Plantain, Red Clover and Sweet Vernal-grass. It is expected that orchids will eventually colonise the sward naturally, for example Early Purple Orchid and Common Spotted Orchid. The grassland would provide a naturally colourful display throughout the summer and would support a diverse community of invertebrates, especially butterflies and moths, and grasshoppers and crickets. Skylarks are likely to establish several breeding territories within the grassland sward, while it will also provide important

foraging habitat for Song Thrushes, Linnets and Yellowhammers. Coarser patches of the grassland sward will be encouraged in order to promote colonisation by Bank Voles, which will provide an important food source for Barn Owls. The grassland could also provide become used as a forging area by Badgers and reptiles (Grass Snake, Common Lizard and/or Slow-worm).

Management objectives, performance indicators and monitoring

Table 3 provides a list of management objectives for each of the priority habitats and for a selection of key priority species. It includes indicators for measuring success, timescales and outlines monitoring methods.

**Table 3.** Management objectives, performance indicators and monitoring

| Feature | Objective | Indicator | Monitoring |
|---|---|---|---|
| *Habitats* | | | |
| Ponds | Establishment of a network of good-quality wildlife ponds of various sizes and water regimes | ≥15 good-quality ponds established of various water regimes within 3 years | Annual monitoring of pond wildlife quality and water regimes during first five years then every three years |
| Grassland | Establishment of species-rich neutral grassland throughout grassland areas not designated as 'amenity grassland' | ≥15 plant species/$m^2$ with a composition similar to the MG5 grassland type within 3 years | Annual 1x1m quadrat monitoring of plant species composition during first five years then every three years |
| Hedgerows | Restoration and establishment of good-quality hedgerows rich in native woody species | All hedgerows of good-quality and with ≥6 native woody species every 30m within 4 years | Annual monitoring of hedgerow quality and species composition during first five years then every three years |
| Woodland | Establishment of patches of oak woodland | Patches of oak woodland established similar to the W10 woodland type within 40 years | Annual monitoring for first five years, then every three years, recording tree health and species composition in 10x10m quadrats |
| Marsh | Establishment of a diverse marsh | ≥10 wetland plant species/16$m^2$ in a marsh of about 0.5ha within 3 years | Annual 4x4m quadrat monitoring of plant species composition during first five years then every three years |
| Dead wood | Establishment of frequent, good-quality dead wood habitat | ≥30 piles of deciduous dead wood each ≥70 cm height throughout woodland areas and adjacent to ponds within 1 year | Assessment of dead wood habitat quality two years after placement then every three years |
| *Species* | | | |
| Great Crested Newt | Establishment of a medium-sized Great Crested Newt breeding population | A peak pf 10-100 adult Great Crested Newts caught in six bottle trap surveys | Annual bottle-trap surveys of ponds from years 3 to 7, then every three years |

| Feature | Objective | Indicator | Monitoring |
|---|---|---|---|
| | | conducted in suitable weather conditions during March-May within 5 years | |
| Barn Owl | Establishment of breeding Barn Owls | ≥1 pair of breeding Barn Owls established within 5 years | Annual activity surveys and inspection of nest boxes and other suitable nest sites from year 2 onwards. |
| Kingfisher | Establishment of breeding Kingfishers | ≥1 pair of breeding Kingfishers established within 5 years | Annual inspection of suitable nest sites |
| Water Vole | Establishment of a resident population of Water Voles | Population of Water Voles established within 5 years | Annual surveys for signs of presence during years 3 to 7, then every three years, including searches for signs of American Mink and Brown Rat |
| Bats | Establishment of a diverse feeding community of bat species and ≥1 regular roost | ≥5 feeding bat species regularly occurring and ≥1 regular roosting site within 4 years | Annual surveys of bat activity and searches of suitable bat roost sites during years 2 to 7, then every three years |

### Outline work schedule

An outline of a 5-year work schedule is provided in Figure 1. Each of the main tasks is described in more detail below.

## Establishment of a network of good-quality wildlife ponds of various sizes and water regimes

1. Excavation of ≥15 ponds. A prior hydrological assessment should determine which ponds would need to be lined with bentonite (overlain by 30cm of subsoil) in order to retain water. Pond margins will be highly convoluted with shallow slopes (maximum 1:2 gradient) and grading down to a maximum depth of 1m.
2. The ponds will be rain-fed systems with a naturally fluctuating water level.
3. Plant and animal communities will be allowed to develop through natural colonisation which is expected to be rapid though seeding with sediment from other ponds in the region will be investigated.
4. Annual monitoring of pond wildlife quality and water regimes will be undertaken during the first five years then every three years.

## Establishment of species-rich neutral grassland throughout grassland areas not designated as 'amenity grassland'

1. Firstly and most importantly, a stale seedbed free from weeds will be established by one of the following measures, as appropriate:

   a. the topsoil (and component seedbank) will be removed (NB: 'A horizon' only) to provide a subsoil surface;
   b. the soil will be deep ploughed (50-100cm depth) to bury the topsoil (and seedbank) and establish a surface layer of subsoil; or
   c. the majority of the seedbank will be killed off by allowing its germination and then applying monthly applications of a herbicide for six months during the growing season (Mar-Sep), including removal of dead vegetation.
2. Methods 1a and 1b will be used where possible, with the aim of establishing the following target nutrient levels at the soil surface: total nitrogen <10,000 ppm; extractable phosphorus <16 ppm; extractable potassium 0-400 ppm; and extractable magnesium 0-100 ppm. Method 1c will be used when it is not possible to use either of the other methods, for example within the vicinity of existing trees (where root damage may occur) or where an excess of topsoil requires it to be retained at the surface.
3. Prior to sowing the surface will be rotovated to a depth of 10cm in Jul/Aug and then rolled (or harrowed) to produce a fine tilth.
4. A commercial MG5 seed mixture will be used containing a majority of the following species: *Achillea millefolium* (Yarrow), *Centaurea nigra* (Common knapweed), *Conopodium majus* (Pignut), *Galium verum* (Lady's bedstraw), *Hypochoeris radicata* (Cat's ear), *Lathyrus pratensis* (Meadow vetchling), *Leontodon autumnalis* (Autumn hawkbit), *Leucanthemum vulgare* (Oxeye daisy), *Lotus corniculatus* (Common bird's-foot trefoil), *Plantago lanceolata* (Ribwort plantain), *Prunella vulgaris* (Selfheal), *Ranunculus acris* (Meadow buttercup), *Rhinanthus minor* (Yellow rattle), *Rumex acetosa* (Common sorrel), *Succisa pratensis* (Devil's-bit scabious), *Trifolium pratense* (Red clover), *Veronica chamaedrys* (Germander speedwell), *Vicia cracca* (Tufted vetch), *Agrostis capillaris* (Common bent), *Anthoxanthum odoratum* (Sweet vernal-grass), *Cynosurus cristatus* (Crested dog's-tail) and *Festuca rubra* (Red fescue).
5. The seed mixture will be sown at a rate of 40kg/ha, and then rolled to tickle the seed into the tilth.
6. The sward will be cut to 4cm height in March and September each year and clippings removed.
7. Annual 1x1m quadrat monitoring of sward species composition will be undertaken during the first five years then every three years.

## Restoration and establishment of good-quality hedgerows rich in native woody species

1. Existing hedgerows will be retained where possible and protected from construction activities where necessary with suitable temporary fencing.
2. Gaps in existing hedgerows will be planted with a diversity of native woody species (see below).
3. For hedgerows that need to be removed, an evaluation of their translocation to suitable areas elsewhere on site will be conducted by a specialist contractor.
4. For new hedgerows, the hedgeline will be rotovated to 1m wide and black polythene mulch strips (200 gauge) will be laid on the soil surface to prevent weed establishment, with the sides dug into the soil to hold it in position during its lifetime (about 4 years).
5. Native shrubs will be planted using bare-rooted transplants (60-90 cm). It is important that plants of British origin are used, ideally from the local region, since plants from

continental Europe can have inferior survival, higher disease susceptibility and relatively low growth.

6. Species composition will include 50% Hawthorn (*Crataegus monogyna*), 20% Field Maple (*Acer campestre*), 15% Blackthorn (*Prunus spinosa*), 3% Guelder Rose (*Viburnum opulus*), 3% Buckthorn (*Rhamnus cathartica*), 3% Holly (*Ilex aquifolium*), 3% Dogwood (*Cornus sanguinea*) and 3% Hazel (*Corylus avellana*).
7. Species will be notch planted through the mulch strips in two rows 50 cm apart, with transplants spaced at staggered 30cm intervals along the rows.
8. Standard trees will be planted in new hedges at random distances to avoid an avenue effect, but generally 40-60m apart. They will comprise 40% Pedunculate Oak (*Quercus robur*), 40% Ash (*Fraxinus excelsior*), 10% Wild Cherry (*Prunus avium*) and 10% Field Maple (*Acer campestre*). These will be 90-120 cm bare-rooted transplants and will be notch-planted through the mulch mat. Also, they will be fastened to a stake so that they are clearly visible when hedge cutting.
9. Rabbit-proof fencing will be erected along both sides of the hedge planting strip, which will be inspected and repaired bi-annually.
10. The tops of newly planted hedges will be trimmed each autumn until the required height is reached (about 2 m). They will then be cut every three years, as will existing hedges.
11. Annual monitoring will be undertaken of hedgerow quality and species composition during first five years then every three years.

## Establishment of patches of oak woodland

1. Existing mature trees will be retained where possible and protected from construction activities under a 'Tree protection plan' compiled in accordance with BS 5837:2005 ('Trees in relation to construction').
2. Planting will be undertaken around existing mature trees and elsewhere to create patches of oak-dominated woodland.
3. Prior to planting, the soil surface will be treated as described under actions 1-3 for the establishment of species-rich grassland.
4. Native shrubs and trees will be planted using plants of British origin, ideally from the local region. Stock will be 60-90 cm bare-rooted transplants.
5. Within the main drifts, the mix of tree species will be 40% Pedunculate Oak (*Quercus robur*), 40% Ash (*Fraxinus excelsior*), 5% Wild Cherry (*Prunus avium*), 5% Rowan (*Sorbus aucuparia*), 5% Field Maple (*Acer campestre*) and 5% Wych Elm (*Ulmus glabra*). Species should be planted randomly using notch planting in Nov-Mar. Planting should be at variable spacing, usually at about 2m distance but upto 4m in some areas to promote bushier growth. Geometric patterns or regular shapes should be avoided. In particular, edges should be scalloped in order to maximise the length of woodland-edge, where species diversity is highest.
6. The woodland edge should include two rows of denser planting (1 m intervals) with shrubs, including 40% Hazel (*Corylus avellana*), 40% Common Hawthorn (*Crataegus monogyna*), 5% Spindle (*Euonymus europaeus*), 5% Crab Apple (*Malus sylvestris*), 5% Blackthorn (*Prunus spinosa*) and 5% Dogwood (*Cornus sanguinea*). Once established, the dense edge will help to reduce wind currents within the main drifts and hence promote tree growth through higher temperatures and improved humidity. It will also provide a seed source for the natural establishment of an under-storey of shrubs within the main woodland drifts.

7. Larger areas of planted trees will be protected from grazing by rabbit fencing until the plants are well established. Possible deer grazing of the saplings in these areas will be monitored and if this proves to be a substantial problem then deer-proof fencing should be erected. Smaller blocks of woodland will protect plants individually with plastic tree shelters.
8. An area of about 1m$^2$ will be kept weed-free around each planted sapling, using glyphosate herbicide, until the tree canopy closes (*i.e.* after 3-5 years where tree spacing is 2m).
9. The ground flora will be assessed 7-10 years after planting to assess the rate of colonisation of woodland herbs. If this has been poor, introduction of native species through seed and pot plants will be evaluated.
10. Annual monitoring will be undertaken for first five years, then every three years, recording tree health and species composition in 10x10m quadrats.

## Establishment of a diverse marsh

1. A shallow scrape with a convoluted margin will be excavated to expose the subsoil at a depth (to be determined through a hydrological assessment) that allows shallow flooding in the winter months.
2. The marsh will be rain-fed systems with a naturally fluctuating water level.
3. Plant and animal communities will be allowed to develop through natural colonisation which is expected to be rapid though seeding with sediment from other marshes in the region will be investigated.
4. Annual 4x4m quadrat monitoring of plant species composition will be undertaken during first five years then every three years.

## Establishment of frequent, good-quality dead wood habitat

1. ≥30 piles of deciduous dead wood (each ≥70 cm height) will be created throughout woodland areas and adjacent to ponds, using wood from trees within the site that have to be felled for development.
2. Assessment of dead wood habitat quality will be undertaken two years after placement then every three years.

## Establishment of a medium-sized Great Crested Newt breeding population

1. Annual bottle-trap surveys of ponds will be undertaken from years 3 to 7, then every three years.

## Establishment of breeding Barn Owls

1. Nest boxes for Barn Owls will be positioned at suitable locations in mature trees.
2. Annual activity surveys and inspection of nest boxes and other suitable nest sites will be undertaken from year 2 onwards.

## Establishment of breeding Kingfishers

1. A kingfisher bank will be created along the margin of one of the larger ponds. Subsoil will be packed behind shuttering to a height of 1.5m above the summer water level, and the surface will be seeded as part of the species-rich grassland creation. The shuttering will be removed in April ensuring that it has been in place for at least one year.
2. Annual inspection of suitable nest sites will be undertaken from year 2 onwards.

## Establishment of a resident population of Water Voles

1. Annual surveys will be undertaken for signs of presence during years 3 to 7, then every three years.

## Establishment of a diverse feeding community of bat species and ≥1 regular roost

1. Bat boxes will be positioned at suitable locations in mature trees.
2. Annual surveys will be undertaken of bat activity and searches of suitable bat roost sites during years 2 to 7, then every three years.

**Figure 1.** Outline 5-year work schedule for wildlife habitat creation, management and monitoring

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 0 | **Heslington East Ecology** | **255.4 wks** | **01/01/08** | **21/11/12** |
| 1 | **Barn Owl** | **235 wks** | **01/01/08** | **02/07/12** |
| 2 | Nest box provision | 1 wk | 01/01/08 | 07/01/08 |
| 3 | Nest boxes installed | 0 days | 07/01/08 | 07/01/08 |
| 4 | **Monitoring** | **182.6 wks** | **01/01/09** | **02/07/12** |
| 13 | **Kingfisher** | **214.2 wks** | **25/03/08** | **01/05/12** |
| 14 | Nest bank construction | 1 wk | 25/03/08 | 23/03/09 |
| 15 | Nest bank completed | 0 days | 23/03/09 | 23/03/09 |
| 16 | **Monitoring** | **104.4 wks** | **03/05/10** | **01/05/12** |
| 20 | **Bats** | **243.2 wks** | **01/01/08** | **28/08/12** |
| 21 | Roost box provision | 1 day | 01/01/08 | 01/01/08 |
| 22 | Roost boxes installed | 0 days | 01/01/08 | 01/01/08 |
| 23 | **Monitoring** | **160.4 wks** | **03/08/09** | **28/08/12** |
| 28 | **Badger** | **222 wks** | **01/01/08** | **02/04/12** |
| 29 | Sett construction | 1 mon | 01/01/08 | 28/01/08 |
| 30 | Setts completed | 0 days | 28/01/08 | 28/01/08 |
| 31 | **Monitoring** | **156.8 wks** | **01/04/09** | **02/04/12** |
| 36 | **Ponds** | **239.4 wks** | **01/01/08** | **01/08/12** |
| 37 | Hydrological assessment | 1 mon | 01/01/08 | 28/01/08 |
| 38 | Excavation and lining | 2 mons | 29/01/08 | 24/03/08 |
| 39 | Ponds completed | 0 days | 24/03/08 | 24/03/08 |
| 40 | **Monitoring** | **203.4 wks** | **09/09/08** | **01/08/12** |
| 46 | **Marsh** | **235 wks** | **01/01/08** | **02/07/12** |
| 47 | Hydrological assessment | 1 mon | 01/01/08 | 28/01/08 |
| 48 | Excavation | 2 mons | 29/01/08 | 24/03/08 |
| 49 | Marsh completed | 0 days | 24/03/08 | 24/03/08 |
| 50 | **Monitoring** | **199 wks** | **09/09/08** | **02/07/12** |
| 56 | **Hedgerows** | **255.4 wks** | **01/01/08** | **21/11/12** |
| 57 | Restoration of existing | 1 mon | 01/01/08 | 28/01/08 |
| 58 | New planting/fencing | 1 mon | 01/01/08 | 28/01/08 |
| 59 | Hedgerows completed | 0 days | 28/01/08 | 28/01/08 |
| 60 | **Trimming of new hedges** | **209.6 wks** | **17/11/08** | **21/11/12** |
| 66 | Cutting of existing | 1 wk | 02/11/10 | 08/11/10 |
| 67 | **Monitoring** | **156.8 wks** | **01/07/09** | **02/07/12** |
| 72 | **Woodland** | **223 wks** | **25/03/08** | **02/07/12** |
| 73 | Ground preparation | 6 mons | 25/03/08 | 08/09/08 |
| 74 | Planting/fencing | 1 mon | 09/09/08 | 06/10/08 |
| 75 | Woodland completed | 0 days | 06/10/08 | 06/10/08 |
| 76 | **Weed control** | **174.2 wks** | **30/12/08** | **01/05/12** |
| 82 | **Monitoring** | **156.8 wks** | **01/07/09** | **02/07/12** |
| 87 | **Dead wood** | **146.2 wks** | **07/10/08** | **26/07/11** |
| 88 | Creation of wood piles | 2 wks | 07/10/08 | 20/10/08 |
| 89 | Wood piles completed | 0 days | 20/10/08 | 20/10/08 |
| 90 | Monitoring | 1 day | 26/07/11 | 26/07/11 |
| 91 | **Species-rich grassland** | **234 wks** | **25/03/08** | **17/09/12** |
| 92 | Ground preparation | 6 mons | 25/03/08 | 08/09/08 |
| 93 | Sowing | 1 wk | 09/09/08 | 15/09/08 |
| 94 | Grassland completed | 0 days | 15/09/08 | 15/09/08 |
| 95 | **Spring mowing** | **156.8 wks** | **16/03/09** | **15/03/12** |
| 100 | **Summer mowing** | **157 wks** | **15/09/09** | **17/09/12** |
| 105 | **Monitoring** | **156.8 wks** | **01/07/09** | **02/07/12** |
| 110 | **Great Crested Newt** | **112.6 wks** | **15/03/10** | **09/05/12** |
| 111 | **Monitoring** | **112.6 wks** | **15/03/10** | **09/05/12** |
| 115 | **Water Vole** | **104.4 wks** | **03/05/10** | **01/05/12** |
| 116 | **Monitoring** | **104.4 wks** | **03/05/10** | **01/05/12** |