

APPENDIX 5
Ecological Management Plan
ECOSA

EAGLETHORPE, THE ELTON ESTATE, PETERBOROUGH
UPDATING ECOLOGICAL MANAGEMENT PLAN 2018

Final Document

June 2018

Please note:

This report is an update on the original management plan produced by RPS in 2006. The majority of text prepared by RPS has been replicated within this updated management plan, with updating amendments made to the original text by ECOSA.

Preliminary Ecological Appraisals • Protected Species Surveys and Licensing • NVC • EclA • Management Plans
Habitats • Badger • Bats • Hazel Dormouse • Birds • Reptiles • Amphibians • Invertebrates • Riparian and Aquatic Species

ECOSA, Ten Hogs House, Manor Farm Offices, Flexford Road, North Baddesley, Hampshire, SO52 9DF
Tel: 02380 261065 Email: info@ecosa.co.uk Web: www.ecosa.co.uk

Registered Office: 3-4 Eastwood Court, SO51 8JJ Registered in England No: 6129868



EAGLETHORPE, THE ELTON ESTATE, PETERBOROUGH
UPDATING ECOLOGICAL MANAGEMENT PLAN

Table of Contents

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION.....	3
1.1 Site Location and Description	3
1.2 Planning Context.....	3
1.3 Summary of Current Situation.....	4
1.4 Origin of Information	5
1.5 Overall Status and Wildlife Importance.....	5
2.0 AIMS, OBJECTIVES AND PRIORITIES OF MANAGEMENT.....	7
2.1 Aims and Objectives	7
2.2 Habitat creation priorities	8
2.2.1 <i>Reed Bunting</i>	8
2.2.2 <i>Snipe</i>	8
2.2.3 <i>Jack Snipe</i>	8
2.2.4 <i>Teal</i>	8
2.2.5 <i>Lapwing</i>	8
2.2.6 <i>Common Sandpiper</i>	8
2.2.7 <i>Amber Listed Waders</i>	9
3.0 CONSTRAINTS ON MANAGEMENT	10
3.1 Hydrology.....	10
3.2 Pollution	10
3.3 Public Access.....	11
4.0 HABITAT RESTORATION AND ENHANCEMENT WORKS	12
4.1 Stage 1: Site Preparation.....	12
4.1.1 <i>Pre-clearance Works</i>	12
4.1.2 <i>Additional Surveys</i>	13
4.1.3 <i>Crassula Removal</i>	14
4.1.4 <i>Orange Balsam Removal</i>	15
4.1.5 <i>Earth Bund Removal</i>	16
4.2 Stage 2: Physical Wetland Creation Works	17
4.2.1 <i>Depths, Areas and Slopes of Shallows</i>	17
4.2.2 <i>Marginal Habitats</i>	18
4.2.3 <i>Reservoir Feeder Channel</i>	19
4.3 Stage 3: Planting and Establishment.....	20
4.3.1 <i>Planting of the Shallows and Wet Lips of the Reservoir</i>	20
4.3.2 <i>Planting of Surrounding Areas</i>	21
4.4 Sourcing of Plant Material.....	22
4.5 Ecological Clerk of Works	23
5.0 ONGOING MANAGEMENT AND AFTERCARE	25
5.1 Grassland Management.....	25
5.2 Feeder Channel Management	26

6.0	TIMESCALE FOR ENHANCEMENTS AND MANAGEMENT	27
7.0	MONITORING	28
7.1	Reporting Results	29
8.0	REFERENCES.....	30

APPENDICES AND FIGURES

Appendix 1 Recommended Plant Species

Appendix 2 Post Enhancement Monitoring

FIGURE 1 Profile across Shallows Area and Surrounding Marshy Grassland

FIGURE 2 Landscaping Scheme

DISCLAIMER

This is a technical report and does not represent legal advice. You may wish to seek legal advice if this is required.

DOCUMENT SOURCE

This report is an update on the original management plan produced by RPS in 2006. The majority of text prepared by RPS has been replicated within this updated management plan, with updating amendments made to the original text by ECOSA.

COPYRIGHT

© This report is the copyright of Ecological Survey & Assessment (ECOSA) Ltd. Any unauthorised reproduction or usage by any person is prohibited.

EXECUTIVE SUMMARY

This Ecological Management Plan (EMP) was originally produced by RPS in 2006 to satisfy a planning condition for the construction of an agricultural reservoir on a site to the north of Eaglethorpe adjacent to the River Nene in Northamptonshire. This updated EMP has been reviewed and updated by Ecological Survey & Assessment Ltd. (ECOSA) to reflect the current status of the scheme and recommended ecological management. This document supersedes previous versions of the EMP for the site.

The EMP is required to set out practices to ensure compliance with wildlife legislation during construction and to set out a habitat creation, management and monitoring regime for a conservation area of wetland shallows to be created as mitigation for habitat loss due to the reservoir construction. The EMP seeks to be acceptable to all parties involved, to at least return the site to its previous conservation value after construction of the reservoir, and to set up a timetable for enhancements and monitoring to ensure that the wildlife aims and priorities are met.

A species of invasive non-native plant, New Zealand pygmyweed, has been recorded on site. Another non-native species, orange balsam has also been recorded, although this species is not as invasive. It was envisaged that the New Zealand pygmyweed would be dealt with most effectively by burying it on site during construction works, whilst orange balsam could be efficiently removed by cutting.

A small population of grass snake were found on site (Ecoscope; 2003a); this EMP outlines methods for ensuring that individuals will not be killed or injured during construction.

Breeding birds recorded on site in 2003 included BoCC Red List species, such as reed bunting (RPS Ecoscope, 2003a). A previous survey also found breeding redshank, lapwing, ringed plover and little ringed plover (Wigginton, 1998). A winter bird survey identified numbers of teal, snipe and jack snipe of local importance (RPS Ecoscope, 2003b). A low number of common sandpiper were recorded on site in 2008

To create wetland habitat suitable for bird species of conservation interest, the EMP recommends the creation of shallows with stepped levels, varying from 1m to 2m depth, with gradual slopes of a maximum of 1 in 5 between levels. The surrounding land is to be made into marshy grassland kept at around winter water level, with some humps to provide islands and varied water levels in the event of flooding.

It is further recommended that some planting of emergent, marginal and aquatic vegetation be carried out in order to provide areas from which vegetation can spread around the shallows. Lists of recommended species are provided, including a list of species suitable for seeding the marshy grassland to provide cover and foraging opportunities for waders.

A table for monitoring measurable targets relating to the important features of the site is provided, with most features requiring visits during summer to check on their status. An Ecological Clerk of Works will be appointed to oversee certain key stages of the habitat enhancements.

1.0 INTRODUCTION

1.1 Site Location and Description

The site is the location of a proposed agricultural reservoir north of the village of Eaglethorpe in Northamptonshire, and is owned by the Elton Estate. It is situated just south of the River Nene, which will provide water for the reservoir and shallows when the river is above a threshold level.

1.2 Planning Context

Planning permission for the reservoir was granted on 24th September 2004. Of the conditions imposed by the planning authority, Condition 13 required the production of an Ecological Management Plan (EMP). RPS produced an EMP in 2006 in-order to discharge this condition. An application to extend the end date to 2018 of the original planning permission EN/02/0846C was subsequently made in June 2014 (NCC Ref: 13/00073/MINVOC, ENC Ref: 14/01140/NCC). Planning permission was granted subject to conditions including the following ecological related conditions:

- **Condition 12**

Within 3 months of the date of this permission an Ecological Mitigation and Management Plan that is in general accordance with sections 5.1 and 5.5 of the RPS Ecological Management Plan (dated 15/08/2006 approved pursuant to permission ref. no. EN/02/846C) and section 5.0 of the ECOSA Ecological Assessment Report submitted with this application, shall be submitted for approval in writing by the Mineral Planning Authority. The plan shall include, amongst other things:

- a) Plans for the treatment of Crassula infestation and monitoring its success;*
- b) Design of the conservation area to maximise potential for breeding and wintering bird species of interest;*
- c) Proposals for the long-term management of the conservation area for the benefit of the wildlife interest;*
- d) A programme to monitor the development of vegetation and the bird populations on the site;*
- e) Measures and monitoring to ensure that reptiles (particularly Grass Snake) are not harmed during construction;*
- f) Details of the attendance of a Clerk of Works for the remaining construction and restoration works;*

- **Condition 20**

Except as may otherwise be agreed in writing by the Mineral Planning Authority within 6 months of the date of this permission, a landscaping scheme shall be submitted to the Mineral Planning Authority for approval. The scheme shall take into account any approved provisions of the revised Ecological Management Plan submitted pursuant to condition 12 of this planning permission. The scheme shall include proposals for the planting of trees, shrubs and plants, around the wet lips of the reservoir and the wetland area, with details of their numbers, size and species.

- **Condition 25**

Not later than the completion of the mineral extraction operations or the date referred to in Condition 26 of this permission, whichever is the sooner, a 5 year ecological aftercare programme incorporating the provisions of the scheme agreed under Condition 12 of this permission shall be submitted to the Mineral Planning Authority for approval in writing. The five year aftercare programme, as may be approved by the Authority, shall be implemented throughout the aftercare period.

This Updating Ecological Management Plan was prepared in-order to address Conditions 12, Condition 20 and Condition 25.

The extant permission for the site is due to lapse on 31st July 2018. Due to a lack of suitable engineering fill a Section 73 application is due to be submitted to the Minerals Planning Authority in order to extend the expiry date of the permission for a further two years to 2020. The required engineering fill is anticipated to be extracted from the adjacent Elton 2 extraction site, which will be subject to a separate application in 2018.

This document has been updated in order to update the ecological management for the site in light of the new timescales. Subject to approval by the Minerals Planning Authority, this document supersedes the previous Ecological Management Plan for the site prepared in 2016

1.3 Summary of Current Situation

The extraction of minerals and construction of a reservoir at the Elton Park site commenced in 2008 following the granting of planning permission for the works. Renewed planning permission to extend the end date of the original planning permission to 2018 was subsequently granted subject to conditions in 2014. A further extension of the original planning permission is due to be submitted to the Minerals Planning Authority in 2018 to extend the works to 2020.

1.4 Origin of Information

Information on the status of the site for informing this updated management plan is derived from surveys taken of the site during 2002 and 2003 by Ecoscope Applied Ecologists and RPS Ecoscope. These surveys include:

- An ecological seeping survey, carried out in June 2002, which included a Phase 1 Habitat survey, scoping for protected species and a list of dominant plant species;
- A winter bird survey, carried out from November 2002 to March 2003 to identify any legally protected bird species or species of conservation importance; and
- A breeding bird and reptile survey, carried out from March to July 2003 to record the numbers of birds breeding of all species, including species of conservation concern and to assess the presence and likely population size of reptiles on site.

This updated version of the EMP has been updated based on additional surveys undertaken by ECOSA following commencement of the works. These surveys include:

- Updating Extended Phase 1 Habitat Survey including a Phase 2 water vole and otter survey at the site in May 2013; and
- Updating walkover survey on the 3rd September 2014 to assess the current ecological conditions on site; and
- Updating otter and water vole survey undertaken on 29th March 2018 of banks of the River Nene associated with the proposed Elton 2 site¹.

1.5 Overall Status and Wildlife Importance

The breeding bird survey (RPS Ecoscope, 2003a) identified 27 species of birds breeding on site, an assemblage that equates to local importance. Of these, two species were BoCC Red Listed and five species were BoCC Amber listed. The two BoCC Red listed species, reed bunting *Emberiza schoeniclus* and song thrush *Turdus philomelos*, are also UK BAP species. A previous survey by Wigginton (1997) also identified little-ringed plover *Charadrius dubius*, lapwing *Vanellus vanellus*, ringed plover *Charadrius hiaticula*, and redshank *Tringa totanus* as breeding on site, of which the first is listed on Schedule I of the Wildlife & Countryside Act and the last three are BoCC Amber Listed.

¹ The 2018 survey did not entail a comprehensive resurvey of the site for otter and was primarily associated with the proposed Elton 2 extraction site. The full results of this survey will be incorporated into a separate report.

The winter bird survey (RPS Ecoscope, 2003b) identified 47 bird species on site, with 22 being BoCC Red or Amber Listed. The site held a wintering bird assemblage of local importance, with common snipe *Gallinago gallinago* and jack snipe *Lymnocyptes minimus* of particular local importance.

Surveys undertaken to inform the designation of the Eaglethorpe New Lake SINC in 2008 recorded the BoCC Amber Listed common sandpiper *Tringa hypoleucos*.

The reptile survey (RPS Ecoscope, 2003a) found a low population of grass snake *Natrix natrix* on the site. Grass snake are protected from killing and injuring under the Wildlife & Countryside Act (1981 and as amended).

The ecological scoping survey (Ecoscope Applied Ecologists, 2002), suggested the possibility that water vole *Arvicola amphibius* and otter *Lutra lutra* may occur on the adjacent River Nene, as records for these species existed from the surrounding area. Surveys will be undertaken for these species prior to works which would affect riverbank habitat.

2.0 AIMS, OBJECTIVES AND PRIORITIES OF MANAGEMENT

2.1 Aims and Objectives

This management plan has been prepared to fulfil the condition of planning consent for an ecological management plan. This is to be achieved through the following objectives:

- The plan should be acceptable to all parties concerned, namely Northamptonshire County Council, Natural England (formally English Nature), the Wildlife Trust and the Elton Estate;
- After the construction has finished, the site should seek to at least return to the conservation interest of the site as identified in ecological surveys carried out in 2002 and 2003; and
- The plan should include a monitoring and review process sufficient in order to ensure that the conservation objectives for the site are achieved.

The specific aims of the management plan are:

- To provide guidance on best practice operations to ensure protection of grass snake during construction; and
- To produce a wetland area that is of benefit to wildlife, in particular to snipe, teal and other water birds (see priorities below). This will be achieved through the following objectives:
 - Removal of the non-native species New Zealand pygmyweed *Crassula helmsii* from the site;
 - Removal of the non-native species orange balsam *Impatiens capensis* from the site;
 - Creation of a water body with shallows and wet mud areas to benefit waders and water birds; and
 - Planting of marginal, aquatic and emergent vegetation to provide cover and food for water birds and create habitat for other wildlife.

It is expected that the habitat created to achieve these objectives will also be of high value to other wildlife, including dragonflies, bats, water vole and grass snake.

2.2 Habitat creation priorities

Whilst the creation of a wetland is expected to benefit various species, it is intended to be of most value to breeding and wintering bird species outlined below (as well as waders generally).

2.2.1 Reed Bunting

Two pairs of reed bunting were recorded as occurring on site during the breeding season of 2003 (RPS Ecoscope, 2003). This species is a BoCC Red List species, as it has undergone a greater than 50 % decline in UK breeding population over the last 25 years. The management plan seeks to enhance the value of the site for this species to breed.

2.2.2 Snipe

The numbers of this species recorded on site in the winter of 2002-2003 are considered to be of County significance for Northamptonshire (RPS Ecoscope, 2003b). The species is on the BoCC Amber List on account of a moderate (25 - 49 %) decline in UK breeding population over the last 25 years. The management plan seeks to conserve and enhance the overwintering value of the site to this species.

2.2.3 Jack Snipe

The numbers of this species recorded on site in the winter of 2002-2003 are considered to be of local importance, being an uncommon winter visitor to Cambridgeshire and Northamptonshire (RPS Ecoscope, 2003b). The management seeks to at least conserve the overwintering value of the site to this species.

2.2.4 Teal

Teal *Anas crecca* are another BoCC Amber List species, as more than 20 % of the North West European non-breeding population occurs in the UK. A maximum count of 87 teal was seen in the winter of 2002-2003 (RPS Ecoscope, 2003b). The management plan seeks to conserve and enhance the overwintering value of the site to this species.

2.2.5 Lapwing

The BoCC Red Listed lapwing *Vanellus vanellus* was recorded as breeding on site in the past, though not during the breeding bird survey of 2003 (RPS Ecoscope, 2003). The management plan seeks to enhance the value of the site for this species to breed and overwinter.

2.2.6 Common Sandpiper

The BoCC Amber Listed common sandpiper *Actitis hypoleucos* was recorded using a recently created scrape on site during the assessment of the Eaglethorpe New Lake SINC. These birds are likely to be passage birds and the site is unlikely to support breeding common

sandpiper. The management plan will ensure that the site provides suitable bankside habitat suitable to support a range of passage migrant waders including common sandpiper.

2.2.7 Amber Listed Waders

Three to four pairs of redshank, a BoCC Amber List species, have been recorded as breeding on site in the past, although none were recorded as breeding in 2003 (RPS Ecoscope, 2003). Four pairs of Amber listed ringed plover have been recorded as breeding on site in 1997 (Wigginton, 1998), although none were recorded in either the winter bird survey of 2002-2003 or the breeding bird survey of 2003 (RPS Ecoscope, 2003). It is envisaged that the management plan will provide more breeding opportunities for these species on site.

3.0 CONSTRAINTS ON MANAGEMENT

The delivery of a management plan is subject to practical constraints imposed by existing conditions. The following key constraints will need to be accommodated within the plan.

3.1 Hydrology

There are two sources of water for existing and proposed wetlands within the site: rainfall and the adjacent River Nene.

The system will operate as follows: During winter, the reservoir will recharge from the River Nene through the feeder channel. Once the water level in the reservoir reaches the level of the lip separating the reservoir from the wetland creation area, water will overflow and recharge this area. The water level in the wetland will therefore be dictated by the maximum water level in the reservoir during this period.

However, during the summer, when water levels in the reservoir fall due to abstraction, water in the wetland will be trapped by the lip and will be retained, subject to losses from evaporation only. The initial water level in the wetland will therefore be dictated by the height of the lip dividing the wetland from the reservoir, and will decline subsequently as evaporation occurs.

The ability to retain water within the wetland area represents an opportunity to provide wintering habitat at times of high water levels, and habitat for waders during times of diminishing water levels.

There is a risk that if a dry winter follows a dry summer, when the reservoir would be expected to be at a low level, there may be insufficient river flow to fill up the reservoir and replenish the wetland shallows. However, this risk is the same as the risk of the area not flooding during dry winters under current land use.

3.2 Pollution

When the reservoir and adjacent wetlands are created, it is not expected that there will be any potential local sources of point source pollution present. The only threat to the wetland area from this type of pollution would be from any pollution incident on the river during the time when the river is high enough to flow into the reservoir. Even if this occurs, the reservoir itself would be expected to act as a buffer between the river and the wetland, making the risk from point source pollution to be very low.

Diffuse pollution is likely to affect the river and hence the connected reservoir and shallows, and the River Nene flowing past Eaglethorpe is designated as a Eutrophic Sensitive Area (DEFRA, 2003). The vegetation planted has to therefore be largely tolerant of the consequences of higher nutrient levels. The use of natural colonisation in parts of the site will ensure that communities develop that are suited to the conditions.

3.3 Public Access

A bird hide will be installed on the side of the wetland area nearest to the A605. In order to prevent disturbance to birds from visitors accessing the hide, it is recommended that a dense screening hedge comprised of native trees and shrubs including willow species *salix* and hawthorn *Crataegus monogyna* be planted along the access track leading up to the hide.

It is also recommended that in order to minimise disturbance, public access to the river bank is discouraged by allowing the development of a screen of scrub southwards from the hide, so that visitors to the site are restricted to the footpath and hide only.

4.0 HABITAT RESTORATION AND ENHANCEMENT WORKS

Three stages to restoration and enhancement are envisaged as follows, which are described below:

<i>Stage 1</i>	Site preparation
<i>Stage 2</i>	Physical wetland creation works
<i>Stage 3</i>	Planting, establishment and monitoring

4.1 Stage 1: Site Preparation

4.1.1 Pre-clearance Works

Grass Snake

Preparation of the site in advance of soil stripping and minerals extraction is required to ensure that grass snake are not harmed. The population found during the reptile surveys was small, and it is therefore considered that a sufficient area of habitat will remain around the periphery of the site to allow the population to persist until habitat creation commences.

To minimise the risk of harm to grass snake mitigation includes displacing individuals from the area to be excavated. This will be achieved by:

- Placing artificial refugia (sheets of corrugated metal and/or roofing felt) in areas of habitat which will not be affected by site works (e.g. in the strip of land between the reservoir and the River Nene). This will provide places of shelter outside the works area and hence encourage grass snake to move. Rubble mounds will be placed in strategic areas to provide basking sites, shelter and hibernation sites for reptiles.
- Prior to soil stripping, grass snake will be encouraged to move to the margins by strimming areas of suitable habitat to render them less favourable to reptiles. The sward is likely to be quite tall at the time of strimming, so initially, the cut will be to a minimum of 10cm in height. The next cut will be lower, and will be carried out on a warm day when reptiles will be active and therefore able to move out of the path of the strimmer. The site will be strimmed from the centre to the edges, to ensure that reptiles are not trapped in 'islands' of long grass that are subsequently mown. The sward will then be kept low with regular cuts to ensure that reptiles do not recolonise the site prior to soil stripping.

It is understood that the site was initially cleared in accordance with the above method in 2007 with subsequent works undertaken in cleared and inundated areas of no suitability for reptiles. All the work areas within the site have been now been stripped and are unsuitable for reptiles including the proposed area for the shallows.

An area of suitable reptile habitat remains in the form of a corridor running along the western site boundary between the reservoir and the River Nene. This habitat will remain unaffected by the works. These retained boundary habitats will be protected by a fenced buffer zone extending 5m into the site from the River Nene. Temporary fencing (orange barrier mesh fencing or similar) will be installed to demark the retained buffer zones and ensure no accidental tracking of machinery into this retained habitat.

During the updating walkover survey on the 3rd September 2014, the rubble piles and refugia outlined above could not be identified on site, but the vegetation was high and as these features would have been placed at the start of works these are likely to now be overgrown and difficult to identify on site. New refugia will be placed on site in the remaining reptile habitat to provide shelter and basking sites. These refugia will be checked on an ad hoc basis during any site visits undertaken by the ecological clerk of works during the active reptile season.

Water Vole and Otter

No evidence of water vole has been previously identified on site or along the banks of the adjacent River Nene, however, the river provides suitable habitat for this species. Evidence of otter has been recorded on a single occasion as part of the March 2018 survey associated with the Elton 2 site. Evidence of old otter footprints and otter spraints were recorded along the stretch of watercourse on the west of the site.

To minimise the risk of disturbance and to avoid any damage to bankside habitats, a protective buffer will be created between the edge of the works and the banks of the River Nene. These retained boundary habitats will be protected by a fenced buffer zone extending a minimum of 5m into the site from the River Nene. Temporary fencing (orange barrier mesh fencing or similar) will be installed to demark the retained buffer zones and ensure no accidental tracking of machinery into this retained habitat.

4.1.2 Additional Surveys

A survey of the point where the reservoir feeder channel will join the River Nene will be carried out for water vole and otter. It is not considered likely that an otter holt will occur, but the presence of water vole is a possibility. Should any signs of these species be found, the location of the feeder channel will be positioned so that water vole burrows are not impacted.

The feeder channel will be designed to provide additional habitat for water vole; see Section 5.2 for details.

A water vole and otter survey was carried out on site as part of the updating extended Phase 1 ecological assessment, undertaken by ECOSA in May 2013. No evidence of either water vole or otter was identified during this survey and therefore no direct impacts on these species are anticipated.

An updating water vole and otter survey will be undertaken prior to any work commencing on the construction of the feeder channel.

4.1.3 *Crassula Removal*

Objectives

The objective is the total eradication of *Crassula helmsii* from the site and hence the removal of the risk of this species infesting and dominating the wetland and reducing its value to wildlife.

Rationale

Crassula helmsii is an invasive, non-native species of aquatic plant from Tasmania. It grows over other aquatic vegetation, kills native plants and creates a poor, oxygen depleted habitat for aquatic animals (Newman, 2000). Since it grows in depths of up to 3m, the entirety of the shallows in the created wetland habitat could potentially become swamped with this plant if it is allowed to remain on site. It is easily spread, with a 5mm fragment of plant with a node being sufficient to start a new plant (Newman, 2000).

The Environment Agency should be consulted on the disposal of *Crassula*, even on site disposal, as this may be covered by waste disposal legislation.

Crassula helmsii was previously found within an area of inundation vegetation in the west of the site.

Actions

- Confirm and clearly mark out and fence the perimeter of the area containing *Crassula helmsii* in a manner sufficient to deter people, larger mammals and machinery entering the area before disposal of the weed.
- Remove topsoil containing *Crassula* and place in stockpiles adjacent to the bridleway.
- Carry out gravel extraction.
- Place *Crassula*-contaminated topsoil stockpiles at the base of the extraction void where the wetland area will be created.

- Cover with clays and soils from the next phase of overburden removal.
- Before the reservoir and wetlands are filled with water, the ground should be thoroughly surveyed for *Crassula*, in case fragments have been dropped and are growing. If found, the *Crassula* should be treated with Glyphosate. The Environment Agency should be consulted before herbicides are used near water.
- Ensure during all operations where people or machinery come into contact with areas contaminated by *Crassula* that boots and machinery are washed thoroughly before leaving the site. This species has been known to spread between sites in the past in mud on boots and machinery.
- Monitoring of *Crassula* contaminated stockpiles and areas where this species previously occurred will be undertaken on an annual basis for five years following completion of the works to ensure this invasive species does not recolonise the site.

During the site visit on 3rd September 2014 no evidence of *Crassula* was found on site and it is considered that this invasive species has been removed and destroyed at the site. The area identified as inundated vegetation supporting *Crassula* within the RPS survey is now bare disturbed ground.

Despite the lack of evidence of *Crassula*, the site will be thoroughly surveyed by the ecological clerk of works prior to the filling of the reservoir and wetlands in accordance with Step 6 outlined above. If the species is found to have re-colonised the site the actions above will be repeated and further monitoring undertaken.

4.1.4 Orange Balsam Removal

Objective

The objective is the removal of the non-native orange balsam *Impatiens capensis* from the site, and hence maximise the area of site that can be used by native vegetation and wildlife.

Rationale

Orange balsam is a non-native species, frequent in parts of the southern UK that is slowly increasing its range (State, 2003). Although not particularly invasive or listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), it is still an alien species that reduces native species diversity.

Orange balsam was found as scattered individuals on site in the inundation grassland. However, seeds may have reached other parts of the site.

Actions

It is considered that orange balsam should be removed during the process detailed above for the removal of *Crassula*.

During the site visit on 3rd September 2014 no evidence of orange balsam was found on site and it is considered that this invasive species has been removed and destroyed at the site. The area identified as inundated vegetation supporting orange balsam within RPS survey is now bare disturbed ground.

Despite the lack of evidence of orange balsam, the site will be thoroughly surveyed by the ecological clerk of works prior to the filling of the reservoir and wetlands in accordance with Step 6 outlined above.

4.1.5 Earth Bund Removal

Earth bunds have been created from stockpiled materials along the bridleway on the southern boundary of the site. These bunds have become colonised by vegetation and provide suitable reptile habitat. To ensure no reptiles are harmed, prior to the removal of these bunds, phased vegetation clearance will be undertaken during the active reptile season (April to September) to persuade reptiles to move into the retained habitat along the site boundaries. Approximately 30 refugia consisting of bituminous felt cut into 0.5x0.5m tiles will be deployed around the periphery of the earth bunds within retained habitat to provide suitable shelter for reptiles displaced from the bunds during the clearance. The bunds will then be trimmed under ecological supervision to a height of 150mm above ground level, working slowly and progressively towards the retained habitat. Arisings will then be removed from the bunds to avoid creating suitable refugia within the bunds. The following day, an ecologist will undertake a fingertip search of the remaining vegetation on the bunds, relocating any reptiles found into the retained habitat. The site will then be trimmed to ground level under ecological supervision to remove all vegetation from the bunds. A destructive search will then be conducted under ecological supervision to remove any suitable areas which could be used by sheltering reptiles. The bunds will be excavated under ecological supervision, with areas providing suitable shelter for reptiles excavated slowly using a toothed bucket. The stockpile will then be removed. Any reptiles found during the removal of the bunds will be placed by the ecologist under a refugia within the retained habitat along the banks of the River Nene in the north of the site.

4.2 Stage 2: Physical Wetland Creation Works

The proposed wetland comprises two key areas. First, a stepped wetland composed of permanently and seasonally inundated vegetation. The deepest part of this area will be up to 2m below maximum water depth and is expected to remain permanently inundated throughout the year. Second, marginal marshy grassland that will be inundated only during winter when water levels are highest.

4.2.1 Depths, Areas and Slopes of Shallows

Objective

To create water at different levels that will be suitable foraging habitat to a wide range of water birds in winter, and continue to be valuable foraging habitat for waders and ducks, including redshank and teal, as the water levels drop through the summer months.

Rationale

Snipe require areas of very shallow water and wet tussocky grassland for wintering. Waders require areas of shallow water for wintering and for summer foraging. Teal require water at around 10 to 15cm depth. Other dabbling ducks require around 30cm water depth, and diving ducks around 2m water depth (Game Conservancy, 1981). Other species such as common sandpiper require areas of bare ground around the banks of the lake. The deeper areas will also provide a refuge for aquatic invertebrates in summer as the water level drops in the shallows. The area involved will be around 2 ha in size, to the south and southwest of the reservoir.

Actions

An area of shallows, comprising a series of stepped levels and islands, will be created according to the following requirements (see **Table 1**). Figure 1 displays the depths and relative areas involved in side view. Depths given are from maximum water level expected in winter.

Table 1: Depths and features of the proposed shallows

Depth (cm) below Max. Water Level	Percentage Area of Shallows*	Additional Features
200	40%	N/A
90	10%	On this level, at least 2 areas to be left at 20cm depth to form islands when the water levels drop. The islands plus slopes (max. steepness 1 in 5) to comprise half of this level, i.e. 5% of the shallows site.
75	10%	N/A
60	10%	N/A
45	10%	On this level, at least 2 areas to be left at 5cm depth to form islands when the water levels drop. The Islands plus slopes (max. steepness 1 in 5) to comprise most of this level, i.e.

		around 8% of the shallows site.
30	10%	N/A
15	10%	N/A

*To include slopes up to next level of a maximum gradient of 1 in 5

The surface of the shallows base, from 75cm depth and shallower, will be covered with topsoil to provide a rich substrate for the growth of aquatic plants and invertebrates. The depths stipulated in the table above will be inclusive of topsoil.

The edges of each level and the islands will be scalloped as far as possible in order to form bays and spits, so as to maximise the amount of water's edge. A south or southeast facing spit on the north or west bank of the shallows will be covered with gravel to provide a loafing area for birds, and potential breeding site for ringed plover.

Half of the islands created on each level (i.e. at 90cm and 45cm levels) will be capped with shingle, the other half of the islands with 20 - 30cm of topsoil, and the topsoil-capped islands will be planted with emergent plants as described in subsection 6.5. These islands will provide resting and potential breeding sites for wildfowl and waders.

The aims, objective and methodology for the construction of the wetland creation remain the same and will be undertaken following completion of the extraction works. The ecological clerk of works will visit the site periodically during the construction of the wetland areas to ensure compliance with the environmental management plan.

4.2.2 Marginal Habitats

Objective

The objective for the surrounding area is to create an area that will be suitable for snipe, jack snipe and other wintering wader species.

Rationale

Snipe, jack snipe and some other wader species forage within tussocky wet grasslands. These areas are seasonally inundated when water depths are highest during winter. This type of habitat is favoured by wintering water birds including snipe and jack snipe. It could also potentially provide suitable breeding area for other waders.

The area involved is between the area set aside for shallows and the boundaries of the site and the reservoir. This is expected to comprise around 30 m width around the shallows area, terminating at the northern corner of where the shallows meet the reservoir, and at the eastern corner of where the shallows meet the reservoir.

Actions

An area of marshy grassland and larger humps will be created according to the following criteria (depths given are from water level expected in winter)

- 80 % of the area around the shallows will be at 0cm (around the water level expected in winter).
- 20% of the area to be formed into two distinct humps of +20cm, to act as islands during winters of above average water level, to include slopes of 1 in 5 maximum gradient.
- The humps/islands will be positioned as far from the public footpath and A605 and other sources of disturbance as possible.

The aims, objective and methodology for the creation of marginal habitat remain the same and will be undertaken following completion of the extraction works. The ecological clerk of works will be on site during the initial setting out of the marginal habitat creation to ensure compliance with the environmental management plan.

4.2.3 Reservoir Feeder Channel

Objective

The objective of the design and plantings of the reservoir feeder channel is to maximise the potential of this feature to provide habitat for water vole.

Rationale

Water vole require well-vegetated ditches with a suitable substrate for burrowing. Such ditches will also provide good habitat for invertebrates and grass snake.

The feeder channel will connect the reservoir with the River Nene. Its precise location will depend on the results of surveys carried out to determine whether water vole are present.

Actions

The channel will be constructed as far as practicable according to the preferred features for water vole, which include:

- Earth banks to facilitate burrowing;
- Steep bank profile (>45°);
- High density and diversity of herbaceous bankside cover;
- High density (>40%) of emergent species cover, particularly sedges, rushes, *Phragmites* and *Sparganium*,
- High degree (>40%) of water surface cover from aquatic vegetation; and

- Absence of bankside trees and shrubs.

Species listed in Appendix 1.2 will be planted/sown on the banks. Plant directly those species not so suitable for seeding, such as some rush and sedge species.

A grassland mix (those species listed in Appendix 1.3) will be sown on top of the banks.

If a particular sedge species cannot be sourced, then another shallow water sedge or rush species on the marsh plant or emergent plant list can be as a substitute. Sedges or rushes will be planted in groups to provide patches of cover for snipe.

The aims, objective and methodology for the creation of the reservoir feeder channel are unchanged since 2011 and will be undertaken following completion of the extraction works. A water vole and otter survey was undertaken by ECOSA on 3rd May 2013 during the updating extended Phase 1 ecological assessment. No evidence of water vole or otter was identified during this survey. The ecological clerk of works will undertake an updating water vole survey immediately prior to the construction of the feeder channel to ensure no existing water vole burrows are impacted by the construction of the feeder channel and to maximize the ecological benefits of the channel.

4.3 Stage 3: Planting and Establishment

Planting will be required within the two wetland areas described above as well as within the wet lips of the agricultural reservoir.

The planting methodology for the site remains as set out in the original EMP, outlined below. Prior to the planting and sowing of new habitats, the planting list will be sent to the Ecological Clerk of Works if species differ from those outlined in Appendix 1. The ecological clerk of works will supervise the initial setting out of planting areas in accordance with the EMP.

4.3.1 *Planting of the Shallows and Wet Lips of the Reservoir*

Objective

To create habitat that will benefit birds such as snipe, jack snipe and waterfowl in winter, and benefit breeding water birds in summer. To create a natural landscaped edge to the agricultural reservoir.

Rationale

Snipe require tall vegetation to provide concealment over winter. Many duck species require seeds from aquatic and emergent vegetation for food in winter. Aquatic emergent and marginal vegetation will support invertebrates, providing a food supply for duck and wader chicks in summer, as well as cover from predators.

The plantings will involve all depths of the shallows, and the wet lip areas of the reservoir.

Actions

A list of recommended species and preferred planting depths and propagation methods is given in Appendices 1.1 and 1.2.

Seeding and transplanting should be carried out between late summer and early spring. Planting of emergents will be in a minimum of three 5 - 10 m long blocks around the shallows so as to ensure that suitable cover is built up in some areas within a short space of time, whilst other areas will remain more exposed initially. Common reed *Phragmites australis* will be planted in a single block in a bay on the north or west side of the shallows. The recommended planting density is 4 per m². The resulting variation in cover will suit a wide range of species.

Common reed, common clubrush *Schoenoplectus lacustris*, branched bur-reed *Sparganium erectum* and Yellow Flag *Iris pseudacorus* will also be planted in the wet lip areas of the reservoir.

Aquatic species will be spread more evenly around the flooded area, and water edge/ marsh plants should have their seeds widely dispersed around the edge of the shallows and the surrounding area.

The gravel covered islands and the gravel covered spit will not have any emergents or marginal plants planted on them.

When transplanting, roots will be kept wet. For non-rhizomatous species in particular, take as much of the soil/mud surrounding the rootball as possible.

If the emergent species listed in Appendix 1.2 cannot be easily obtained as a whole plant, then seed could be used instead, and spread over the relevant area. With regard to the aquatic species in Appendix 1.1, if a species cannot be easily obtained then more of another species on the list can be substituted in its place, but the aquatics should include at least one species of pondweed *Potamogeton* sp. and one species of stonewort *Chara* or *Nitella* sp.

4.3.2 Planting of Surrounding Areas

Objective

The objective of the plantings around the area of the shallows is to create wet grassland that will provide both cover for snipe and jack snipe in winter, and an area suitable for waders to breed in summer with minimal disturbance.

Rationale

Snipe and jack snipe require both swampy ground to forage for invertebrates, and cover in the form of tussock forming grasses, rushes and sedges. These grasses, rushes and sedges

will also provide cover for nests and young of reed bunting and waders such as redshank. Other plants will support and attract invertebrates to provide prey for juvenile birds.

A screen of low native bush species along the public footpath will minimise the amount of disturbance the birds may receive from passing people, in addition to providing wildlife habitat in their own right.

The area involved is between the area set aside for shallows and the boundaries of the site and the reservoir. This is expected to comprise around 30 m width around the shallows area, terminating at the northern corner of where the shallows meet the reservoir, and at the eastern corner of where the shallows meet the reservoir.

Actions

- Sow the seed of species listed in Appendix 1.3 as these are considered suitable for marshy grassland. The broad grassland type aimed for approximates to NVC type MG 13 (Rodwell, 1992), adapted in light of the species known to already occur on site.
- Plant directly those species not so suitable for seeding, such as some rush and sedge species.
- For the grassland mix, those species specified listed in Appendix 1.3 as occupying 5 % or more of the final area are the key species required to create the characteristic grassland type. If seed of some of the remaining species cannot be sourced, then that species may be omitted provided the proportions of the other species in the mix are increased accordingly.
- If a particular sedge species cannot be sourced, then another shallow water sedge or rush species on the marsh plant or emergent plant list can be as a substitute. Sedges or rushes should be planted in groups to provide patches of cover for Snipe.
- Native Willow species, particularly Sallow species *Salix caprea* and *Salix cinerea* together with other native shrubs such as hawthorn will be planted along the south of the wetland area, to shield the shallows from the public footpath and hence reduce disturbance of the birds. This planting will be used to create a hedgerow in advance of the removal of earth bunds and stockpiles. Species and planting specifications are provided in Appendix 1.1, 1.2 and 1.3.

4.4 Sourcing of Plant Material

In order to minimise costs and maintain local diversity, it is preferable to allow natural colonisation from existing sources of plant material.

However, in order to ensure that habitats mature quickly, it will be desirable to introduce plant material in some areas. Were possible, plants from retained areas of vegetation on site would be translocated, although care would need to be taken to ensure that non-native species are not translocated as well.

Any species essential for habitat creation which cannot be obtained in this manner will be sourced from an external supplier. All species will be native and of local provenance.

4.5 Ecological Clerk of Works

ECOSA have been appointed as Ecological Clerk of Works for the site and will undertake necessary site visits and surveys as required to facilitate the EMP. Ecological supervision by the Clerk of Works will be undertaken in accordance with **Table 2**. Ingrebourne Valley Limited, the site operator, will be responsible for informing the Ecological Clerk of Works of the confirmed commencement dates of works requiring ecological supervision, including the removal of bunds, commencement of the creation of the shallows and the construction of the feeder channel where this joins the River Nene.

The Ecological Clerk of Works will review the plans of the shallows with construction engineers before the shallows are created. The Ecological Clerk of Works will provide on-going advice so as to ensure that the wildlife objectives are met should additional constraints be encountered during the work. The Ecological Clerk of Works will check the site for the presence of breeding birds during the breeding season (March - late August) to ensure that construction and planting works do not disturb the nests of breeding birds. The Ecological Clerk of Works will also undertake reptile monitoring and reptile mitigation during the clearance of the vegetated stockpiles and bunds.

The Ecological Clerk of Works will also check for the presence of *Crassula* in the site after disposal and before the shallows are created, and oversee and advise on the planting of the shallows and surroundings.

Ecological supervision by the Clerk of Works will be undertaken in accordance with **Table 2**.

Table 2 – Programme of site attendance by Ecological Clerk of Works during remaining construction works

Year	2016 to 2018											
Month	J	F	M	A	M	J	J	A	S	O	N	D
Works	No on-site works. Importation of clay to Elton Plant Site Planting of willow hedgerow to provide screening in advance of earth bund removal will be undertaken in 2016/2017 planting season (November 2016 – March 2017)											

Clerk of works				1 day per year - Monitor current site conditions including invasive species, breeding birds and reptile refugia checks.								
Year	2019/2020 (depending on date of completion of engineering works and stockpiling of clay material from the Elton 2 Site)											
Month	J	F	M	A	M	J	J	A	S	O	N	D
Works	1 st January – 31 st March Continued Importation/ Stockpiling of Clay to Elton Plant Site			1 st April – 31 st May Dewatering Operations		1 st June – 31 st July Final Engineering Operations/ Clay Lining/ Profiling for Shallows		1 st August – 31 st December All planting shallows species/grasses etc.				
Clerk of works				<ul style="list-style-type: none"> ▪ Breeding bird survey in April prior to commencement of on-site works. ▪ Phased vegetation clearance and destructive search during removal of bunds. Commence in April/May. ▪ Re-survey of feeder channel location for signs of otter and water vole. May-September. ▪ Monitor site for colonisation of invasive species. ▪ Monitoring of new planting/habitat creation following completion of works. 								

5.0 ONGOING MANAGEMENT AND AFTERCARE

Following completion of the restoration of the site in 2019/2020 (depending on date of completion of engineering works and stockpiling of clay material from Elton 2 Site), ongoing management of the site will be undertaken by The Elton Estate who will undertake the required maintenance and management of retained and restored habitats. In accordance with *Condition 25* The ongoing management will be undertaken for five years following completion of the works to ensure successful establishment of habitats on site. An integral part of the management plan process will be monitoring the success of the management regime and a formal progress review. There will be an EMP review meeting at the end of every year, attended by the Elton Estate, their appointed ecologist and management contractor and the Minerals Planning Authority (MPA), to discuss the progress of the activities undertaken. This will enable issues to be identified and resolved where required. A formal progress report will be provided to the management team, Mineral Planning Authority and Local Planning Authority, containing action plans for any issues identified.

The monitoring and review process will comprise an annual review report to include the following elements:

- Details of extent, timing and outcome of all works undertaken in the previous years;
- Site Manager's assessment of effectiveness of works undertaken; and
- Recommendations for next year's management requirements.

The five-year management and aftercare programme will be undertaken in accordance with the actions outlined below.

5.1 Grassland Management

Objectives

The objective of this is to maintain a grassland habitat with a diversity of vegetation heights suitable for a range of birds and other wildlife.

Area

The area involved is the marshy grassland around the shallows part of the site.

Actions

The marshy grassland area will be cut once per year in August, when any juvenile birds on site should have flown, and before birds arrive on the autumn migration. Frequent small patches of taller vegetation, particularly rushes and sedges, should be left to provide cover for snipe. More rushes and sedges should be left towards the shallows.

Cutting will be to a minimum height of 10cm to avoid injury to grass snake. Mower cuttings will be removed from the site. No fertilisers should be applied to the area.

If control of invasive weeds is considered necessary, the Environment Agency will be consulted before herbicides are applied, as the area is adjacent to a river.

5.2 Feeder Channel Management

Objectives

The feeder channel will be managed to a) ensure that water flow is not choked by vegetation and b) to maximise habitat potential for water vole.

Actions

When vegetation growth in the channel develops to the point where water flow might be impeded, the vegetation will be mown. Only one bank will be mown on each occasion; this will keep the channel open but allow vegetated banks to persist.

Mowing will take place in winter, and will be to a minimum height of 10cm. Cuttings will be removed.

6.0 TIMESCALE FOR ENHANCEMENTS AND MANAGEMENT

The following tables give the timetables for the habitat enhancements and management. **Table 3** condenses the various activities that have to take place in order to create the habitats and features required under the ecological management plan. A timetable for ongoing management is outlined in **Table 4**.

Table 3: Timetable for initial habitat restoration and enhancement post-completion

Habitat/ Area	Prescription	Timescale
Inundation area	Removal of <i>Crassula</i>	First year post-completion
Shallows and surrounding area	Creation of stepped shallows and landscaping of surrounding marshy area	Between August and February of final year of project
Shallows	Planting of shallows with aquatic, emergent and marginal vegetation	Between late summer and early spring following creation of shallows
Reservoir	Planting of wet lips with selected emergent vegetation	Between late summer and early spring following creation of wet lips
Marshy grassland	Seeding of marshy grassland	Between late summer and early spring following creation of shallows

Table 4: Timetable for ongoing management

Habitat/ Area	Prescription	Timescale
Marshy grassland	Mowing, but leaving frequent small patches of taller rushes, sedges or other vegetation	Once per year during August
Reservoir feeder channel	Occasional mowing of in channel vegetation to ensure uninterrupted water flow to reservoir	Mow half the channel each year (or every two years if growth is not vigorous) during November – January

7.0 MONITORING

Wetlands change naturally over time, with habitats altering through the process of succession. In order to ensure the continuing conservation value of the site, and to ensure that the objectives of the management plan are achieved, regular monitoring will be required after the shallows and surrounding marshy grassland have been created. Review and alteration of the actions in the management plan may be necessary in order to achieve the plan's objectives.

Following the completion of the restoration of the site, the Elton Estate will appoint a suitably experienced and qualified ecologist to undertake protected species and habitat monitoring surveys and to provide an annual review of the Ecological Management Plan. Where appropriate, local British Trust for Ornithology volunteers will be consulted regarding any species records which have been recorded from the site associated with the installed hide. The targets to be monitored, and conditions which may prompt review, are given in **Appendix 2**.

Following the creation of new habitats, the vegetation on site will be monitored on an annual basis for five years following completion of the works. This will be undertaken by the ecologist appointed by the Elton Estate. A National Vegetation Classification (NVC) survey will be undertaken to assess the quality of the habitats created. Monitoring visits will comprise a single annual visit undertaken between late April and early July by an experienced ecologist to monitor how newly created habitats are establishing. The ecologist will record species diversity and vegetative cover. The ecologist will assess the success of habitat creation and provide updated recommendations for management or replanting if planting fails or if ruderal or invasive species colonise newly created habitats.

In addition, the success of the wetlands in terms of attracting key bird species will be monitored. This will be undertaken by the ecologist appointed by the Elton Estate. This will be achieved via a programme of summer and winter visits by an ornithologist to identify and count bird species on site. The surveys will be carried out in accordance with the Common Bird Census (CBC) and Royal Society for the Protection of Birds (RSPB) survey guidance. Four visits per year during the five-year aftercare period will be undertaken to ascertain whether the desired bird species are occurring on site. These monitoring surveys will include two wintering bird surveys undertaken between November and March and two breeding bird surveys undertaken between April and June. The surveys will be undertaken by a suitably experienced ornithologist. These surveys will commence in 2018, with four surveys undertaken per year until 2022.

Monitoring of the reptile population on site will also be undertaken by the ecologist appointed by the Elton Estate in years 2 and 5 (2019 and 2022) following completion of the works to assess the status of the population and determine whether any modifications to the on-going

management is required. The monitoring surveys will entail the laying of approximately 60 bitumen roofing felt mats and 50 tins (refugia) 500 x 500mm in areas of suitable habitat within the site. The refugia will be inspected for reptiles on seven occasions per monitoring year, between April and May. During each survey visit the species, sex (if possible) and age of all reptiles encountered will be recorded.

7.1 Reporting Results

The results of the monitoring will be sent to the Mineral Planning Authority, the Bedfordshire Cambridgeshire and Northamptonshire Wildlife Trust and the Northamptonshire Biodiversity Records Centre. An annual report on the success of the Ecological Management Plan and any recommended changes to the management plan will be submitted to the Mineral Planning Authority for approval on an annual basis in 2018, 2019, 2020, 2021 and 2022 following completion of EMP Annual Review Meeting at the end of each year. Results of wintering bird, breeding bird and reptile monitoring surveys will be provided to the Mineral Planning Authority, the Bedfordshire Cambridgeshire and Northamptonshire Wildlife Trust and the Northamptonshire Biodiversity Records Centre within four weeks of the completion of the surveys each year (July/August). The report will be produced by the ecologist appointed by the Elton Estate.

8.0 REFERENCES

DEFRA (2003). Urban Waste Water Treatment Directive Sensitive Areas: Anglian Region. http://www.defra.gov.uk/environment/water/quality/uwwtd/sensarea/pdf/sensarea_anglian.pdf

Ecoscope Applied Ecologists (2000). Wildlife Management & Habitat Creation on Landfill Sites: a Manual of Best Practice. Ecoscope Applied Ecologists, Muker.

Ecoscope Applied Ecologists (2002). Ecological Scoping of Land at Elton Park, Peterborough. Unpublished report to DK Symes Associates.

Environment Agency (2003). Guidance for the Control of Invasive Weeds in or near Fresh Water. Environment Agency. www.introduced-species.co.uk/Species/plants/jewelweed.htm

Newman, J. (2000). Australian Swamp Stonecrop. IACR-Centre for Aquatic Plant Management. <http://www.waterpolicyteam.org>

Rodwell, J.S. (1992). British Plant Communities Volume 3: Grasslands and Montane Communities. Cambridge University Press.

RPS Ecoscope (2003a). Elton Estate: Breeding Bird and Reptile Survey of Proposed Reservoir Site 2003. Unpublished report to DK Symes Associates.

Ecoscope (2003b). Invertebrate Bird Survey of Land at Elton Estate, Peterborough, 2002-2003. Unpublished report to DK Symes Associates.

Snow, D.W. & Perrins, C.M. (1998) The Birds of the Western Palearctic: Concise Edition Volume 2: Passerines. Oxford University Press.

Snow, D.W. & Perrins, C.M. (1998). The Birds of the Western Palearctic: Concise Edition Volume 1: Non-Passerines. Oxford University Press.

State, A.D. (2003). Introduced Species in the British Isles- jewelweed. <http://www.introduced-species.co.uk/Species/plants/jewelweed.htm>

The Game Conservancy (1981). Midfowl Management on Inland Waters. Game Conservancy.

The Wildfowl and Wetlands Trust (1994) Wetlands, Industry and Wildlife: a Manual of Principles and Practices. The Wildfowl and Wetlands Trust.

White, G., Gilbert, J., Benstead, P., Fasham, M. and Jose, P. (2003). Habitat Creation Handbook for the Minerals Industry. RSPB, Sandy.

Wigginton, M. (1998). Birds at the Seasonal Lake, The Mill, Warmington, in 1997. Unpublished report.

APPENDIX 1 RECOMMENDED PLANT SPECIES

Appendix 1.1 Aquatic Species

English Name	Scientific Name	Planting Depth	Propagation and Planting Technique
Broad leaved pondweed	<i>Potamogeton natans</i>	90cm to 2m	Transfer shoots with roots or push winter buds into clay balls to be thrown in.
Fennel leaved pondweed	<i>Potamogeton pectinatus</i>	90cm to 2m	Transfer cuttings.
Spiked water-milfoil	<i>Myriophyllum spicatum</i>	60 to 75cm	Push cuttings into the mud, or into a clay ball and throw in.
*Yellow water-lily	<i>Nuphar lutea</i>	2m	Transfer rhizomes.
Starwort	<i>Callitriche</i> sp.	90cm	Transfer plants.
Stonewort	<i>Chara</i> sp. and <i>Nitella</i> sp.	2m	Drop in a pile (weigh down with stone if necessary).
Water crowfoots	<i>Ranunculus</i> sp., especially <i>R. peltatus</i> , <i>R. trichophyllus</i> and <i>R. aquatilis</i>	90cm to 2m	Push cuttings into the mud, or into a clay ball and throw in.

* Species recorded as occurring on-site

Appendix 1.2 Emergent and Shallow Edge Species

English Name	Scientific Name	Planting Depth	Propogation and Planting Technique
Common reed	<i>Phragmites australis</i>	60cm	Transplant rhizomes.
Branched bur-reed	<i>Sparganium erectum</i>	30 to 45cm	Transplant rhizomes/corms.
Water dock	<i>Rumex hydrolapathum</i>	45cm	Transplant whole plants.
Arrowhead	<i>Sagittaria sagittifolia</i>	15cm	Plant stolons, or push winter-buds into the mud.
*Lesser pond sedge	<i>Carex acutiformis</i>	15cm	Divide and transplant rhizomes.
Amphibious bistort	<i>Persicaria amphibia</i>	60 to 75cm	By seeds or division.
*Yellow flag iris	<i>Iris pseudacorus</i>	15 to 30cm	Transplant rhizomes.
*Brooklime	<i>Veronica beccabunga</i>	15cm	Plant seed or transplant.
Common club-rush	<i>Schoenoplectus lacustris</i>	45 to 60cm	Divide and transplant.
*Water plantain	<i>Alisma plantago-aquatica</i>	45 to 60cm	From seed.
*Hard rush	<i>Juncus inflexus</i>	20, 15 to 5cm	Divide and transplant rhizomes.
*Soft rush	<i>Juncus effusus</i>	20, 15 to 5cm	Divide and transplant rhizomes.
*Compact rush	<i>Juncus conglomeratus</i>	20, 15 to 5cm	Divide and transplant rhizomes.
*Creeping water cress	<i>Rorippa nasturtium aquaticum</i>	15cm or less	Transplant whole plants or from seed.
*Marsh yellow cress	<i>Rorippa islandica</i>	15cm or less	Transplant whole plants or from seed.
*Common spike-rush	<i>Eleocharis palustris</i>	Edge	Divide and transplant.

English Name	Scientific Name	Planting Depth	Propogation and Planting Technique
*Water horsetail	<i>Equisetum fluviatile</i>	Edge	Transplant rhizomes.
Marsh marigold	<i>Caltha palustris</i>	Edge	Transplant whole plants, or from seed.
Purple-loosestrife	<i>Lythrum salicaria</i>	Edge	From seed.

* Species recorded as occurring on-site

Appendix 1.3 Marshy Grassland Species

English Name	Scientific Name	Planting Depth	Propogation and Planting Technique	Percentage of Seed Mix
*Meadowsweet	<i>Alipendula ulmaria</i>	Edge and marsh	Transplant whole plants, or from seed.	N/A
*False Fox Sedge	<i>Carex otrubae</i>	Edge and marsh	Divide and transplant rhizomes.	N/A
*Cyperus Sedge	<i>Carex pseudocyperus</i>	Edge and marsh	Divide and transplant rhizomes.	N/A
*Gypsywort	<i>Lycopus europaeus</i>	Marsh	From seed.	2
*Marsh Cudweed	<i>Filaginella uliginosa</i>	Marsh	From seed.	2
*Common Figwort	<i>Scrophularia nodosa</i>	Marsh	From seed.	2
Cuckoo Flower	<i>Cardamine pratensis</i>	Marsh	From seed.	2
Hemp Agrimony	<i>Eupatorium cannabinum</i>	Marsh	From seed.	2
*Creeping Buttercup	<i>Ranunculus repens</i>	Marsh	From seed.	5%
Cocksfoot	<i>Dactylis glomerata</i>	Marsh	From seed.	5%
*Marsh Foxtail	<i>Alopecurus geniculatus</i>	Marsh	From seed.	30%
Rough Meadow Grass	<i>Poa trivialis</i>	Marsh	From seed.	10%
*Creeping Bent	<i>Agrostis stolonifera</i>	Marsh	From seed.	40%

* Species recorded as occurring on-site

APPENDIX 2 POST-ENHANCEMENT MONITORING

Monitoring Targets, Timetable and Responsibilities

Habitat or Species of Interest	Targets to Monitor	Monitoring Responsibility	Timescale	Criteria for Review of Management Plan	Actions in Light of Review	Responsibility for Actions
<i>Crassula helmsii</i>	Absence of <i>Crassula</i> from shallows and surrounding area.	Elton Estate	Annually in summer	<i>Crassula</i> found	Confirm identification and seek advice from Environment Agency on use of chemical controls	Elton Estate
Emergent Vegetation	Amount of emergent vegetation cover should increase each year up to 30 % of area of shallows.	Elton Estate	Annually in summer	Emergent vegetation cover fails to increase each year towards 30 % cover	Consultation between Elton Estates appointed ecologist and management contractor and others to determine reason for poor establishment and rectify situation accordingly	Elton Estate
Shallows	Coverage by emergents, especially reed, should be under 30% of the shallows area.	Elton Estate	Annually in summer	Greater than 30% coverage by emergents	Elton Estates management contractor to undertake annual cutting in autumn of the excess area of emergent vegetation	Elton Estate
Marshland Vegetation	Rushes and sedges should establish as clumps within a year of planting	Elton Estate	Annually in summer	Rushes and sedges fail to establish	Consultation between Elton Estates appointed ecologist and management contractor and others to determine reason for poor establishment and rectify situation accordingly	Elton Estate
Wintering Birds	Numbers of snipe recorded should increase each year after shallows creation until at least equal to numbers found in winter of 2002-2003	Elton Estate	Annually in winter	Snipe fail to return to site, remain at a level lower than found in winter 2002-2003 and fail to increase in numbers over a 3 year period	Consultation between Elton Estates appointed ecologist and management contractor, local BTO surveyors and Wildlife Trust to determine reason for low numbers of snipe and rectify situation as necessary	Elton Estate
	Jack snipe should be recorded as present on site at least every other year	Elton Estate	Annually in winter	Jack snipe are not seen on site, or only very rarely	Consultation between Elton Estates appointed ecologist and management contractor, local BTO surveyors and Wildlife Trust to determine reason for lack of Jack Snipe and rectify situation as	Elton Estate

Habitat or Species of Interest	Targets to Monitor	Monitoring Responsibility	Timescale	Criteria for Review of Management Plan	Actions in Light of Review	Responsibility for Actions
					necessary	
	Numbers of teal recorded should increase each year after shallows creation until at least equal to numbers found in winter of 2002-2003	Elton Estate	Annually in winter	Teal fail to return to site, remain at a level lower than found in <i>winter</i> 2002-2003 and fail to increase in numbers over a 3 year period	Consultation between Elton Estates appointed ecologist and management contractor, local BTO surveyors and Wildlife Trust to determine reason for low numbers of Teal and rectify situation as necessary	Elton Estate
Reed Bunting	Reed Bunting should be found to be breeding on site	Elton Estate	Annually in summer	Reed bunting fail to breed on site even after 3 years	Consultation between Elton Estates appointed ecologist and management contractor, local BTO surveyors and Wildlife Trust to determine reason for lack of Breeding Reed Bunting and rectify situation accordingly	Elton Estate
Waders	Red or Amber listed waders should return to breed on site within 3 years of the creation of the shallows	Elton Estate	Annually in summer	No Red or Amber listed waders breeding on site even after 3 years	Consultation between Elton Estates appointed ecologist and management contractor, local BTO surveyors and Wildlife Trust to determine reason for lack of breeding waders and rectify situation as necessary	Elton Estate

FIGURE 1 Profile across Shallows Area and Surrounding Marshy Grassland

EAGLETHORPE, THE ELTON ESTATE, PETERBOROUGH

Updating Ecological Management Plan

Figure 1 Profile across Shallows Area and
Surrounding Marshy Grassland

Client: Ingrebourne Valley Limited

Date: August 2015

Status: Final

KEY



Ground



Expected Water Level in Winter



Island



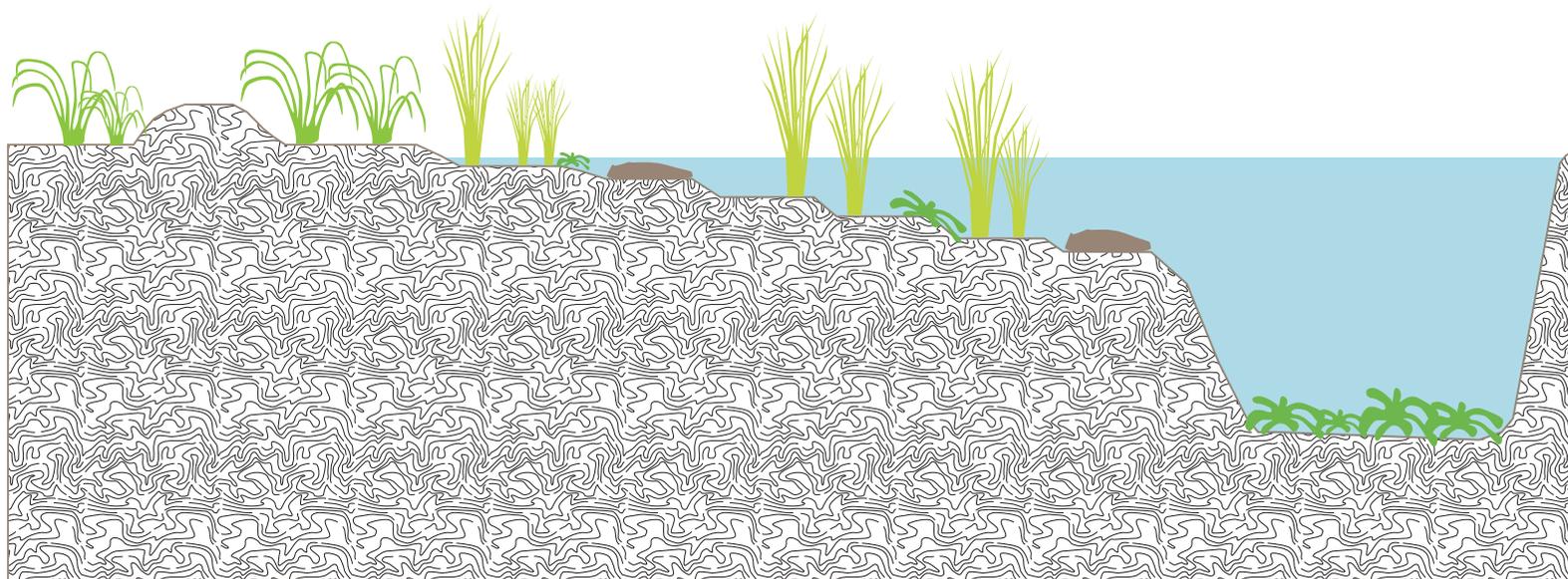
Marginal and Clump Vegetation



Emergent Vegetation



Aquatic Vegetation



South-west

North-east

Horizontal Scale: 1:1,000

Vertical Scale: 1:100

ECOSA

Ecological Survey & Assessment Limited

Ten Hogs House, Manor Farm Offices,
Flexford Road, North Baddesley. SO52 9DF

Tel: 02380 261065 Email: info@ecosa.co.uk

Web: www.ecosa.co.uk

© This map is the copyright of Ecological Survey & Assessment (ECOSA) Ltd.
Any unauthorised reproduction or usage by any person is prohibited.

FIGURE 2 Landscaping Scheme

EMERGENT AND SHALLOW EDGE SPECIES

ZONE A SPECIES (10 species, Depth 0-30cm)

- | | |
|-----------------------|-------------------------------------|
| Arrowhead | <i>Sagittaria sagittifolia</i> |
| Lesser Pond Sedge* | <i>Carex aculiformis</i> |
| Yellow Flag Iris* | <i>Iris pseudacorus</i> |
| Brooklime* | <i>Veronica beccabunga</i> |
| Hard Rush* | <i>Juncus inflexus</i> |
| Soft Rush* | <i>Juncus effusus</i> |
| Compact Rush* | <i>Juncus conglomeratus</i> |
| Creeping Water Cress* | <i>Rorippa nasturtium aquaticum</i> |
| Marsh Yellow Cress* | <i>Rorippa islandica</i> |
| Common Spike-rush* | <i>Eleocharis palustris</i> |

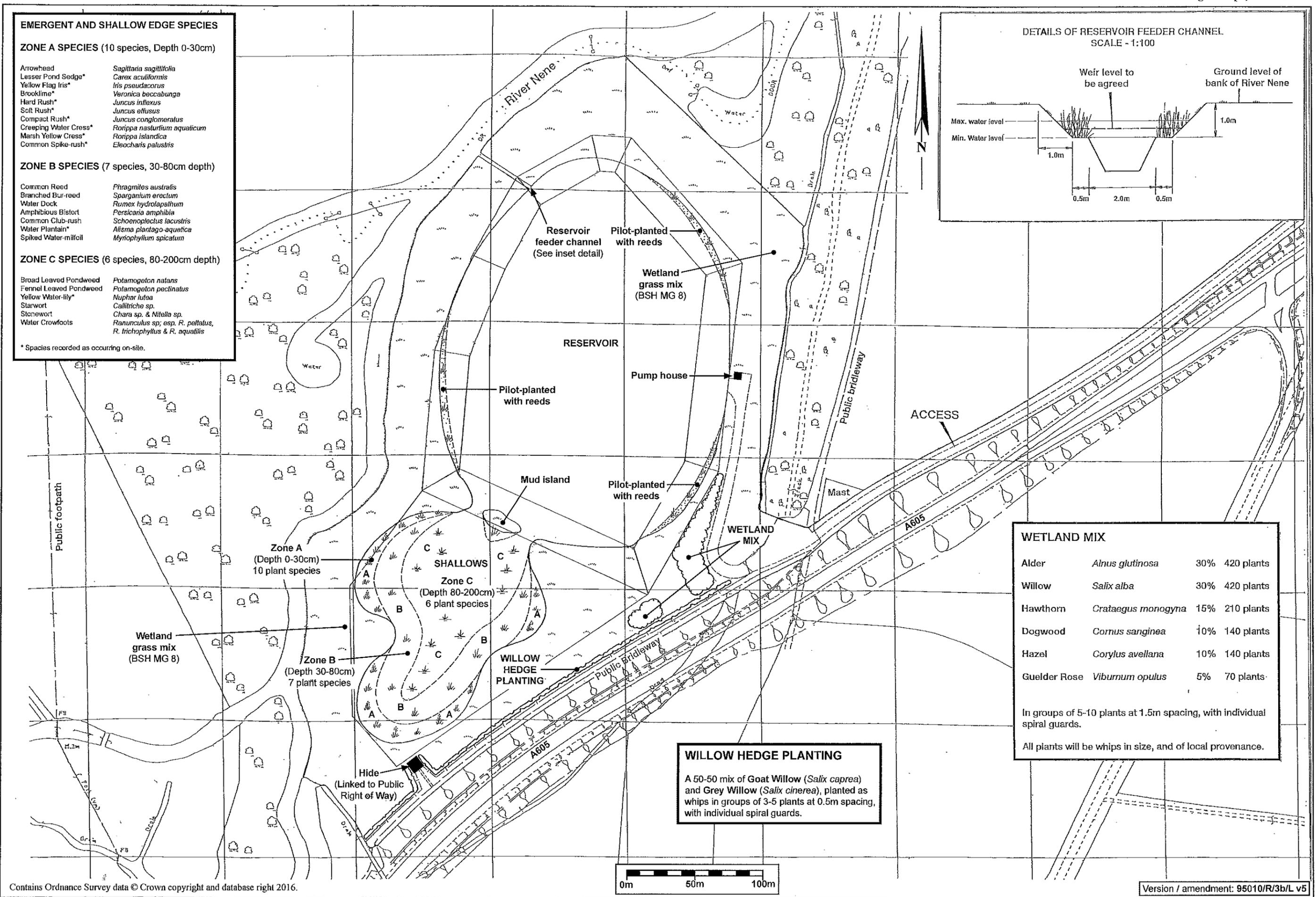
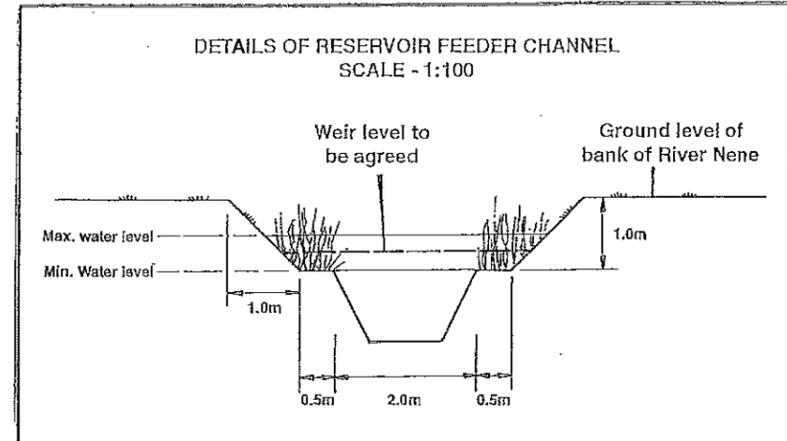
ZONE B SPECIES (7 species, 30-80cm depth)

- | | |
|----------------------|---------------------------------|
| Common Reed | <i>Phragmites australis</i> |
| Branched Bur-reed | <i>Sparganium erectum</i> |
| Water Dock | <i>Rumex hydrolapathum</i> |
| Amphibious Bistort | <i>Persicaria amphibia</i> |
| Common Club-rush | <i>Schoenoplectus lacustris</i> |
| Water Plantain* | <i>Alisma plantago-aquatica</i> |
| Spiked Water-milfoil | <i>Myriophyllum spicatum</i> |

ZONE C SPECIES (6 species, 80-200cm depth)

- | | |
|------------------------|--|
| Broad Leaved Pondweed | <i>Potamogeton natans</i> |
| Fennel Leaved Pondweed | <i>Potamogeton pectinatus</i> |
| Yellow Water-lily* | <i>Nuphar lutea</i> |
| Starwort | <i>Callitriche</i> sp. |
| Stonewort | <i>Chara</i> sp. & <i>Nitella</i> sp. |
| Water Crowfoots | <i>Ranunculus</i> sp; esp. <i>R. peltatus</i> ,
<i>R. trichophyllus</i> & <i>R. aquatilis</i> |

* Species recorded as occurring on-site.



WETLAND MIX

Alder	<i>Alnus glutinosa</i>	30%	420 plants
Willow	<i>Salix alba</i>	30%	420 plants
Hawthorn	<i>Crataegus monogyna</i>	15%	210 plants
Dogwood	<i>Cornus sanguinea</i>	10%	140 plants
Hazel	<i>Corylus avellana</i>	10%	140 plants
Guelder Rose	<i>Viburnum opulus</i>	5%	70 plants

In groups of 5-10 plants at 1.5m spacing, with individual spiral guards.
All plants will be whips in size, and of local provenance.

WILLOW HEDGE PLANTING
A 50-50 mix of Goat Willow (*Salix caprea*) and Grey Willow (*Salix cinerea*), planted as whips in groups of 3-5 plants at 0.5m spacing, with individual spiral guards.

Contains Ordnance Survey data © Crown copyright and database right 2016.