

HAVANT THICKET RESERVOIR PROJECT

OUTLINE BIODIVERSITY MITIGATION AND COMPENSATION STRATEGY



Final Document

September 2020

Preliminary Ecological Appraisals • Protected Species Surveys and Licensing • NVC • EclA • HRA • 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, Romsey, Hampshire, SO51 8JJ Registered in England No: 6129868
Ecological Survey & Assessment Limited is a Trinity Consultants Company



ECOSA Quality Assurance Record

This report has been produced in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Report Writing 2017 (CIEEM, 2017).

Description:	Outline Biodiversity Mitigation and Compensation Strategy
Produced For:	Portsmouth Water Limited
Issue:	Final
Report Reference:	20.0016.0005.F0
Date of Issue:	17 th September 2020
Author:	 Simon Boswell MSc MCIEEM CEcol Principal Ecologist
Checked by:	 Richard Chilcott MSc MCIEEM Principal Ecologist
Reviewed by:	 Simon Colenutt BSc (Hons) MCIEEM CEnv Managing Principal Ecologist

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1.0 INTRODUCTION

1.1 Background

Ecological Survey & Assessment Limited (ECOSA) have been appointed by Portsmouth Water to prepare an outline Biodiversity Mitigation and Compensation Strategy (BMCS) for the Havant Thicket Reservoir Project.

Ecological surveys undertaken between 2005-2009 and 2017-2020 have been used as the basis to support this outline BMCS (**Appendix 1**). The surveys included detailed habitat surveys, along with extensive surveys for bats, otter, water vole, badger, hazel dormouse, breeding birds, wintering birds, reptiles, great crested newt, terrestrial invertebrates and aquatic invertebrates. The results of these surveys were used to prepare ECOSA survey reports to inform an Environmental Statement (ES) Ecology Chapter prepared by Atkins¹ (Atkins, 2020c). The ES Ecology Chapter and this outline BMCS have been prepared to support a planning application for the development of a reservoir at the site.

Within this document where mention is made of 'the site' this refers to the main reservoir site (see **Appendix 1**). Where reference is made to the 'wider site' this relates to the ecological enhancement within Forestry England (FE) Havant Thicket woodland to the north and the connected Bell's Copse to the west of the site and Hampshire County Council's (HCC) Staunton Country Park (SCP) to the south. This area is depicted by the 'site boundary' area on **Appendix 1**. Where reference is made to the Hermitage Stream this relates to the Hermitage Stream Waterbody, which comprises the stream corridor to the south of the site.

Appendix 1 includes details of the key features within the site and surrounding area, including the location of woodland blocks referenced throughout this document.

Off-site mitigation areas are also discussed within this document comprising Southleigh Forest which lies to the east of the site and options for mitigation land being developed by Hampshire and Isle of Wight Wildlife Trust (HIWWT).

The surveys undertaken to date have identified the likely absence of otter and water vole from the site and therefore these species are not considered further in this strategy.

This strategy has been prepared using data and wording from reports prepared by ECOSA for Portsmouth Water, and an Atkins Technical Note outlining the ecological mitigation and compensation strategy (Atkins, 2020). Extensive consultation with Natural England, the Environment Agency, Forestry England and the Local Planning

¹ The Atkins ES Chapter includes the ECOSA ecological survey reports as appendices.

Authority ecologist have also been undertaken between 2018 and 2020 to design appropriate mitigation and compensation.

1.2 The Site

The site is located on the northern edge of Havant in Hampshire, centred on National Grid Reference (NGR) SU 715 097 (**Appendix 1**).

The site is situated within a mixed urban and suburban setting with dense residential development to the south and south-west (Leigh Park and Warren Park). The A3(M) road runs parallel (north/south) to the site approximately 500 metres to its west. To the north, woodland (Havant Thicket) and pasture extend northwards with a mix of arable, pasture and woodland located to the north-east. To the east of the site lies a low-density residential area known as Rowland's Castle, beyond which lie Stansted Park Estate and Southleigh Forest located just within the Sussex county boundary.

The site covers an area of approximately 164 hectares, with a reservoir footprint area of approximately 106 hectares. The land within the site comprises predominantly open pasture, small woodland blocks, hedgerows, and ditches and includes a central spur of woodland referred to as The Avenue. The habitat baseline for the site is presented in **Map 2**.

Forestry England (FE) own Havant Thicket, located to the north of the reservoir, this area consists of approximately 99 hectares of predominately pine woodland. The habitat baseline for Havant Thicket woodland is presented in **Map 3**. The majority of the wider site is located within the FE land associated with Havant Thicket woodland. Part of Staunton Country Park (SCP) is located to the south of the site, comprising parkland and woodland covering approximately 63 hectares.

1.3 Aims and Scope of Report

This document provides a framework for the biodiversity mitigation and compensation strategy for the site to support the reservoir planning application. It is envisaged that a more detailed costed management plan will be devised as part of the post-planning work, to be secured through an S106 agreement and planning condition.

It should be noted that a separate Biodiversity Metric calculation is being prepared for the site by Atkins and Portsmouth Water (Atkins, 2020d) to outline the Biodiversity Net Gain delivered by the proposals (Natural England, 2019), and included in this report at **Appendix 5**. The Biodiversity Net Gain assessment has been included within this document as a result, details of Biodiversity Net Gain have not been included within the report text, although objectives for habitat management at the site have considered the DEFRA biodiversity metric requirements.

1.4 Site Proposals

Portsmouth Water plan to construct a winter storage reservoir, Havant Thicket Reservoir, for public water supply in the centre of the site. The extent of the development is proposed to be approximately 1.6 kilometres from east to west and 800 metres from north to south with a storage capacity of approximately 8,700 million litres.

The approximate time frames of the pre-construction, construction and operational phases covered by this plan are shown in **Table 1**. A separate long-term management strategy will be developed separately to deliver the on-going site management works.

Table 1: Development timescales

Phase	Timescale	Years
Pre-construction	3 year	-3 to 0
Construction and filling	8 years	1-9
Post-construction	5 years	10-14

2.0 MITIGATION AND COMPENSATION PLAN OBJECTIVES

2.1 Introduction

This section provides an overview of the objectives of the outline BMCS for the site.

2.2 Overview of Mitigation and Compensation Plan Objectives

Ecological impacts associated with the reservoir will be mitigated and compensated for through a variety of habitat enhancements and creation, on-site, within the wider site and off-site through:

- Creation of up to 80 hectares of new wood pasture through a partnership with HIWWT;
- Up to 52 hectares of habitat creation / restoration within the site / wider site, inclusive of work in Havant Thicket woodland;
- Up to 75 hectares of habitat restoration within Southleigh Forest; and
- A Capital Grants Scheme to provide funding to study and enhance biodiversity locally.

Key impacts are related to the loss of woodland, including ancient woodland, and associated impacts on hazel dormice and roosting, foraging and commuting bat species, especially Bechstein's bat.

The outline BMCS for the project is based on the following core elements:

- Create an environmentally led design based on the mitigation hierarchy approach of avoid, minimise, or compensate. As far as practical, compensation will be provided within the site and wider site for the key impacts;
- Ensure appropriate mitigation and compensation is implemented for protected and notable species. European Protected Species licences will be obtained where required;
- Create a mosaic of new and high-quality habitats on the site, including a new open waterbody with a retained wetland offering variable water depths, a variety of vegetation types and islands for added habitat complexity and to act as for roosting and nesting sites for birds;
- Enhance land and environment management for biodiversity on the wider site through collaboration with Forestry England and Hampshire County Council and including a long-term site management plan;
- Restoration and creation of off-site high biodiversity value habitats through partnership with HIWWT and ecological restoration of Southleigh Forest;
- Work with the Environment Agency to identify and deliver a reasonable level of habitat mitigation required to offset the impacts of the development on the

waterbody (Expected to be delivered through a catchment partnership approach); and

- Support others to enhance and study existing habitats offsite through provision of a Capital Grants Scheme.

2.3 Structure of the Mitigation and Compensation Plan

The habitat mitigation and compensation prescriptions for the site are provided within Section 3.0, with species specific mitigation and compensation measures detailed in Section 4.0.

The main habitat types which are the focus of this plan are woodland and scattered broadleaved trees, hedgerows, semi-improved grassland, wetland, small headwater watercourses and standing water. Each of these habitat types are detailed individually within Section 3.0.

Biodiversity Net Gain has been dealt with as a separate report prepared by Atkins (see **Appendix 5**). As a result, the outline BMCS does not provide a detailed breakdown of habitat loss and gains as this is provided as part of the Biodiversity Net Gain Assessment. The outline BMCS does include an assessment of the losses and gains in relation to habitats suitable for particular species and species group. This is dealt with generally in the text and in more detail in **Appendix 4**.

3.0 HABITAT-SPECIFIC MITIGATION AND COMPENSATION

3.1 Introduction

This section provides an overview of the habitat-specific mitigation and compensation. It also provides an overview of the habitat management works proposed in Havant Thicket woodland. Locations of on-site pre-development habitat areas are shown in **Map 2** and those in Havant Thicket woodland are shown in **Map 3**.

3.2 Woodland

The site contains seven woodland blocks that are currently included on the Ancient Woodland Inventory (AWI) as Ancient Woodland, all of which are designated as Sites of Importance for Nature Conservation (SINCs).

- The Avenue is semi-natural ancient woodland (6.68 hectares of which 6.16 hectares are to be lost). 18 veteran trees are located within The Avenue, of which 17 will be lost and one will be retained.
- Corsican Pine Plantation is a Plantation on an Ancient Woodland Site (PAWS) (3.31 of which 2.21 hectares to be lost and 1.1 hectares to be modified).
- Middle Clearing is an oak plantation (entire wood of 2.17 hectares to be lost).
- Round Wood is oak plantation (1.99 hectares of which 1.39 hectares to be lost).
- Cabbagefield Row (1.17 hectares retained), semi-natural ancient woodland.
- Staunton Country Park, Portsmouth Water owned, semi-natural ancient woodland (5.44 hectares retained) and
- A small woodland area along streams in Havant Thicket woodland to be lost (0.652 hectares).

In addition, 1.12 hectares of willow tree lines along watercourses will be lost as part of the proposals.

3.2.1 Mitigation

As far as is possible boundary woodland will be protected through incorporation of a 15 metre buffer between construction activities and the woodland edge. Habitat within the site which are not affected by construction will be protected in line with BS 5837:2012 *Trees in Relation to Design, Demolition and Construction – recommendations* (British Standards Institution, 2012).

3.2.2 Compensation

Large-scale habitat restoration will be undertaken within Havant Thicket woodland, Bell's Copse and on Portsmouth Water owned land in SCP. The total wider-site enhancement / creation area is approximately 57 hectares of woodland through

creation of a mosaic of habitats. Creation of mosaic woodland habitats within the site has been undertaken as advanced works within the south-west and north-east corners of the site (**Map 4**). These areas are:

- Phase 1: Gipsies Plain (north-east corner) - 0.76 hectares lowland mixed deciduous woodland and 0.74 hectares wood pasture / parkland
- Phase 2: Deerslaughter Plain (south west corner) - 1.38 hectares lowland mixed deciduous woodland and 1.1 hectares wood pasture / parkland

In addition, there will be small areas of additional on-site woodland creation totalling 0.30 hectares (see **Map 4**).

A number of retained woodland areas within the site will be enhanced. The management of these areas will comprise a mixture of coppicing, glade creation and other techniques to increase habitat diversity. The five areas associated with this work comprise:

- Cabbagefield Row – 1.17 hectares
- Retained area of Round Wood – 0.58 hectares
- Woodland at the base of The Avenue 5.44 hectares
- Swanmore Road shelterbelt – 0.66 hectares

The Corsican Pine Plantation will be felled and replanted with alder and willow to create wet woodland where the landform allows (1.66 hectares).

Compensation for loss of veteran trees from The Avenue will include veteranisation of retained trees through measures such as artificial creation of woodpecker holes, creating broken branches on trees, artificially damaging trunks and creating areas for rot to begin through chainsawing into trunk (Woodland Trust, 2014). Other measures such as moving deadwood and ring barking non-native trees, such as Turkey oak, to create standing dead wood will also be undertaken.

Three areas of woodland creation and enhancement works will be developed in Havant Thicket woodland comprising broadleaved woodland creation, management of hazel coppice and diversification of birch dominated area. Further details of these works are presented below and areas shown in **Map 5**.

4.07 hectares of broadleaved woodland planting will be delivered through clearance of pine plantation in Havant Thicket woodland. Broadleaved species planting will include pedunculate oak, yew, holly, honeysuckle, birch and hazel. On **Map 5** these areas are referenced as 'Conifer Clearfell Areas', FE Compartment 6508B and 6507D.

3.87 hectares of Bell's Copse will be managed through a coppice rotation to diversify the age structure of hazel within this area. On **Map 5** this area is referenced as 'Bell's Copse Woodland Management Area', FE Compartment 6501B.

Within Havant Thicket woodland creation of racks through birch dominated woodland to either encourage existing broadleaved trees or plant new broadleaved woodland to diversify woodland. Including clearing halos around young trees such oak, hazel and hornbeam to speed up the development of broadleaved woodland. The area covered by the management of birch dominated areas is 28.7 hectares. On **Map 5** these areas are referenced as 'Birch Dominated Compensation Areas'.

An area of powerline wayleave in Bell's Copse will also be brought into positive ecological management comprising regular mowing and rotational scrub management introduced to create a mosaic of habitats and more graded edge to the woodland. This will compensate for the loss of willow tree lines within the site. This area covers 3.41 hectares and is not included in the woodland creation / enhancement area calculation referenced above. On **Map 5** this area is referenced as 'Grassland/Scrub Mosaic Management Area', FE Compartment 6501A.

A partnership with HIWWT will be developed to deliver 80 hectares of wood pasture, the location of this area is currently still in discussion, and will be subject to land availability. The project will be delivered as one large unit of land if possible, but if that is not, smaller parcels of land will be acquired, ideally next to existing parcels of woodland.

Southleigh Forest, which is part of Portsmouth Water's landholding is a ~75 hectare pine plantation will be brought into positive ecological management. A detailed management plan will be prepared for the woodland to include the gradual felling of pine woodland and replacement with lowland mixed deciduous woodland and wood pasture.

3.3 Scattered Broadleaved Trees

A total of 29 broadleaved trees, dominated by pedunculate oak, are scattered across the on-site grassland. There are also a number of willow species treelines associated with the on-site ephemeral streams. All the 29 scattered broadleaved trees and the majority of the willow tree lines will be lost under the footprint of the reservoir.

3.3.1 Mitigation

Willow scrub will be retained along the north-eastern boundary of the site and Havant Thicket woodland. As these are not affected by construction, they will be protected in line with BS 5837:2012 *Trees in Relation to Design, Demolition and Construction – recommendations* (British Standards Institution, 2012).

3.3.2 Compensation

As an enhancement measure, a total of 142 standard broadleaved trees have been planted within the combined Gipsies and Deerslaughter plain (Phase 1 and Phase 2 areas, see Paragraph 4.2.2 for details).

3.4 Hedgerows

Hedgerows are present along the boundary of Gipsies Plain on the eastern edge of the site.

3.4.1 Mitigation

The hedgerow habitat will be protected in line with BS 5837:2012 *Trees in Relation to Design, Demolition and Construction – recommendations* (British Standards Institution, 2012). No compensation is required as no hedgerows will be lost.

3.4.2 Enhancement

The current hedgerows on site were strengthened and enhanced in 2018 through the planting of native species to increase biodiversity at the site. This area is located with the Phase 1 planting area and is shown in detail within **Map 10**.

3.5 Semi-Improved Grassland

The site comprises a mosaic of semi-improved grassland including dry neutral to acid grassland (50.55 hectares), damp to wet grassland and rush pastures (86.25 hectares) and species-poor rush pasture (5.15 hectares). The majority of these areas will be lost as a result of the development of the reservoir (139 hectares in total).

3.5.1 Mitigation

Grassland habitat present within the on-site Phase 1 and Phase 2 advance planting areas will fall under the tree protection requirements as per Paragraph 3.2.1.

3.5.2 Compensation

The total site, wider site and off-site enhancement / creation and off-site semi-improved grassland compensation is 52.88 hectares. The focus of semi-improved grassland areas will be to increase species diversity and introduce a grazing regime to deliver long-term stability in grassland quality. Neutral grassland will be created or enhanced in the following locations:

- On-site: Phase 1 and Phase 2 advance planting areas (1.63 hectares) - enhanced
- On-site: Outer reservoir embankment (15.83 hectares) - created
- On-site: Around reservoir (15.42 hectares) – created / enhanced
- Off-site: Partnership with HIWWT (20 hectares) – enhanced / created

Parcels of acid grassland will also be developed through the habitat management works in Havant Thicket woodland, as per Paragraph 3.2.2.

3.6 Wetland

The site includes 1.21 hectares of the Habitat of Principal Importance Purple Moor Grass and Rush Pasture which will be lost under the footprint of the reservoir. The existing soils and hydrological status of Havant Thicket woodland is conducive to the compensation for the loss of Purple Moor Grass and Rush Pasture. Previous forestry clearance has resulted in the development of heath and mire communities that conform to Purple Moor Grass and Rush Pasture.

3.6.1 Compensation

It is proposed that heather (or other natural material) dams are placed at appropriate locations agreed with Forestry England along stream corridors within Havant Thicket woodland to create areas of localised flooding as flow is inhibited and held back behind the dam. This will re-wet localised areas as part of habitat restoration works for Purple Moor Grass and Rush Pasture habitat in Havant Thicket woodland. These areas will be within the 'Stream Corridor Enhancement Area' shown in **Map 5**.

Species poor marshy grassland and neutral grassland habitat will be enhanced to Purple Moor Grass and Rush Pasture through the drainage design proposed in the south-west corner of the site. This area is labelled as 'Retained Species Poor Rush Pasture to be Enhanced to Priority Habitat: Purple Moor Grass Rush Pasture' on **Map 4** and covers an area of 1.28 hectares.

Within Havant Thicket woodland 2.22 hectares of Forest Meadow will be created through clearance of young birch trees which have regenerated in previous clear fell / heathland areas to create permanent open space. Sward will be left to develop naturally into a Purple Moor Grass and Rush Pasture and scrub mosaic suitable for a variety of notable plant species. On **Map 5** these areas are referenced as 'Forest Meadow Creation', FE Compartment 6508A and 6502A.

3.6.2 Enhancement

A further 10.2 hectares of wetland with semi-natural freshwater habitat associated with the northern edge of the reservoir will be created. Within this area 3.4 hectares of reedbed will be created along the northern edge of the reservoir. The areas with created reedbed and wetland vegetation are marked as 'Wetland Area with Retained Wet Woodland Fringes' shown on **Map 4**.

An area of Shoreline Ephemeral Shallows vegetation will be left to develop naturally on the north-east corner of the reservoir (see **Map 4**). This habitat covers an area of 1.68 hectares.

3.7 Watercourses

There are three ephemeral watercourses that start within the Havant Thicket woodland and drain south across the site. Where not shaded by trees, these features support marshy vegetation. Furthermore, aquatic invertebrate surveys have identified a number of notable species within the on-site watercourses. The loss of the approximately 3.7 kilometres of these watercourses creates a possible deterioration at a waterbody scale of the ecological status or potential of the Hermitage Stream Water Framework Directive (WFD) waterbody. Future revisions of the outline BMCS will provide the required detail for the Water Framework Directive Article 4.7 derogation which is being sought and discussed with the Environment Agency and Local Planning Authority.

3.7.1 Mitigation

Notable plants recorded in the on-site watercourses and ditches will be translocated into suitable wider-site habitats within Havant Thicket, Bell's Copse and SCP. The translocation will involve only a small number of individuals rather than entire populations, species subject to translocation will comprise ragged-robin, marsh pennywort and marsh St. John's wort.

3.7.2 Compensation

An overall package of compensation and enhancement works to develop the appropriate level of compensation for impacts on watercourses is being designed by Portsmouth Water in consultation with the Environment Agency. Further details are provided in Paragraph 4.9.3.

Existing watercourses within Havant Thicket will enter positive ecological management through the removal of trees from sections to allow light to reach the watercourse and increase species diversity. There will be a graded scrub and woodland edge to these habitats. The area covered by these works covers 1.12 hectares.

A section of watercourse will also be created on the southern edge of the embankment, this area is referenced as 'Created Stream' on **Map 4** (250 metres in length) The design of this stream will be subject to a separate detailed design plan. Overarching aims for the watercourse will be to provide a natural stream corridor with gently sloping vegetated banks.

3.8 Standing Water

The Upper Lake, approximately 0.65 hectares in size, is present at the northern end of The Avenue. A second pond in Havant Thicket woodland, approximately 0.016 hectares in size, is located within the high-water level boundary of the proposed wetland.

3.8.1 Mitigation

Where practical, notable plants recorded in the on-site standing water will be translocated into suitable wider-site habitats within Havant Thicket, Bell's Copse and SCP. The translocation will involve only a small number of individuals rather than entire populations, species subject to translocation will comprise marsh St. John's wort and creeping forget-me-not.

3.8.2 Compensation and Enhancement

Pond 16 is below the high water mark in Havant Thicket woodland and will be enhanced as part of the proposed wetland (see **Appendix 1**). This may include the removal of vegetation surrounding the pond to allow light to enter and increase riparian vegetation. The area covered by this pond covers 0.02 hectares.

Further ponds within Havant Thicket woodland will be enhanced through removal of conifers around these features to allow light to enter areas and increase riparian vegetation (1.57 hectares). This will provide compensation for loss of notable plants in Upper Lake (The Avenue) as these ponds are suitable receptor sites for marsh St. John's wort and creeping forget-me-not, which are the species to be translocated. Pond enhancement works will be undertaken in advance of translocation of plants from Upper Lake.

Two ponds have been created in the Gipsies Plain ecological corridor totalling 0.004 hectares.

The creation of Havant Thicket Reservoir will create 106 hectares of open water. The northern edge of the reservoir will be managed for nature conservation (see Paragraph 3.6.2 for further details).

4.0 SPECIES-SPECIFIC MITIGATION AND COMPENSATION

4.1 Introduction

This section provides an overview of the species-specific baseline, mitigation and compensation measures. The areas of habitat lost includes permanent loss beneath the footprint of the reservoir, and temporary loss of habitats outside the reservoir footprint during the construction phase.

It should be noted that the mitigation and compensation measures for European Protected Species (bats, hazel dormouse and great crested newt) may be varied through Natural England European Protected Species Mitigation (EPSM) licence process. Where this occurs the BMCS will be updated accordingly.

As an overarching requirement for the mitigation and compensation an Ecological Clerk of Works (ECoW) will be employed to oversee the protected species works.

An overview of the suitable habitat loss within the site and compensatory habitat works is presented in **Appendix 4**.

4.2 Bats

4.2.1 Baseline and Habitat Loss

Between 2008 and 2018 a total of at least thirteen species have been recorded including rarer species such as barbastelle and Bechstein's bat.

The site contains four small woodland areas with suitability to support roosting bats, Middle Clearing, Round Wood, The Corsican Pine Plantation and The Avenue. Additional habitat with suitability for bats is present within SCP to the south of the site and Havant Thicket Woodland to the north of the site.

Between 2008-2018 the following bat roosts were recorded within the site; four Bechstein's bat day roosts, one Bechstein's bat night roost, one Natterer's bat day roost, two maternity roosts and six day/night roosts of brown long-eared bat. The brown long-eared bat maternity roosts were not recorded concurrently and are considered to be same roost.

Given the woodland present, a small number of other lower status roosts of these species and of common pipistrelle, soprano pipistrelle and *Myotis* bat species may be present on site. These may include day / night roosts and hibernation roosts.

Further roosts were recorded off-site including a maternity roost of Bechstein's bat in SCP which was recorded in 2008. Additional surveys undertaken by ECOSA and other ecological consultants in SCP in 2009, 2016 and 2018 have not recorded this or any

other Bechstein's bat maternity roosts in this location. Other notable bat roosts in the local landscape included common pipistrelle and whiskered bat maternity roosts in nearby buildings, and brown long-eared bat and Natterer's bat maternity roosts in trees within SCP.

Habitats lost with suitability for bats comprise:

- 6.16 hectares of lowland mixed deciduous woodland
- 3.57 hectares of broadleaved woodland
- 3.31 hectares of pine plantation
- 1.27 hectares of willow / blackthorn scrub
- 138.78 hectares of grassland;
- 0.65 of secondary woodland associated with high water mark;
- 0.65 hectares of pond

Overall, there will be an approximate loss of 156 hectares of bat foraging habitat and approximately 13 hectares² of roosting habitat.

4.2.2 Mitigation

Wherever possible boundary woodland will be protected through incorporation of a 15 metre buffer between construction activities and the woodland edge. Habitat within the site which are not affected by construction will be protected in line with BS 5837:2012 *Trees in Relation to Design, Demolition and Construction – recommendations* (British Standards Institution, 2012).

Works will be undertaken in accordance with a Natural England European Protected Species Licence (EPSM). It is proposed that the bat licence will cover the destruction of roost sites, disturbance and capture of a maximum of 50 brown long-eared bat, 20 Bechstein's bat, 10 Natterer's bat, 10 other *Myotis* bat species³, 20 common pipistrelle and 10 soprano pipistrelle. In addition, five individuals of other *Vespertilionidae* bat species⁴, comprising either barbastelle or noctule are included.

Woodland clearance works of trees with bat roost suitability, will be timed to occur when bats are less susceptible to disturbance or breeding, and will also consider the mitigation requirements of other protected species, especially hazel dormouse and breeding birds. This will result in works to trees with bat roost suitability being undertaken in March and / or September-October.

² It should be noted that a small proportion of the woodland habitat to be lost is not suitable for roosting bats, particularly the willow tree lines within the site and the birch scrub associated with the reservoir high water mark in Havant Thicket.

³ There are seven species of *Myotis* bats in Britain. *Myotis* bats are very difficult to identify specifically, this can generally only be done by examination of physical features and Phylogenetic Analysis Identification of bat droppings. Many of these bats are common and will utilise buildings for roosting often occupying small and inaccessible voids.

⁴ All UK bat species apart from lesser horseshoe and greater horseshoe.

All medium and high suitability trees with potential bat roosting features will be inspected by a bat licenced ecologist and then sectionally felled. The location of medium and high suitability trees has been identified in the recently completed Ground Level Tree Assessment (ECS, 2020). ~30 roost feature will be moved to an off-site tree and strapped to a limb to retain suitable roosting resources within the local landscape. If bats are present within the feature when felling occurs (or conclusive evidence could not be confirmed), these limbs should be carefully removed and lowered to the ground and left overnight leaving the roost feature facing upwards, to allow any bats present to leave of their own accord, before the limb is strapped to an off-site tree.

In an attempt to encourage a stable maternity colony of Bechstein's bat to roost close to but not within the site a small number of bat boxes (three Schwegler 1FW and eight Schwegler 2FNs) known to be suitable for this species⁵ were erected in May 2018 within woodland which will be retained to the north and south of the site.

During the construction phases of the development, the retained woody vegetation on-site and along the boundaries of the site will be protected by Heras fencing (or similar). There will be no access to these areas by machinery or site contractors and these areas will not be used for storage. There will be no construction access to these areas for the duration of the development works. Where possible suitable bat roost features will be identified within retained trees located close to construction works, where these are identified a larger buffer to construction will be considered.

It is not expected that lighting would operate overnight, but it may do on occasion. Lighting will comprise hooded luminaires directed away from vegetation and or low level bollard lighting particularly the boundary hedgerows and treelines. Ideally the bulbs will be LED and at the warmer end of the spectrum (e.g. avoiding blue or white light). LED lights emit much lower levels of UV and therefore have a lower impact on bats. The new lighting will be task related, associated with the visitor centre and associated car park. The lux level will be as low as possible to allow the task to be carried out safely and effectively. Guidance on task related lighting levels and mitigation options as described within the Bats and Artificial Lighting in the UK report will be followed (Institution of Lighting Professionals, Bat Conservation Trust, 2018).

4.2.3 Compensation

In order to provide compensation for the loss of the commuting corridor provided by The Avenue a 50 metre wide by 300 metre long native woodland linkage with associated ponds has been planted between Havant Thicket and SCP in the east of the site (see **Map 7**). This includes planting three metre high standards as well as smaller shrub understorey species to ensure the new woodland is functional as a

⁵ Both boxes used by Bechstein's bat in Dorset (J. Stobart per comms).

commuting corridor immediately, as it will effectively resemble a 50 metre wide hedge /scrub belt in the early years. The defunct hedgerows in this area will also be bolstered with native species planting to further improve habitat connectivity in the east of the site.

The creation of on-site mosaic of habitats, 10.2 hectares wetland, 36.71 hectares grassland, 3.77 hectares woodland/parkland planting, 106 hectares open water will provide foraging habitats for bats and enhancement of 0.37 hectares of willow scrub.

On the west side of the site the existing woodland fringe will be widened and native species blocks of woodland will be planted within the grassland to provide a suitable mosaic of habitats for commuting and foraging, in an area where there is currently very little bat activity. The new woodland in the south-west of the site was planted in early 2020.

To provide interim roosting opportunities, in advance of clearance works wooden bat boxes with suitability for a variety of species will be erected within three kilometres of the site in SCP, Havant Thicket and / or Southleigh Forest. A single box will be provided for each moderate or high roost suitability tree removed. The boxes will be erected in locations where sufficient foraging habitat is present in the vicinity of the boxes.

Due to their age structure Havant Thicket woodland has fewer natural roost features suitable for maternity roosts, but some value for foraging. Providing bat boxes will significantly increase the carrying capacity for roosting bats of these woodland areas within the range of the Bechstein's bat and brown long-eared bat maternity colonies recorded on or in the vicinity of the site.

A programme of woodland management in Havant Thicket will improve the foraging value of this area north of the site. Those compensation measures which will benefit bats are provided in **Table 2** and shown on **Map 7**. The works will restore broad leaved woodland, provide an extensive network of ecological corridors through the woodland (including along stream edges), and create a more diverse mosaic of habitats, all of which will be beneficial for bats creating a more diverse and enhanced foraging habitat.

Table 2: Compensation works in Havant Thicket woodland with benefits for bats

Management Area	Description	Area (ha)	Availability	Species Compensation
Forest Meadow	Clearance of young birch trees which have regenerated in previous clear fell areas to create permanent open space	2.22	Short, medium and long-term suitability for foraging bats, especially edge feeding species	Bechstein's bat, Natterer's bat and other commoner species
Clear-fell Areas	Felling and clearance of pine plantations, subsequent planting of native broadleaved trees	4.07	Short, medium and long-term suitability for a variety of bats	Short term suitability for species with a preference for open habitat such as noctule and serotine, long term suitability for woodland species including Bechstein's bat and brown long-eared bat
Woodland stream enhancement	Opening up of stream corridors, with graded edge	1.12	Short, medium and long-term suitability for a variety of bat species	Bechstein's bat, Natterer's bat and other commoner species
Priority Ecological Corridors along existing rides	Create graded edges to existing ride network, providing enhanced reptile habitat	9.62	Short, medium and long-term suitability for a variety of bat species	Bechstein's bat, Natterer's bat and other commoner species
Pond Enhancements	Conifers around Forestry England ponds removed allow light to enter area.	1.57	Short, medium and long-term suitability for a variety of bat species	Bechstein's bat, Natterer's bat and other commoner species
Management of birch dominated areas	Creation of racks through birch dominated woodland to either encourage existing broadleaved tree or plant new broadleaved woodland (leaving some unplanted clearings)	28.7	Short term suitability for foraging bats associated with edge habitat, Medium to long-term suitability for woodland bats.	Brown long-eared bat, Bechstein's bat, Natterer's bat and various other species
Bells Copse Woodland Management	This oak-hazel woodland will be managed on a long-term hazel coppice rotation	3.87	Medium and long-term habitat improvement	Brown long-eared bat, Bechstein's bat, Natterer's bat and various other species
Grassland / Scrub Mosaic Management Area	Rotational management of grassland and scrub along wayleave	3.41	Short, medium and long-term habitat improvement	Brown long-eared bat, Bechstein's bat, Natterer's bat and various other species

The management of extremely dense birch dominated areas within Havant Thicket will make these formerly inaccessible areas accessible for foraging bats. The birch removal will provide 28.7 hectares of newly accessible habitat for woodland bats, particularly brown long-eared bat and Bechstein's bat, partially compensating for the on-site woodland loss.

It is unlikely that the proposed compensation within the site will entirely off-set the loss of foraging habitat for bats, therefore off-site compensation will be delivered as part of a series of works comprising three main elements:

Habitat enhancements within the wider-site, in Havant Thicket woodland and Bell's Copse will compensate for loss of habitats (51.97ha, see **Table 2**).

Further enhancement beyond the required compensation works will be provided through the restoration of Southleigh Forest, a 75-hectare area mixed woodland, with conifer and oak plantation. The management work in this woodland will provide a short-term benefit to foraging bats by opening up this woodland, creating edge habitat and diversifying the niches available to bats. Bat boxes will also be erected in Southleigh Forest to increase the initial carrying capacity roosting bats. In the long-term the reversion of Southleigh Forest to lowland mixed deciduous woodland and wood pasture will create high quality foraging and roosting opportunities for bats. It should be noted that Southleigh Forest lies within the core range of the Hampshire / Sussex border population of Bechstein's bat (see **Appendix 1**).

The wood pasture creation associated with the partnership with HIWWT will also aim to deliver high quality foraging and roosting habitats for bats. It is currently unclear whether this will benefit the bat populations within the site.

Overall, there will be a 116 hectare increase in bat foraging habitat and long-term increase in 171 hectares increase in high quality roosting habitat (see **Appendix 4** for further details).

4.3 Badger

4.3.1 Baseline and Habitat Loss

Survey work conducted in 2018 and 2020 indicated no active badger setts within the site and a low level of foraging / commuting activity. These results are consistent with the survey works carried out previously by ECOSA between 2005-2009.

Habitat loss comprise foraging resources associated with the on-site grassland and woodland. Although given the limited evidence of the species recorded within the site it is likely that only a small number of individuals will be impacted. Woodland within the site with suitability for sett construction will also be lost, albeit much of the area is low-lying and likely to be too wet for sett formation.

4.3.2 Mitigation

In advance of reservoir construction and enhancement works in Havant Thicket woodland, a detailed badger survey of these areas will be undertaken to update this assessment.

Steep sided excavations will be covered overnight or a battered edge ramp inserted to allow any badgers which are trapped to escape of their own accord.

To mitigate for the potential impacts of additional night-time traffic a gate will be installed at the access point, this will prevent regular vehicle access at night.

The status of badger within the construction zone and within 20 metres should be monitored in advance of works beginning to provide an accurate assessment of the status of the species. Should setts become established in the construction zone then methods to avoid, mitigate and / or compensate for the impacts will be devised.

4.3.3 Compensation

Habitat enhancement within Havant Thicket woodland will provide suitable and improved habitat for badger. Forest meadows and management of dense birch thickets will diversify these habitats, increasing the habitat available in this area for foraging badger.

As part of the development of the reservoir, habitat around the perimeter of the site will be managed as grassland with suitability for foraging badger, this will include management regimes to provide varied grassland sward heights. This will also include a large expanse of meadow grassland on the downslope of the reservoir embankment. A 50 metre wide woodland corridor on Gipsies Plain, and new mosaic of woodland planting in the south-west planted in 2018 and 2020 will provide compensatory woodland habitat for foraging badgers. There will also be a scrub and grassland interface along the northern edge of the reservoir which will provide habitat for badger.

4.4 Hazel Dormouse

4.4.1 Baseline and Habitat Loss

Surveys undertaken on site by ECOSA between 2005 and 2009 established that hazel dormouse were present in suitable on-site woodland.

The species is considered to be present throughout Havant Thicket woodland, although much of this area comprises dense birch or coniferous woodland with limited suitability for hazel dormouse.

14.95 hectares of suitable dormouse habitat will be lost as a result of the proposals comprising:

- The Avenue - 6.16 hectares
- Middle Clearing - 2.17 hectares
- Round Wood - 1.39 hectares
- The Corsican Pine Plantation 3.31 hectares

- 1.27 hectares of willow treelines
- 0.65 hectares of birch scrub associated with the high water mark in Havant Thicket woodland

4.4.2 Mitigation

Given the presence of hazel dormouse on the site, it will be necessary to obtain an EPSM licence in respect of the species in order to ensure that animals are not harmed or present during the construction phase. The EPSM application will utilise the results of the hazel dormouse surveys and a detailed mitigation strategy will be devised.

During the construction phases of the development, the retained woody vegetation on-site and along the boundaries of the site with suitability for hazel dormouse will be protected by Heras fencing (or similar). There will be no access to these areas by machinery or site contractors and these areas will not be used for storage. There will be no construction access to these areas for the duration of the development works.

Due to the configuration of the woodland habitat, it is not desirable to simply displace hazel dormouse into surrounding habitat, particularly within the Avenue. The distances involved are relatively long, and the surrounding habitat is presumed to support hazel dormouse at carrying capacity. As a result, a pre-clearance trapping and local translocation exercise is proposed. This will involve setting up holding pens for dormouse at three locations; Cabbagefield Row, Bells Copse and within retained woodland at the southern end of The Avenue. Hazel dormouse will then be trapped and translocated from The Avenue, Middle Clearing and Round Wood. Trapping will involve the erection of a high density of dormouse boxes in the woodlands followed by daily checks. Trapped hazel dormouse will be placed into holding pens which will comprise fenced areas with food and foraging areas provided. The holding pens will be located in Bell's Copse, Cabbagefield Row and woodland to the south of The Avenue. On completion of the on-site vegetation clearance the dormouse will be released. The translocation work will

Habitat will be cleared using single-stage or two-stage clearance with translocation continuing during the clearance. Active season single-stage clearance will involve incremental clearance of woodland during the period from April-May and / or September-October. The direction of clearance works is shown in **Map 8**. Where it has not been possible to complete clearance works during the active season the remaining areas will be cleared using a two-stage clearance method whereby vegetation is cut using hand tools to 15-30 centimetres about ground level during the period from December to February. When hazel dormouse emerge from hibernation in April they will disperse into nearby habitat. As the reservoir will be flooded the root balls and stumps are unlikely to need to be removed (i.e. the second stage of the clearance will

not need to occur). Only areas within 100 metres of suitable retained habitat will be subject to a two-stage clearance process to ensure that hazel dormouse emerging from hibernation are able to locate nearby suitable habitat.

Pre-construction works have been implemented on Gipsies Plain which include planting of a 50 metre wide woodland strip, bolstering of hedgerows and scrub planting with suitability for hazel dormouse (see **Map 9** and **Map 10**). This work will mitigate for the loss of connectivity between SCP and Havant Thicket woodland.

Post-construction the potential impact of informal human access on hazel dormouse in Havant Thicket woodland will be managed through a robust recreation strategy which considers biodiversity. It is likely that this work will include the installation of marked trails and the introduction of a ranger service.

4.4.3 Compensation

The 50 metre wide broadleaved woodland planting on Gipsies Plain and associated hedgerow bolstering will create additional suitable hazel dormouse habitat in advance of woodland clearance works taking place. A total of 0.63 hectares of broadleaved woodland with scrub understorey was planted on Gipsies Plain in 2018. A further 300 metres of existing defunct hedgerow has been bolstered with planting to make it suitable for hazel dormouse and then managed appropriately. 25 dormouse boxes will also be installed within the woodland strip to provide an initial increase in sites suitable for nesting. Depending on the project timescales, and the associated maturity of planted woodland, some of these boxes may need to be erected on posts rather than on trees.

Within Havant Thicket woodland additional habitat capacity for hazel dormouse will be created, some of which will be available for colonisation in advance of clearance works taking place (see **Table 3**, **Map 9** and **Map 10**). As an additional compensation measure approximately 300 hazel dormouse boxes will be installed within woodland to the north, east and south of the site. Nest boxes can increase density of hazel dormouse as suitable nesting sites can often be a limiting factor to population growth (Bright, et al., 2006).

The compensation works on-site and in Havant Thicket woodland have been designed to cover a significantly larger area than the suitable hazel dormouse habitat within the site to off-set the loss of moderate quality habitat within The Avenue.

Table 3: Habitat management work in Havant Thicket woodland to benefit hazel dormouse

Management Area	Description	Benefit	Area	Availability	Initial Carrying Capacity
Management of birch dominated areas	Creation of 'racks' through birch dominated woodland to either encourage existing broadleaved tree growth or plant new broadleaved woodland	In the short-term improved ground vegetation and development of scrub where more light reaches the woodland floor will be of benefit to hazel dormouse. The increase in woodland species diversity (including planting hazel) will benefit hazel dormouse in the medium to longer term.	28.7	Short term (within ~2-3 years), medium and long term	High
Priority Ecological Corridors along existing rides	Graded edges to existing ride network	Graded edge with bramble and more mixed vegetation will provide improved foraging for hazel dormouse in the short term. Appropriate rotational management will ensure benefits to the species in the medium and longer term.	9.62	Short, medium and long-term	Low
Bells Copse Management	Coppice rotation to diversify hazel age structure	The introduction of a hazel coppice rotation in the medium to long-term will be of significant benefit to hazel dormouse, ensuring optimum hazelnut production.	3.87	Long-term	Low
Clear-fell Area	Felling and clearance of pine plantations, subsequent	Increase the tree species diversity which will benefit hazel dormouse in the	4.07	Medium to long-term	Negligible

Management Area	Description	Benefit	Area	Availability	Initial Carrying Capacity
	planting of native broadleaved trees	medium to longer term.			

In addition, rotational hazel coppicing will be introduced, within woodland to the south of The Avenue which is owned by Portsmouth Water. In the medium to long-term this will enhance this habitat for hazel dormouse.

In the long-term the works within Southleigh Forest will provide enhanced habitat for hazel dormouse, although it is not currently known whether the species is present in this woodland.

Overall, within the species known range there will be a 59 hectare increase in habitat suitable for hazel dormouse (see **Appendix 4** for further details).

4.5 Birds

4.5.1 Baseline and Habitat Loss

A variety of breeding and wintering birds typical of grassland and woodland habitats are present at the site. There is a relatively dense population of skylark at the site which has remained constant between surveys in 2008 and 2018. Meadow pipit is a notable species, four pairs were recorded breeding on site. Significant populations of notable wintering bird species were not recorded. The key breeding species are skylark and meadow pipit. Havant Thicket supports small populations of nightjar.

Habitats lost with suitability for breeding and wintering bird comprise:

- Loss of 138.7 hectares grassland used by ground nesting birds such as skylark.
- Loss of 13.68 hectares woodland used by woodland species.
- Loss of 1.27 hectares willow / blackthorn scrub used by woodland species.

4.5.2 Mitigation

Where possible, removal or alteration to woodland, scrub and hedgerows will be undertaken outside of the main bird nesting season which extends from March to August, inclusive. Clearance of grassland during the winter is unlikely to be a suitable option given the requirement to translocate reptiles during their active season (March-October). However, where possible reptile destructive search works will be timed to be undertaken during the autumn, late-August-October to avoid the bird nesting season.

If this is not possible, and works are required during March to late August, then areas subject to clearance will be thoroughly checked for ground nesting birds. If nesting birds are discovered then a suitable buffer zone will be left around the nests and the nest site monitored by an ecologist until young are confirmed to have fledged.

In advance of construction works a woodland link has been planted on Gipsies Plain. This will provide a commuting corridor for birds moving between SCP and Havant Thicket woodland.

Retained woodland on the periphery of the site with potential for breeding birds, will be protected from accidental incursions using protective fencing.

It is possible that the construction site may attract little ringed plover, a species which utilises ephemeral wetland habitat. The Ecological Clerk of Works (ECoW) will consider this species during the period from March to July, when the species is present and breeding in the UK. If little ringed plover breeding is suspected or confirmed a 50 metre exclusion zone will be provided to prevent additional disturbance or harm to this Schedule 1 species.

Post construction measures will be implemented to control and manage dog access. This will include the inclusion of dog walking routes away from sensitive areas and no dog access to sensitive area (e.g. the new wetland).

4.5.3 Compensation

Compensation for loss of on-site habitats will comprise two main elements; enhancement and development of a mosaic of habitats within the ecological enhancement area and compensatory habitats developed within the site.

Habitat restoration works proposed at Havant Thicket will provide suitable habitat for a range of scarce and notable species. Details of the works that are particularly relevant to birds are presented in **Table 4**.

Table 4: Compensation works for birds in Havant Thicket woodland

Management Area	Description	Area (Ha)	Suitability
Forest Meadows	Clearance of young birch trees which have regenerated in previous clear fell areas to create permanent open space.	2.22	Long term suitability for breeding nightjar and other species such as bullfinch, linnet, stonechat and whitethroat.
Clear-fell Area	Felling and clearance of pine plantations, subsequent planting of native broadleaved trees.	4.07	Short-term suitability for breeding nightjar. Medium and long-term suitability for breeding and wintering woodland species including marsh tit, stock dove, mistle thrush, tawny owl, song thrush and bullfinch.
Woodland stream enhancement	Opening up of stream corridors, with graded edge.	1.12	Suitable habitat for a range of species including foraging woodcock
Priority Ecological Corridors along existing rides	Creating graded edges to existing ride network, providing enhanced habitat	9.62	Increased foraging and nesting habitat for a variety of woodland and scrub species
Pond Enhancements	Conifers around Forestry England ponds removed to allow light to enter area and increase riparian vegetation.	1.57	Compensation for loss of Upper Lake (The Avenue).
Management of birch dominated areas	Creation of racks through birch dominated woodland to either encourage existing broadleaved tree or plant new broadleaved woodland to diversify woodland.	28.7	Medium and long-term suitability for a range of woodland species, including many species currently present within on-site habitats.

The new on-site mosaic of habitats on the site (create 10.2 hectares of wetland, 36.71 hectares of grassland, 3.77 hectares of woodland/parkland planting, 106 hectares of open water, enhanced 0.37 hectares willow scrub) will benefit a variety of species including wetland birds and help retain nightjar nesting opportunities.

As part of the development of the reservoir grassland habitat around the perimeter of the site will be specifically created for skylark and meadow pipit, this will include management regimes to provide varied grassland sward heights. The compensation for ground nesting birds within the site is considered to off-set the loss of breeding meadow pipit territories affected as a result of the construction of the reservoir. It is unlikely that the compensation grassland within the site will entirely off-set the loss of skylark territories, therefore off-site compensation will be included in the proposals as part of a Portsmouth Water Capital Grants Scheme of biodiversity enhancements in the local area.

There will also be a scrub and grassland interface along the northern edge of the reservoir which will provide habitat for notable species affected by the development including linnet, bullfinch, song thrush, kestrel and dunnock. The creation of compensation habitats on-site and in Havant Thicket is considered to off-set the loss of breeding territories as a result of the reservoir construction, especially considering the limited number of territories of these species recorded in areas affected by construction (see **Table 4**).

To compensate for the loss of tree cavities as a result of woodland removal nest boxes with a variety of cavity sizes and forms will be erected in Havant Thicket woodland and SCP. Owl and kestrel type boxes would be included, as well as more typical cavity and open fronted boxes.

The proposed broadleaved woodland creation works within Southleigh Forest and the HIWWT wood pasture creation will provide long-term benefits for the local populations of birds, particularly nightjar.

Overall, there will be a 222 hectare increase in high quality habitat for a range of breeding bird species (see **Appendix 4** for further details).

4.6 Reptiles

4.6.1 Baseline and Habitat Loss

Surveys undertaken on site indicated that an exceptional population of slow-worm, a good population of common lizard and a low population of adder and grass snake are present. Previous surveys in 2005-2008 identified an exceptional population of all four common species of reptile on site. Given that the habitat remains broadly similar, and fewer refugia were deployed in 2018 it is unlikely that this assessment will have changed in the intervening period. There was a clear preference for reptiles to be found in 'edge' habitats within the site, especially the south-facing northern boundary.

Habitats lost with suitability for reptiles comprise:

- 139 hectares grassland
- 1.27 hectares willow / blackthorn scrub
- 0.65 hectares associated with Upper Lake

4.6.2 Mitigation

Given the presence of reptiles on the site, it will be necessary to ensure that these animals are not harmed and that animals are not present within the development area during construction works. Prior to works commencing on site the grassland habitat will be grazed more heavily to reduce the height of the sward and make it less suitable for reptiles. Compartmentalised reptile fencing would be the most efficient way to achieve

clearance of the site within a defined time frame. Therefore, grazing will be combined with a variety of measures which could include reptile fencing. A high density of reptile refugia at the site followed by up to 90 days of trapping to translocate reptiles to nearby receptor sites. Where very low numbers of reptiles are recorded during trapping a reduction in trapping effort to 60 days will be considered by the ecologist overseeing the translocation. A destructive search of the development area will also be undertaken, this may include soil stripping under the supervision of an ecologist.

All translocation works will be undertaken in the reptile active season which runs from April to October. Given the size of the site and the scale of the project it will be necessary to undertake translocation works in phases over a number of years. In advance of each phase of construction the grazing regime in that area will be increased to ensure the sward is as short as practically possible, supplemented by cutting as required to ensure a short sward is maintained prior to construction in each phase.

During the initial development of the reservoir the footprint of the works will cover virtually all of the site. Reptile habitat will be avoided on the periphery of the site, particularly around Gypsies Plain on the eastern edge of the site, in the south-west and along the northern boundary shoreline. These areas and other perimeter reptile habitat to be retained should be protected from accidental incursions during construction works, through the use of Heras fencing, or similar.

In addition to re-instating grazing at the site, mitigation will include management of a section of birch dominated woodland and associated stream corridor immediately to the north of the site. This work will be undertaken in advance of works commencing on site and allow reptiles to disperse into this area as the site becomes less suitable for reptiles through grazing.

4.6.3 Compensation

It will be necessary to provide a suitable receptor area for animals translocated away from the site. A number of receptor sites will be developed within Havant Thicket woodland where 2018 surveys have confirmed no or extremely small existing reptile populations. It may also be possible to set up receptor sites within Southleigh Forest (see **Map 5**) and / or Staunton Country Park. **Table 5** provides the areas, associated management proposals and availability of the receptor areas in Havant Thicket woodland. The overall area of compensation in Havant Thicket woodland providing suitable reptile habitat initially is 47.86 hectares of which 38.24 hectares will have a high initial carrying capacity. Carrying capacity in new areas of reptile habitat within Havant Thicket woodland will be increased through installation of hibernacula and log piles.

The assessment of initial carrying capacity is based on the speed at which suitable habitat will be developed in managed areas, local conditions, and their suitability for reptiles and previous experience of receptor site development. Those site with higher initial carrying capacity will be suitable to accept a higher number of translocated animals initially.

Table 5: Compensation works for reptiles in Havant Thicket woodland

Management Area	Description	Area (ha)	Availability	Initial Carrying Capacity
Forest Meadows	Clearance of young birch trees which have regenerated in previous clear fell areas to create permanent open space	2.22	Short, medium and long-term suitability for reptiles	High
Clear-fell Area	Felling and clearance of pine plantations, subsequent planting of native broadleaved trees	4.07	Short-term suitability for reptiles (~10 years)	High
Woodland stream enhancement	Opening up of stream corridors, with graded edge	1.12	Short, medium and long-term suitability for reptiles	High
Priority Ecological Corridors along existing rides	Create graded edges to existing ride network, providing enhanced reptile habitat	9.62	Short, medium and long-term suitability for reptiles	Medium
Pond Enhancements	Conifers around Forestry England ponds removed allow light to enter area.	1.57	Short, medium and long-term suitability for reptiles	High
Management of birch dominated areas	Creation of racks through birch dominated woodland to either encourage existing broadleaved tree or plant new broadleaved woodland (leaving some unplanted clearings)	28.7	Short term suitability for reptiles (10~years)	High

The clearfell areas outlined will be undertaken in advance of site clearance works beginning to enable a receptor sites to develop within Havant Thicket woodland in advance of translocation works. The habitat works will also be phased to ensure the habitat created is at optimum suitability for reptiles when the phased translocation occurs throughout the construction process.

In addition, a new area of woodland will be planted on Gipsies Plain which will link SCP and Havant Thicket woodland. This woodland will be planted well in advance of construction works beginning and will provide woodland edge habitat for reptiles totalling approximately 300 metres in length. Reptile hibernacula will be installed adjacent to the ephemeral waterbodies within the new woodland.

Furthermore, the young planted areas of woodland within new fencing will create suitable reptile habitat for ~10-15 years. New woodland areas, with associated edge habitat with excellent suitability for reptiles has been created on Deerslaughter Plain in the south-west corner of the site.

In the long-term the grassland developed around the reservoir (36.71 hectares) will provide excellent reptile habitat for animals to recolonise from Havant Thicket woodland. It is anticipated that the south facing margins of the wetland will comprise a mosaic of grassland, scrub, wet woodland and ephemeral pools (10.2 hectares of wetland).

Creation of the new on-site woodland and parkland including two ephemeral ponds and hibernacula between Havant Thicket woodland and SCP. The Phase 1 and 2 planting areas will create 3.77 hectares of suitable reptile habitat.

Given that reptiles will be able to recolonise the site once construction has been completed and embankment grassland develops a proportion of the compensatory habitat within Havant Thicket woodland has been included which will have short-term carrying capacity (~10 years). 10 years is the period over which the habitat on the south facing embankment on the site will develop as suitable reptile habitat. This time period will also allow recolonisation of the area by all four common species of reptile.

It is envisaged that suitable reptile habitat will be available in the site by the time the areas in Havant Thicket woodland are planted as broadleaved woodland which will slowly reduce their suitability for reptiles.

The proposed broadleaved woodland creation works within Southleigh Forest and the HIWWT wood pasture creation will provide long-term benefits for the local populations of reptiles, beyond the compensation requirements detailed above.

Overall, there will be a 109 hectare increase in high quality habitat reptiles, although not all of this habitat will be available in the long-term as woodland develops (see **Appendix 4** for further details).

4.7 Great Crested Newt

4.7.1 Baseline and Habitat Loss

One pond will be lost (0.65 hectares Upper Lake, a shaded pond within woodland clearing in The Avenue) to the reservoir and the water from the wetland will encroach into one pond in Havant Thicket woodland. Neither of these ponds have been identified as supporting great crested newts. A further 37 ponds were recorded within a 500 metre radius of the site and a low population of great crested newt is present within three ponds in Havant Thicket woodland. The closest is approximately 122 metres north of

the proposed reservoir (Grid reference, SU 72230 10309, **Appendix 1**). The development footprint mainly comprises grassland and broadleaved woodland, providing suitable terrestrial habitat for great crested newt.

There will be approximately 0.46 hectares (approximately two percent) of the suitable terrestrial habitat within 250 metres of breeding ponds permanently lost as a result of the development proposals. A further 2.63 hectares of suitable terrestrial habitat with 250 metres of breeding ponds will be temporarily lost during construction.

4.7.2 Mitigation

In advance of construction the development proposals will be revisited to reassess their potential impact on great crested newt. The results of this review will be used to assess whether a great crested newt EPSM licence is required. If a great crested newt licence is assessed to be required then the mitigation will likely comprise manipulation of habitat to reduce the suitability for great crested newt and translocation of any individuals found within the reservoir footprint to the more suitable habitat to the north.

4.7.3 Compensation

Two ephemeral ponds were dug in early 2019 as part of the Advance Planting at Gipsies Plain (0.004 hectares). Creation of the advance planting on-site woodland linkage between Havant Thicket woodland and SCP, as well as enhancement of existing boundary hedgerows. These habitats are suitable for great crested newt during both their aquatic and terrestrial phases.

Creation of 10.2 hectares of new on-site wetland habitat is likely to provide enhanced habitat for great crested newts and the new grassland and woodland habitats will provide suitable terrestrial habitats. Additional hibernacula will be created.

Restoration of existing ponds, within Havant Thicket woodland, which are currently heavily shaded with limited aquatic vegetation will also provide compensation.

The large-scale wider-site habitat enhancement work in Havant Thicket woodland and Bell's Copse will improve habitat for great crested newts.

Overall, there will be a 29 hectare increase in high quality habitat for great crested newt (see **Appendix 4** for further details).

4.8 Terrestrial Invertebrates

4.8.1 Baseline and Habitat Loss

Invertebrate surveys in 2018 recorded a total of four Red Data Book species, eight Nationally Scarce species, three S41 species and one Hampshire BAP species. In the context of the presence of similar habitats such as broadleaved woodland, open

grassland and waterbodies within the local landscape the on-site invertebrate assemblage is not considered to be particularly diverse.

Loss of 139 hectares of grassland and 14.3 hectares of woodland/scrub with suitability for a range of terrestrial invertebrates.

4.8.2 Mitigation

During construction boundary trees and woodland and their associated invertebrate assemblage will be protected from accidental encroachment through the installation of fencing.

Given the difficulty in locating, identifying and assessing the current status of many of the notable invertebrate species recorded on and adjacent to the site it is not proposed to provide specific mitigation for particular invertebrate species. However, the loss of habitat supporting these species will be off-set by habitat creation and management works within the site and Havant Thicket woodland, as detailed in Section 3.0. This will create excellent habitat to support a diverse assemblage of invertebrates.

4.8.3 Compensation

Compensation for loss of on-site habitats will comprise two main elements; enhancement and development of a mosaic of habitats within the ecological enhancement area and compensatory habitats developed within the site.

Habitat restoration works proposed at Havant Thicket will provide suitable habitat for a range of scarce and notable species. Details of the works that are particularly relevant to invertebrates are presented in **Table 6**.

Table 6: Compensation works in Havant Thicket woodland with benefits for terrestrial invertebrates

Management Area	Description	Area	Suitability
Forest Meadows	Clearance of young birch trees which have regenerated in previous clear fell areas to create permanent open space. These areas will be managed as open habitats with graded edges.	2.22	Long term suitability for various invertebrate species including white admiral and silver-washed fritillary. The clearing will be sheltered, providing a warm and sunny area, characteristics that are particularly favoured by a variety of invertebrates including various hoverflies and bees. These areas will also provide additional suitable habitat for glow worm, a species known to be present locally.
Clear-fell Area	Felling and clearance of pine plantations, subsequent planting of native broadleaved trees.	4.07	Short-term suitability for species which rely on open habitats. Long-term suitability for a variety of notable species, especially the significant number of moth species likely to be supported by the site which rely on

Management Area	Description	Area	Suitability
			broadleaved woodland habitats. Initially, this area will also provide additional suitable habitat for glow worm.
Woodland stream enhancement	Opening up of stream corridors, with graded edge. On-going rotational management will be undertaken.	1.12	Suitable habitat for a range of invertebrate species including purple emperor. These areas will also provide additional suitable habitat for glow worm.
Priority Ecological Corridors along existing rides	Creating graded edges to existing ride network, providing enhanced habitat. On-going rotational management will be undertaken.	9.62	Increased foraging and nesting habitat for a variety of woodland and scrub species, especially purple emperor and various hoverflies and bees. These areas will also provide additional suitable habitat for glow worm.
Pond Enhancements	Conifers around Forestry England ponds removed to allow light to enter area and increase riparian vegetation.	1.57	Compensation for loss of Upper Lake (The Avenue). Willows that will flourish around the edges of the newly opened ponds will provide suitable habitat for a range of species, especially purple emperor.
Management of birch dominated areas	Creation of racks through birch dominated woodland to either encourage existing broadleaved trees or plant new broadleaved woodland to diversify woodland.	28.7	Medium and long-term suitability for a range of woodland invertebrate species, including many species currently present within on-site habitats. Initially these areas will also provide additional suitable habitat for glow worm.

As part of the development of the reservoir grassland habitat around the perimeter of the site will be subject to management regimes which will provide varied grassland sward heights with suitability for numerous species,

Deadwood, particularly larger limbs, will be moved into retained on and off-site woodlands. This will provide deadwood for saproxylic invertebrates.

The management proposals within Havant Thicket woodland will provide significant enhancement for purple emperor, especially in priority ecological corridors, along stream corridors and as part of pond enhancement works. The graded edges to many of these habitats will increase the extent of sallows within the site, which are particularly important for the species. In the long-term there will also be an increase in the area of oaks within close proximity to the population of purple emperor present within Havant Thicket woodland.

Overall, there will be a 108 hectare increase in high quality habitat terrestrial invertebrates and the proposals will significantly diversify the local landscape for this species group (see **Appendix 4** for further details).

4.9 Aquatic Ecology

4.9.1 Baseline Condition and Habitat Loss

Aquatic invertebrate surveys undertaken by Atkins in April 2020 on the intermittent headwaters of Riders Lane Stream identified seven species of notable invertebrates. Of these there are two beetles listed as Nationally Scarce (*Ochthebius pusillus* and *Hydrochus angustatus*) and one Nationally Scarce caddisfly (*Limnephilus bipunctatus*) (Atkins, 2020a). The intermittent nature of the streams coupled with several culvert structures downstream result in these watercourses being considered suboptimal for fish, other than 'minor' species such as stickleback, minnow, stone loach and bullhead.

4.9.2 Mitigation

As part of the construction works mitigation for aquatic ecology will include:

- Improvements to river substrate for all pipeline crossings (3 x 20 metre river length) – using gravels/pebbles to cover concrete bed and also reinstating banks
- Translocation of aquatic invertebrate communities at locations with some of the highest diversity as part of enabling works.

Where works are undertaken in association with streams a pre-construction checks will be undertaken and Invasive Non-Native Invasive Species removed, particularly Himalayan balsam which has been recorded along the pipeline route previously. Where Non-Native Invasive Species are recorded these will be managed to prevent additional spread associated with the construction works.

Further details on the mitigation measures in relation to aquatic ecology are presented in the Outline Environmental Management Plan (Atkins, 2020b).

4.9.3 Compensation

The overall compensation strategy for aquatic ecology will comprise a package of measures that contribute to the overall compensation for the impact of the development. The final make-up of the overall WFD-driven compensation works will be developed and agreed by PW, LPAs and the EA over the coming weeks, and set out in the WFD Article 4.7 case, and future versions of the BMCS and its implementation plans.

These have been quantified as part of the Biodiversity Net Gain assessment for Rivers (Atkins, 2020a) which was included within the ES as report reference HTR-ATX-XX-RP-0070 Appendix 15.4 ES Volume 4.

MoRPh surveys⁶ and wider catchment walkovers have been used to identify opportunities for compensation within the Hermitage Stream catchment. This has identified the following potential elements of the final compensation package in relation to aquatic ecology that is to be agreed with the Environment Agency:

- Creation of 10.2 hectares of wetland habitat;
- Creation of new compensation flow channel totalling 250 metres (see **Map 4**).
- Compensation flow regime with opportunity to develop an intermittent or continual flow regime with more consistent water quality compared to current baseline;
- Additional ditch habitat created within the site;
- Improvements to headwater streams upstream of the reservoir (including woody debris);
- Creation of 106 hectares of open water habitat;
- Improvements to culverts in the Riders Lane Stream catchment – to improve habitats and fish passage⁷;
- Wider catchment measures, i.e. fencing around poached banks in upper Riders Lane Stream and work to reduce pesticides inputs into the Headwater Streams;
- Restoration of one or more sections of the Hermitage Stream;
- There will be four new wetland areas created around the northern edge of the reservoir, plus provision of an area for wet grassland habitat creation to the east of the retained wetland;
 - The wetland will be fed by three headwater streams, and will also be in continuity with the reservoir water level under normal operation conditions when the reservoir water levels are between 39.0 – 39.5 metres Above Ordnance Datum (AOD).
 - Structures will retain water at naturally consistent levels in the wetland when the main reservoir water levels are lower than 38.8 m AOD, such as during lengthy operations or drought. They will be built during the very first earthworks season, initially to retain flows from headwater streams, allowing these to be diverted away from the reservoir construction area.
 - The retained wetland area will be approx. 6.8 hectares when the main reservoir level is at 38.8 metres AOD. The wetland area will be approximately 10.2 hectares when the reservoir is full.
 - The wetlands will have variable water depths and will include a number of islands.

⁶ As requested by the Environment Agency

⁷ In line with the Water Framework Directive objectives for the Hermitage Stream

- Reedbed areas which will be suitable for variety of wetland invertebrate species and is likely to encourage a diverse dragonfly assemblage and the alder leaf beetle given the likely increase in alder at the site as a result of the wetland creation. The reservoir, and wetland together will provide excellent new habitat for aquatic invertebrate species. It will also attract a range of different wildlife and bird species to the site.

A new compensation flow channel will be created between the reservoir's Control House and the Riders Lane Stream this will create 250 metres of new aquatic habitat and carry the reservoir's compensation flow. There will be a controlled compensation flow from the reservoir as required by the Environment Agency to maintain the health of the ecology and wider environment in and downstream of the Riders Lane stream. Exact details on the reservoir's compensation flow will be subject to agreement with the Environment Agency. Conceptually, this could be several different options:

- Applying a continual flow, using median (Q50) gauged flow from the Hermitage Stream Gauging Station factored by area to the catchment upstream of the reservoir embankment using the CATCHMOD model;
- Continuation of the current intermittent nature of the catchment (mimic natural wetting and drying); or,
- A hybrid regime based on 1 and 2.

New ditch habitats will be created around the reservoir embankment, capturing overland flows from the embankment area and will simulate natural wetting and drying which currently occurs in existing ditch habitats, notably to the east of the site. Upstream of the reservoir, localised woodland stream enhancements on intermittent headwaters of Riders Lane Stream will also provide some compensation for permanent losses of watercourse extents, through improving existing habitat as well as culvert improvements (which currently do not relay flow reliably). Localised tree felling will open up the tree canopy and provide woody debris for the streams, increasing habitat diversity.

Once filled, the reservoir itself will provide up to 106 hectares of open water habitat at Top Water Level. This will create a new lake waterbody under the Water Framework Directive. There will be aeration equipment, controlled from the Control House, to manage reservoir water quality and prevent adverse effects as a result of thermal stratification. This will have downstream benefits for dissolved oxygen levels. The compensation flow will also result in more consistent water quality and an improvement in primary and secondary productivity (which is considered positive), with no negative effects on ecological functioning of watercourse or WFD status anticipated from the

impact of the development on this flow regime. This is also in context of variable water quality in the current river system.

The reservoir will cause a significant reduction of the amount of nitrogen discharged into Langstone Harbour SAC SSSI, especially during periods when the reservoir is filling (e.g. following construction and recharge following drier weather).

Three culverts in the Riders Lane Stream will be upgraded to allow operational flow releases to occur safely. Improvements to in stream and bankside habitats and to fish passage will be undertaken as part of this work, meaning that WFD Mitigation Measures for the Hermitage Stream WFD waterbody will be implemented for these culverts. Finer materials will be placed inside the new culvert pipes, providing fish passage improvements. An inverted entry/exit will be implemented to new culvert pipes along with the installation of soft habitats within the pipe to improve watercourse connectivity.

With regard to fencing, some areas in the (upper) Riders Lane Stream have been considered to benefit from this and reduce inputs from sediments and nutrients into the catchment. Portsmouth Water will also work with catchment partners to remove pesticide inputs into the headwater streams north of the reservoir.

With regard to waterbody level restoration, the amount and type of river habitat mitigation required in the Hermitage Stream waterbody remains to be finally resolved with the Environment Agency. Portsmouth Water has made a clear commitment to delivering the necessary level of aquatic habitat mitigation reasonably required to offset the impacts of the development on the Hermitage Stream waterbody.

This outline BMCS is intended by the Environment Agency and Natural England to be an adaptable document in relation to the ways in which these commitments are discharged and will therefore be amended and updated through the delivery process with their input and agreement.

5.0 MONITORING AND REVIEW

5.1 Introduction

This outline BMCS has been written to extend over a number of years, during which environmental conditions may change in response to natural and external influences that cannot be anticipated at this time. This section sets out a framework for monitoring of site conditions and the evolution of the BMCS in response to the data gathered. Further details of the ecological monitoring and review at the site are presented in the Atkins Outline Ecological Management Plan (Atkins, 2020b).

5.2 Employed Ecologist

Portsmouth Water will employ an Ecological Clerk of Works to oversee the delivery of the ecological elements, carry out site supervision and spot checks to ensure the works are being delivered to a suitable standard. The employed ecologist will also carry out a site walkover every two years from the start of pre-construction works. The purpose of the walkover will be to identify any site changes which may require alteration to the BMCS or the need to update previously undertaken protected species surveys and will report by way of a written statement of findings. The walkover will also include a review of the mitigation and compensation measures implemented:

- The success of mitigation and compensation; and
- Changes to on-going management that maybe required.

The results of the review will be presented to Portsmouth Water and, where necessary, the BMCS will be updated.

6.0 EXPECTED TIMETABLE OF MITIGATION AND COMPENSATION WORKS

Table 7: Expected timetable of mitigation and compensation works

Action		Year	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pre-construction	Planting of woodland and standard trees on Gipsies Plain																			
	Bolstering of hedgerows adjacent to Gipsies Plain																			
	Planting of woodland and standard trees on Deerslaughter Plain																			
	Clear fell pine area (4.07 hectares) and create Forest Meadows in Havant Thicket woodland (2.22 hectares) to provide receptor area for reptiles																			
	Pond enhancement measures in Havant Thicket woodland																			
	Translocation of notable plant species from Upper Lake to Havant Thicket woodland ponds																			
	Translocation of notable plant species from on-site streams to suitable habitat within Havant Thicket woodland																			
	Vegetation protection measures in line with BS 5837:2012																			
	Erection of bat boxes in off-site areas																			
	Preparation, submission and granting of EPSM licence application to Natural England for bats																			
	Pre-construction badger survey																			
	Preparation, submission and granting of EPSM licence application to Natural England for hazel dormouse																			
	Hazel dormouse translocation works																			
	Pre-felling checks for roosting bats																			
	Felling of on-site woodland under the supervision suitability licensed and experienced ecologists																			
	Translocation of felled oak standards to create monoliths																			
	Erection of bat, dormouse and bird boxes in retained woody vegetation																			
	Preparation of a recreational strategy and costed Ecological Management Plan to ensure successful management of biodiversity																			
	Works timed to avoid nesting bird season, or undertaking breeding bird checks where this isn't possible																			
	Pre-construction grazing of grassland to reduce suitability for reptiles																			
	Creation of reptile hibernacula within Havant Thicket woodland																			
	Installation of reptile fencing and translocation of reptiles into receptor areas within Havant Thicket woodland																			

Action		Year	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Reassessment of on-site habitat for suitability for great crested newt during terrestrial phase																			
	Monitoring and review by project ecologist, site walkover																			
	Southleigh Forest Management																			
	HIWWT partnership wood pasture creation																			
	Habitat enhancements to off-site streams																			
Construction	Remainder of habitat enhancement works undertaken in Havant Thicket woodland																			
	Guidance on task related lighting levels will be followed																			
	Continued protection of vegetation in line with BS 5837:2012																			
	Regular badger surveys during construction																			
	Steep sided excavations will be covered overnight or a battered edge ramp inserted to allow any badgers which are trapped to escape of their own accord																			
	Creation of new compensation flow channel totalling 250 metres																			
	Improvements / restoration to Riders Lane Stream and Hermitage Stream delivered																			
	Wider catchment measures, i.e. fencing around poached banks in upper Riders Lane Stream and work to reduce pesticides inputs into the Headwater Streams;																			
	Monitoring and review by project ecologist, site walkover																			
Post-construction	Guidance on task related lighting levels will be followed																			
	Creation of wetland, open water and grassland habitats across the site																			
	Monitoring and review by project ecologist, site walkover																			

7.0 REFERENCES

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Appendix 1 Vegetation and Protected Species Surveys Undertaken 2005 - 2020

Table 8: Ecological Survey Work Details

Survey Type	Surveyor	2005	2006	2007	2008	2009	2018	2019	2020
Vegetation – Phase 1	ECOSA	F	-	-	-	-	Updating walkover survey	-	-
Vegetation - National Vegetation Classification & Other detailed Survey	ECOSA	-	F	-	F	F	F	Lichen Survey	-
Tree surveys	Atkins	-	-	-	-	-	-		F
Bats - Transect Survey	ECOSA	F	F		F	F	-	-	-
Bats - Vantage Point (Fixed Area) Survey	ECOSA	-	-	-	F	-	F	-	-
Bats - Radio-tracking Survey (on and adjacent to site)	ECOSA	-	-	-	F	F	F ⁸	-	-
Bechstein's Bats - Radio-tracking Survey (within 3 km)	ECOSA	-	-	-	F	F	F ⁹	-	-
Bats - Static Detector Survey	ECOSA/PW	-	-	-	-	-	F	PW ¹⁰	-
Bats - Roost Inspections in Woodlands (Hibernation)	ECOSA	-	-	-	-	F ¹¹	-	-	-
Ground Level Tree Assessment for bats (ECS, 2020)	ECS	-	-	-	-	-	-	-	F
Otter Survey	ECOSA	F	F	-	C	C	F	(see pipeline below)	
Water Vole Survey	ECOSA	F	F	-	C	C	F	(see pipeline below)	
Badger Survey	ECOSA (2005 -2018) PW (2020)	F	F	F	C	C	F	-	F ¹²

⁸ Only Bechstein's bat were radio-tracked during 2018, additional species radio-tracked in 2008

⁹ One Bechstein's bat tracked from Staunton Country Park to Southleigh Forest roost and back (17th-20th July 2019)

¹⁰ Surveys undertaken by Portsmouth Water's staff (bat surveys by Portsmouth Water (PW) Ecologist and nightjar surveys by Environment Lead & retired Hampshire County Council Ranger)

¹¹ Trees with suitable holes and crevices for bat roosts below approximately 5 m were investigated using an endoscope in The Avenue, Middle Clearing and Round Wood

¹² Survey around the edges of The Avenue and northern edge of Staunton Country Park woodlands to the south of the Reservoir Site by PW Ecologist on 13th May 2020.

Survey Type	Surveyor	2005	2006	2007	2008	2009	2018	2019	2020
Hazel Dormouse Survey	ECOSA	F	F	F ¹³	C/F	C ¹⁴	-	-	-
Breeding Bird Survey - All Species	ECOSA	F	-	-	F	-	F	-	-
Breeding Bird Surveys - Nightjar	ECOSA/ PW	-	F	-	F	-	C	C, PW	-
Wintering Bird Survey	ECOSA	F	F	-	F	F	F	-	-
Reptile Survey (Site)	ECOSA	F	C	F	F	-	F	-	-
Reptile Survey – Havant Thicket woodland (FE land)	ECOSA	-	-	-	-	F ¹⁵	F	-	-
Great Crested Newt Survey – Habitat Assessment	ECOSA	F	F	-	-	-	F	-	-
Great Crested Newt Survey - eDNA	ECOSA	-	-	-	-	-	F ¹⁶	-	-
Great Crested Newt Survey - Population Assessment	ECOSA	F	F	-	-	-	F	-	-
Invertebrates - Daytime Visual Survey	ECOSA	F	C	C	C	-	F ¹⁷	-	-
Invertebrates - Aquatic Survey (ARUP, 2009)	ARUP 2009; APEM 2020	-	-	-	F ¹⁸	-	-	-	F ¹⁹
Rivers and Streams (Baseline Geomorphology and River Habitat Survey)	ARUP	-	-	-	F	-	-	-	-
Pipeline Survey (Northern Section) - Extended Phase 1	ECOSA	-	-	F	-	-	-	-	-
Pipeline Corridor (safeguarded route) – Preliminary Ecological Appraisal	ECOSA	-	-	-	-	-	F	-	-
Pipeline Corridor (safeguarded route) – Further ecology surveys	PW	-	-	-	-	-	-	Targeted water vole/otter surveys	-

¹³ Havant Thicket woodland and Staunton Country Park only

¹⁴ One date - 5th June 2008

¹⁵ Targeted transects in Havant Thicket woodland

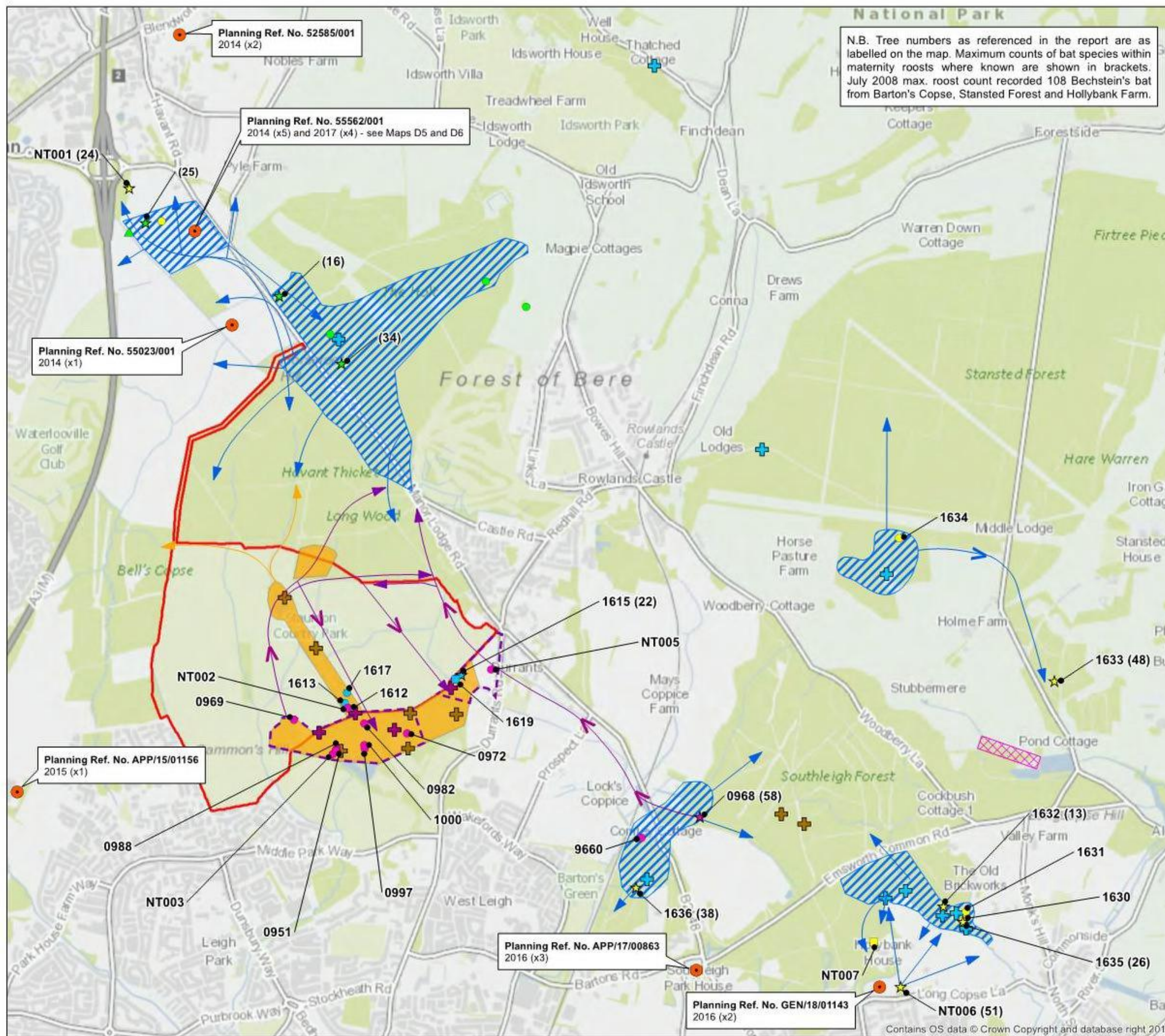
¹⁶ One pond at northern end of Bellis Copse surveyed in 2019 results

¹⁷ Survey effort was targeted to where priority species were recorded previously and to habitat with high suitability on the site

¹⁸ Targeted to select reaches on site and downstream of the site based on professional judgement of the surveyor

¹⁹ Survey locations agreed in consultation with the Environment Agency.

Appendix 2 Bechstein's Bat Landscape Overview



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D42 - Bechstein's Bat Roosts, Foraging Areas and Movements Recorded Between 2008 and 2019

Client: Portsmouth Water

Date: January 2020

Status: Final

KEY

- Site Boundary (the site)
- Development Site where Bechstein's Bat found during survey work (planning reference, year, number of bats)
- Hampshire Bat Group Capture site 27th July 2019: one female and three males (all judged to be juveniles) trapped only
- Bechstein's Bat Capture Site 2018
- Bechstein's Bat Capture Site 2009
- Bechstein's Bat Capture Site 2008
- Key Foraging Areas 2018
- Bat Movements 2018
- Key Foraging Areas 2009
- Bat Movements 2009
- Key Foraging Areas 2008
- Bat Movements 2008

ECOSA Records 2008-2018 (max. count)

- Bechstein's bat maternity roost, 2018
- Bechstein's bat roost (one individual), 2018
- Bechstein's bat maternity roost, 2009
- Bechstein's bat roost (three individuals), 2009
- Bechstein's bat roost (one individual), 2009
- Bechstein's bat maternity roost, 2008
- Bechstein's bat roost (seven individuals), 2008
- Bechstein's bat roost (one individual), 2008

WYG/EPR Records 2009 and 2014 (max. count)

- Bechstein's bat maternity roost, 2014
- Bechstein's bat roost (two individuals), 2014
- Bechstein's bat roost (one individual), 2014

Scale at A3: 1:20,000

0 250 500 1,000 Metres

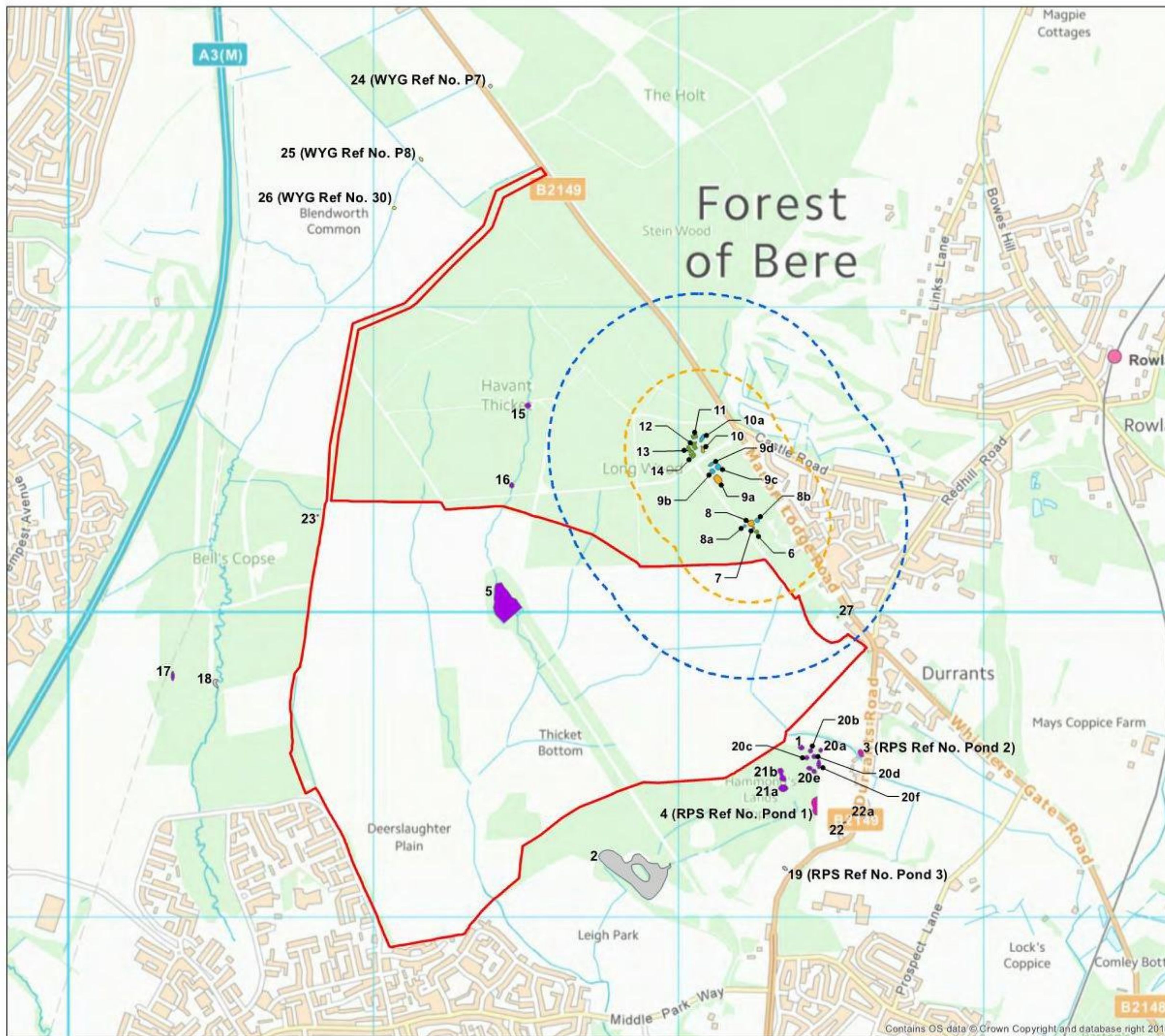
ECOSA

Ecological Survey & Assessment

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

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Appendix 3 Great Crested Newt Survey Results



HAVANT THICKET WINTER STORAGE RESERVOIR

GREAT CRESTED NEWT ASSESSMENT

Map K4 - Great Crested Newt Survey -
Location of Ponds Surveyed and Results

Client: Portsmouth Water

Date: May 2019

Status: Final

KEY

- Site Boundary (the site)
- Confirmed GCN Pond Buffer: 250m Radius
- Confirmed GCN Pond Buffer: 500m Radius

Location of Ponds Surveyed and Survey Results

Pond Surveyed, Great Crested Newt (GCN) Status

- Pond subject to eDNA and GCN surveys by ECOSA in 2018, Positive result - GCN present (Ponds 8, 9a and 10)
- Pond subject to eDNA and GCN surveys by ECOSA in 2018, Negative result - GCN absent (Ponds 6, 7, 11, 12, 13 and 14)
- Pond subject to GCN survey by ECOSA in 2018, Negative result - GCN absent (Ponds 8a, 8b, 9b, 9c, 9d and 10a)
- Pond subject to eDNA survey by ECOSA in 2018, Negative result - GCN absent (Ponds 1, 5, 15, 16, 17, 20a, 20b, 20c, 20d, 20e, 20f, 21a, 21b, 22 and 23)
- Pond subject to eDNA survey by RPS in 2017, Negative result - GCN absent (Pond 3 and Pond 4)
- Pond subject to GCN survey by WYG in 2014, Negative result - GCN absent (Pond 25 and Pond 26)
- Pond not surveyed - deemed unsuitable (Ponds 2, 18, 19, 22a, 24 and 27)

Scale at A3: 1:12,000

0 150 300 600 Metres

ECOSA
Ecological Survey & Assessment

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

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Appendix 4 Summary of Habitat Loss/Gain for Notable Protected Species

Table 9: Habitat loss and suitability²⁰ for species / species groups

Location	Habitat Type	Total Area of Loss (Hectares)	Bats (Foraging)	Bats (Roosting)	Badger	Hazel Dormouse	Birds	Reptiles	Great Crested Newt	Terrestrial Invertebrates	Aquatic Ecology
The Avenue	Lowland mixed deciduous woodland	6.16									
Middle Clearing	Lowland mixed deciduous woodland	2.17									
Round Wood	Lowland mixed deciduous woodland	1.39									
The Corsican Pine Plantation	Pine plantation	2.21									
Willow / blackthorn scrub	Broadleaved woodland	1.27									
Site-wide	Semi-improved grassland	139									
Streams	River (Ephemeral Watercourses)	0.37 (3.7 kilometre length)									
Upper Lake	Pond	0.65									
Wetland	Purple Moor Grass Rush Pasture	1.21									
Standard Trees	Broadleaved standard tree	29 trees									
Total Loss of Suitable Habitat (Hectares)	N/A	N/A	156.18	13.03	156.18	14.95	156.18	140.92	3.09	156.18	0.37

Table 10: Habitat creation and enhancement and suitability for species / species groups

Location	Location	Map Reference	Compensation Type	Habitat Type (Existing / To be Created)	Management	Area (Hectares)	Bats (Foraging)	Bats (Roosting)	Badger	Hazel Dormouse	Birds	Reptiles	Great Crested Newt	Terrestrial Invertebrates	Aquatic Ecology
Phase 1 Planting: Gipsies Plain	On-site	Map 10, Map 4	New habitat creation	Lowland mixed deciduous woodland and wood pasture / parkland, ephemeral ponds	Long-term management once developed	1.50									
Phase 2 Planting: Deerslaughter Plain	On-site	Map 4	New habitat creation	Lowland mixed deciduous woodland and Wood pasture / parkland	Long-term management once developed	2.48									
Cabbagefield Row	On-site	Map 4	Existing habitat enhancement	Lowland mixed deciduous woodland	Coppicing, glade creation	1.17									
Retained area of Round Wood	On-site	Map 4	Existing habitat enhancement	Lowland mixed deciduous woodland	Diversification of age structure	0.58									
Swanmore Road Shelterbelt	On-site	Map 4	Existing habitat enhancement	Lowland mixed deciduous woodland	Coppicing, glade creation, diversification of age structure	0.66									
Corsican Pine Plantation	On-site	Map 4	New habitat creation	Wet woodland	Felling of conifers, creation of wet woodland	1.66									
Scrub / bolstered edge habitat	On-site	Map 4	New habitat creation	Scrub	Edge habitat allowed to develop around perimeter of reservoir	0.90									

²⁰ Habitats with suitability for each species / species group is highlighted

Location	Location	Map Reference	Compensation Type	Habitat Type (Existing / To be Created)	Management	Area (Hectares)	Bats (Foraging)	Bats (Roosting)	Badger	Hazel Dormouse	Birds	Reptiles	Great Crested Newt	Terrestrial Invertebrates	Aquatic Ecology
Small areas of on-site woodland creation	On-site	Map 4	New habitat creation	Lowland mixed deciduous woodland	Long-term management once developed	0.30									
Phase 1 and 2 planting areas	On-site	Map 4	Existing habitat enhancement	Neutral grassland	Long-term management to increase species diversity	1.63									
Hedgerows on Gipsies Plain	On-site	Map 4	Existing habitat enhancement	Hedgerow	Bolstering through the planting of native species	0.20									
Stream creation	On-site	Map 4	New habitat creation	River	Small section of created stream at southern edge of reservoir	0.02									
Wetland area with wet woodland fringes	On-site	Map 4	New habitat creation	Wetland and woodland	Management delivered through long-term management plan	12.36									
Created grassland along reservoir embankment	On-site	Map 4	New habitat creation	Neutral grassland	Management through grazing	15.83									
Created shoreline ephemeral shallows	On-site	Map 4	New habitat creation	Marshy grassland	Management delivered through long-term management plan	1.68									
Retained species poor rush pasture to be enhanced to Priority Habitat: Purple Moor Grass Rush Pasture	On-site	Map 4	Existing habitat enhancement	Purple Moor Grass Rush Pasture	Enhancement through sensitive grazing regime and careful management of hydrology	1.28									
Open water	On-site	Map 4	New habitat creation	Open water associated with reservoir	No specific management	106									
Retained and enhanced grassland	On-site and wider-site	Map 4	Existing habitat enhancement	Neutral grassland	Retained grassland around the perimeter of the site will be enhanced through positive ecological management	15.42									
Woodland at the base of The Avenue	On-site and wider-site	Map 4	Existing habitat enhancement	Lowland mixed deciduous woodland	Coppicing, glade creation, diversification of age structure	5.44									
Havant Thicket woodland: forest meadow	Wider-site	Map 6	New habitat creation	Purple Moor Grass Rush Pasture	Clearance of young birch trees which have regenerated in previous clear fell areas to create permanent open space	2.22									
Havant Thicket woodland: clear-fell area	Wider-site	Map 6	New habitat creation	Lowland mixed deciduous woodland	Felling and clearance of pine plantations, subsequent planting of native broadleaved trees	4.07									
Havant Thicket woodland: woodland stream enhancement	Wider-site	Map 6	Existing habitat enhancement	River	Opening up of stream corridors, with graded edge	1.12									
Havant Thicket woodland: pond enhancements	Wider-site	Map 6	Existing habitat enhancement	Ponds	Conifers around ponds removed allow light to enter area.	1.57									
Havant Thicket woodland: management of birch dominated areas	Wider-site	Map 6	Existing habitat enhancement / new habitat creation	Lowland mixed deciduous woodland	Creation of racks through birch dominated woodland to either encourage existing broadleaved tree or plant new broadleaved woodland	28.7									
Havant Thicket woodland: Bells Copse woodland management	Wider-site	Map 6	Existing habitat enhancement	Lowland mixed deciduous woodland	This oak-hazel woodland will be managed on a long-term hazel coppice rotation	3.87									

Location	Location	Map Reference	Compensation Type	Habitat Type (Existing / To be Created)	Management	Area (Hectares)	Bats (Foraging)	Bats (Roosting)	Badger	Hazel Dormouse	Birds	Reptiles	Great Crested Newt	Terrestrial Invertebrates	Aquatic Ecology
Havant Thicket woodland: removal of path	Wider-site	Map 6	New habitat creation	Scrub	New graded scrub edge created to replace footpath	0.37									
Havant Thicket woodland: grassland / scrub mosaic management Area	Wider-site	Map 6	Existing habitat enhancement	Grassland and scrub mosaic	Rotational management of grassland and scrub along wayleave	3.41									
Havant Thicket woodland: priority ecological corridors along existing rides	Wider-site	Map 6	Existing habitat enhancement	Graded edges to existing ride network	Graded edge with bramble and more mixed vegetation, rotational management	9.62									
Southleigh Forest	Off-site	Map 5	Existing habitat enhancement	Lowland mixed deciduous woodland	Felling of conifers, creation of wet woodland	74.96									
Wildlife Trust Partnership	Off-site	N/A	New habitat creation	Wood pasture	Management of existing farmland to create wood pasture	60 ²¹									
Wildlife Trust Partnership	Off-site	N/A	New habitat creation	Lowland meadow	Management of existing farmland to deliver semi-improved / unimproved grassland	20									
Total	N/A	N/A	N/A	N/A	N/A	378.81	272.34	184.52	93.93	73.22	378.34	250.83	33.02	263.85	124.23

Table 11: Total Loss / gains for species / species groups

Species / Species Group	Loss (Hectares)	Compensation (Hectares)	Difference (Hectares)
Bats (Foraging)	156.18	272.34	+116.16
Bats (Roosting)	13.03	184.52	+171.49
Badger	156.18	93.93	-62.25
Hazel Dormouse	14.95	73.22	+58.27
Birds	156.18	378.34	+222.16
Reptiles	140.92	250.83	+109.91
Great Crested Newt	3.09	33.02	+29.93
Terrestrial Invertebrates	156.18	263.85	+107.67
Aquatic Ecology	0.37	124.23	+123.86

²¹ 80 hectares of wood pasture in total inclusive of the 20 hectares of neutral grassland located in the same land parcel.

Appendix 5 Biodiversity Net Gain Assessment



Havant Thicket Reservoir Project

Biodiversity Metric Report Report for Terrestrial Habitats

Portsmouth Water Ltd.

18/09/2020

Atkins Doc No.: HTR-ATK-RZ-RE-RP-Z-0009

Atkins Revision No.: C01

Notice

This document and its contents have been prepared and are intended solely as information for Portsmouth Water Limited and use in relation to the Havant Thicket Reservoir.

Atkins Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 34 pages including the cover.

Document history

PW Revision	Status	Purpose description	Originated	Checked	Reviewed	Authorised	Date
C01	B1	Final	CW	MB	LJB	LJB	18/09/20
P01		First Issue	CW	RB	MB		15/09/20

Client signoff

Client	Portsmouth Water Ltd.
Project	Havant Thicket Reservoir Project
Job number	5169117
Client signature / date	

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1. Introduction

Atkins Limited (Atkins, a member of the SNC Lavalin group) was commissioned by Portsmouth Water to undertake a study in which the Department for Environment, Food and Rural Affairs (Defra) Biodiversity Metric 2.0¹ published by Natural England would be applied where appropriate to the Havant Thicket Reservoir Project.

Biodiversity Net Gain (BNG) is an approach to development that leaves biodiversity in a better state than before. This report focusses on the habitat component of the Biodiversity Metric 2.0 only. A separate report, Appendix A15.4 of the Havant Thicket Reservoir Project Environmental Statement Volume 4, provides the equivalent calculations for the linear watercourse habitats.

This report presents:

- Baseline condition for on-site habitats and the biodiversity units that will be lost during the works required for the Scheme.
- Predicted biodiversity units to be created onsite through habitat creation and enhancement.
- Predicted biodiversity units to be created offsite through habitat creation and enhancement.

The Biodiversity Metric 2.0 calculations (referred to as the 'metric calculations') in this report, cover habitat losses and gains within the Reservoir Site, and do not include the Pipeline Corridor. This is because all habitat losses for the pipeline will be temporary and subject to bespoke mitigation / compensation through onsite restoration.

The Havant Thicket Reservoir Project will result in the unavoidable loss of ancient woodland and veteran trees, which are irreplaceable habitats. The Defra Biodiversity Metric 2.0 guidance (2019)², includes a series of principles that underpin the metric. Principle 4 states:

"Impacts on ... irreplaceable habitats are not adequately measured by this metric, and will likely require separate consideration."

The Biodiversity Net Gain, Good practice Principles for Development (CIRIA, 2019)³ states:

A project affecting irreplaceable habitat, while not achieving BNG at the project level, can and should generate meaningful gains or net gains for other biodiversity features. These gains or net gains should be based on advice in this guide, while being clear that the development project overall cannot achieve BNG because of impacts on irreplaceable habitats."

Due to the unavoidable loss of ancient woodland, including some individual veteran trees, which are irreplaceable habitats, the Scheme overall cannot achieve biodiversity net gain in good practice terms. For irreplaceable habitats, design has minimised their loss as far as practicable and a bespoke approach to compensation for these habitats has been designed in consultation with key stakeholders. The losses of ancient woodland and compensation for these losses are described in Chapter 9 Biodiversity in the Havant Thicket Reservoir Project Environmental Statement Volume 2. The compensation comprises a bespoke combination of onsite and offsite woodland and wood-pasture creation and enhancement. These areas of loss and compensation are therefore excluded from the metric calculations in this report.

In addition to irreplaceable habitats, the Biodiversity Metric 2.0 also indicates that loss of habitats that have been assigned to a 'very high' distinctiveness band⁴ should be excluded from metric calculations, with bespoke compensation created instead. Areas of purple moor-grass and rush pasture priority habitat to be lost within the Reservoir Site are classified as a habitat of very high

¹ The Biodiversity Metric 2.0 USER GUIDE Beta Version. First Published July 2019. Natural England Joint Publication JP029

² The Biodiversity Metric 2.0 USER GUIDE Beta Version. First Published July 2019. Natural England Joint Publication JP029

³ CIRIA (2019). The Biodiversity Net Gain, Good practice Principles for Development. Page 132. Section T3.7 Differentiating Biodiversity Losses / Gains From Impacts on Irreplaceable Habitats. <https://cleem.net/wp-content/uploads/2019/02/C776a-Biodiversity-net-gain-Good-practice-principles-for-development-A-practical-guide-web.pdf>

⁴ Habitats that are listed as Endangered or Critical on the European Red List of Habitats or Priority Habitats with a small amount of remaining habitat in the UK and with a lot of it unprotected by designation.

distinctiveness⁵. The areas of these habitats are shown on Figure 9.3 in Havant Thicket Project Environmental Statement Volume 3. The losses of purple moor-grass and rush pasture priority habitat and compensation for these losses are described in Chapter 9 Biodiversity in the Havant Thicket Project Environmental Statement Volume 2. The compensation comprises bespoke onsite purple moor-grass and rush pasture creation. These areas of loss and compensation are therefore excluded from the metric calculations in this report. However, some retained wet grassland will be enhanced to create purple moor-grass and rush pasture, and this specific element of work is included in this report.

⁵ Priority habitats as defined in Section 41 of the Natural Environment and Rural Communities Act that are highly threatened, internationally scarce and require conservation action are assigned Very High distinctiveness under the Metric.

2. Method

2.1. Application of the Biodiversity Metric 2.0

Areas of habitat to be lost, created or enhanced at the Reservoir Site have been taken from Chapter 9 Biodiversity in the Havant Thicket Reservoir Project Environmental Statement Volume 2.

Habitat areas, along with the condition of habitats, were inputted to the Defra Biodiversity Metric 2.0 Calculation Tool⁶ in order to calculate the baseline habitat biodiversity units for the Reservoir Site. Habitat (area) units, hedgerow (linear) units and river (linear) units are all calculated separately and are not interchangeable.

A habitat's distinctiveness score is derived from its intrinsic biodiversity value, reflecting the rarity of the plant community, the time it takes to reach maturity, its value to fauna, and its ecosystem function. This score is pre-assigned and is pre-populated in the metric. A summary of the habitats present and their distinctiveness and their assumed condition can be found in Table A-1 – Broad Habitat Types Conversion to UK Habitat Classification and Summary of Compensation Strategy, in Appendix A of this Biodiversity Metric report.

Habitat condition was assigned based on professional judgement informed by data in the ECOSA Vegetation survey report⁷. The mapping in that report has not used a standard habitat classification system. Therefore, there has been subjective interpretation to convert to UK Habitat classification system that the Biodiversity Metric 2.0 uses, and the results of this exercise were reviewed and agreed by the original ECOSA habitat surveyor. A precautionary approach has been taken to condition assumptions, which are underpinned by detailed field survey data. Table A-1 – Broad Habitat Types Conversion to UK Habitat Classification and Summary of Compensation Strategy, in Appendix A of this Biodiversity Metric report illustrates how this conversion was undertaken. This table also includes a summary of the approach to compensation for each habitat type for reference.

The metric calculations use measures of a habitat's area (in hectares), its distinctiveness (rarity) and its condition, to calculate biodiversity units. The metric also involves additional multipliers to calculate post-development biodiversity units. These include delivery risk, spatial risk and temporal risk. Full details of the definitions of these multipliers and how the values for each multiplier are assigned to each habitat, are set out in the Biodiversity Metric 2.0 technical supplement⁸.

The biodiversity units of each habitat, for both baseline and post-intervention works, are summed in the Biodiversity Metric 2.0 Biodiversity Unit Calculation Proforma to give a net total number of biodiversity units for both pre and post intervention land use change. The full data input into the metric and the resultant calculations within the metric are provided in Appendix B of this Biodiversity Metric report: Biodiversity Metric 2.0 Calculations for the Reservoir Site.

Following guidance within the Biodiversity Metric 2.0 user guide⁹ habitats of low or medium distinctiveness were assigned low connectivity and habitats of high distinctiveness assigned moderate connectivity. The add-on connectivity tool was not applied, because Natural England have advised that it will be removed from the tool when it is issued in final version in winter 2020¹⁰.

The Reservoir Site includes non-statutory designated sites and the importance of biodiversity to the Havant Thicket Reservoir Project is set out in local planning documents, so the 'strategic significance' of habitats at the Reservoir Site is set at high, as it is considered to be "within area formally identified in local strategy".

The metric calculations also include offsite interventions. Areas of habitat to be created and enhanced offsite are taken from the indicative proposals in the outline Biodiversity Mitigation and Compensation Strategy for potential offsite interventions, specifically a woodland / wood pasture creation project (excluding the part of this that compensates for loss of ancient woodland) being developed with Hampshire and Isle of Wight Wildlife Trust (HIWWT) and enhancement of

⁶ Downloaded 13/07/2020. The Defra 2.0 metric is still in Beta test version with regular updates being published.

⁷ Appendix A9.2 Vegetation survey report in the Havant Thicket Reservoir Project Environmental Statement Volume 4.

⁸ Crosher, I., Gold, S., Heaver, M., Heydon, M., Moore, L., Panks, S., Scott, S., Stone, D. and White, N. (2019) The Biodiversity Metric 2.0: Auditing and accounting for biodiversity value: Technical supplement (Beta version, July 2019). Natural England

⁹ Crosher, I., Gold, S., Heaver, M., Heydon, M., Moore, L., Panks, S., Scott, S., Stone, D. and White, N. (2019) The Biodiversity Metric 2.0: Auditing and accounting for biodiversity value: User guide (Beta version, July 2019). Natural England

¹⁰ <http://nepubprod.appspot.com/publication/5850908674228224>

Southleigh Forest, a woodland owned by Portsmouth Water. Portsmouth Water are committed to work with partners to deliver such valuable offsite interventions.

2.2. Assumptions and Limitations to the Biodiversity Metric 2.0 Assessment

The Biodiversity Metric 2.0 calculator has been used for the assessment although this is currently in Beta format and may be subject to changes prior to its final release (expected in December 2020).

The metric provides a high-risk category that minimises the credits gained for more ecological valuable habitats, which is likely to underestimate the value of habitats that could be created given that the Reservoir Site will be managed as a nature reserve in the long-term.

There is uncertainty about the exact habitats that will establish in the wetland areas as these areas will be partially left to natural colonisation with a variety of water levels included in the design to support establishment of a variety of habitats, so assumptions have been made about the elements best described as ponds or reedbed habitat, based on professional judgement working with the wetland design specialists.

The Freshwater Biological Association 'Habitat Naturalness Assessment' is used to assess the condition of lakes. The average naturalness assessment scores for a lake are then converted into condition scores for use in Biodiversity Metric 2.0¹¹. The assumed condition using the condition table for Lake Habitat Types¹², for the created reservoir is moderate given the wetland design's aspiration to increase the reservoir's naturalness and its biodiversity value and Portsmouth Water's commitment to long term management.

Linear habitats including watercourses have not been included in this assessment. A separate report, Appendix A15.4 of the Havant Thicket Reservoir Project Environmental Statement Volume 4, provides the equivalent metric calculations for the linear watercourse habitats.

Portsmouth Water are committed to maximising the ecological benefits of the Scheme and are including a range of mitigation and compensation measures that cannot be accounted for in a metric. For example, advance planting has already been undertaken within the Reservoir Site and the resultant reduced time to target condition for these areas cannot be reflected in the metric calculations. The proposals also include a visitor centre¹³ to provide social and educational benefits and on-site staff will help manage the Reservoir Site and ensure habitats are able to develop into high value habitats in the long-term.

Detailed proposals are not available for the potential offsite habitat creation and enhancement measures, so a precautionary approach has been taken in estimating the areas affected and the potential success of habitat interventions. The overall compensation package includes a Capital Grants Scheme. It is not possible to predict the habitat interventions that will be funded by this Scheme so it is not included in the metric calculations.

¹¹Details of the methodology for assessing naturalness are located at the following website: <http://priorityhab.wpengine.com/contribute/>

¹² Biodiversity metric 2.0 Technical Supplement - Beta Test Final (March, 2020)

¹³ Note: The visitor centre footprint has not been included in this assessment The addition of the centre will generate further changes to net gain calculations.

3. Results and Discussion

3.1. Application of the Mitigation Hierarchy

The mitigation hierarchy has been used to design the reservoir and supporting development. This is described within Chapter 9 Biodiversity in the Havant Thicket Reservoir Project Environmental Statement Volume 2 and is not duplicated in this report.

3.2. Habitat Losses, Creation and Enhancement on the Reservoir Site

The following tables are copied from data in Chapter 9 Biodiversity in the Havant Thicket Reservoir Project Environmental Statement Volume 2. Table 3-1 sets out the predicted habitat losses. These summarise the losses in Appendix A of this Biodiversity Metric report. Greyed out rows show habitats where losses are subject to bespoke compensation, so they are not included in the metric calculations, but are shown here for completeness of data.

Table 3-1 - Habitat Predicted to be Lost at the Reservoir Site

Habitat type	Comments	Area Lost (ha)
Ancient Semi-Natural Woodland	IRREPLACEABLE HABITAT	9.92
Plantation on Ancient Woodland Sites	IRREPLACEABLE HABITAT	2.53
Purple moor-grass and rush pastures	Priority Habitat of very high distinctiveness	1.21
Damp to wet grassland and developing rush pasture	Non-Priority Habitat	77.73
Damp neutral to acid grassland	Non-Priority Habitat	42.15
Species-poor rush pasture and wetland	Non-Priority Habitat	4.07
Willow scrub	Non-Priority Habitat	0.98
Other scrub	Non-Priority Habitat	0.28
Pond ¹⁴	Non-Priority Habitat	0.39
Made-up track with grass verges	Non-Priority Habitat	1.02

¹⁴ Further information on Upper Lake provided in Aquatic habitats and species section below.

Table 3-2 sets out the predicted areas of habitat to be created. The greyed-out row is habitat creation contributing to compensation for loss of irreplaceable habitat, so it is not included in the metric calculations, but is shown here for completeness of data.

Table 3-2 - Summary of Habitat Creation within the Reservoir Site

Habitat Type	Comments	Indicative Area Created (ha)
Woodland/wood-pasture	Gipsies Plain and Deerslaughter Plain advance planting and additional small areas around the edge of the reservoir footprint	4.30
Grassland	Predominantly on the reservoir embankments	15.83
Wetland	Along northern edge of reservoir	10.21
Shoreline ephemeral shallows	Along wetland edge	1.68
Scrub/ bolstered woodland edge or hedgerows	Around reservoir footprint boundaries	0.91
Open water	The Reservoir (excluding the wetland area)	101.80

The Scheme would also result in construction of features such as the visitor centre and access roads, so the area of habitat loss is greater than the area of habitat to be created.

Within the Reservoir Site the following habitats would be retained and enhanced:

- 127.40 ha woodland retained, within which 52.7 ha would be enhanced, including an area enhanced to create purple moor-grass and rush pasture.
- 15.42 ha grassland retained.
- 1.29 ha species-poor rush pasture enhanced to species-rich purple moor-grass and rush pasture.

The retained and enhanced woodland area (greyed out in the relevant bullet point above) is not included in the metric calculations, because these interventions form part of the compensation for loss of ancient woodland and include the compensation for loss of purple moor grass rush pasture.

3.3. Biodiversity Metric 2.0 Summary Results for the Reservoir Site

Initial metric calculations are provided below for habitats excluding losses and compensation relating to ancient woodland and purple moor-grass and rush pasture priority habitat. These are based on the outline design as described in the Havant Thicket Reservoir Project Environmental Statement. These have been done using the current Beta testing version of Biodiversity Metric 2.0, December 2019¹⁵.

Based on on-site post intervention including habitat retention, creation and enhancement, there is a predicted **net loss of 20.19 %** as detailed below in Table 3-3.

¹⁵ The download of the metric table was carried out on 3rd March 2020. The add -on connectivity tool has not been used for this assessment.

Table 3-3 - Predicted Biodiversity Metric 2.0 Results for the Reservoir Site

On-Site Baseline	Total Site Area (ha)	156.99	Total Baseline Habitat Units	1,311.58
On-Site Post Intervention Including Retention, Creation, Enhancement	Total Site Area (ha)	156.99	Total Post Intervention Habitat Units	1,045.89
			Total Net Unit Change	- 265.70
			Total Net % Change Including On-Site habitat retention / creation	-20.26% loss

3.4. Alternative Biodiversity Metric 2.0 Summary Results for the Reservoir Site, with Revised Difficulty Multiplier

The Biodiversity Metric 2.0 calculator includes some fixed elements, such as the time to target condition and difficulty multipliers for creating or enhancing different habitat types. For example, the multiplier for creating/enhancing non-priority habitat ponds is 1, but the multiplier for creating/enhancing reedbeds is 0.67.

The largest area of habitat creation will be the open water of the reservoir itself. In the metric, reservoirs have a difficulty multiplier of 0.67. While creating reservoirs requires very specific site conditions and skilled engineering, the entire purpose of this Scheme is to create a viable reservoir. For this Scheme, engineering and environmental expertise will be used to design a reservoir that includes features, such as the wetland area, specifically incorporated to improve its value for nature conservation. It therefore appears inappropriate to apply the difficulty multiplier to this habitat type. For comparative purposes, the table below shows how applying a multiplier of 1 instead of 0.67 to the reservoir open water would alter the results.

This change in approach would result in a predicted **net loss of 0.54 %** as detailed in Table 3-4 below:

Table 3-4 - Predicted Biodiversity Metric 2.0 Results for Reservoir Site, with Revised Difficulty Multiplier

On-Site Baseline	Total Site Area (ha)	156.99	Total Baseline Habitat Units	1,311.58
On-Site Post Intervention Including Retention, Creation, Enhancement	Total Site Area (ha)	156.99	Total Post Intervention Habitat Units	1,045.89 - 525.11 + 783.74 ----- 1,304.52
			Total Net Unit Change	- 7.06
			Total Net % Change Including On-Site habitat retention / creation	-0.54 % loss

3.5. Alternative Biodiversity Metric 2.0 Summary Results for the Reservoir Site, including Offsite Interventions

Off-site interventions are envisaged at two locations. These are a woodland and wood-pasture creation project being developed with HIWWT and enhancement of Southleigh Forest, a woodland owned by Portsmouth Water. While details of interventions may change, Portsmouth Water are committed to deliver such valuable interventions offsite, through either partnership or the Capital Grants Scheme.

The woodland and wood-pasture creation is planned to total 80 ha, but 55 ha of this would contribute to the compensation for loss of ancient woodland. Therefore, an additional 25 ha of habitat creation could contribute to the biodiversity metric calculation. The location of this site is not yet confirmed, so as a precaution it is assumed to be outside the Local Planning Authority area, but in a neighbouring one. The metric calculation is based on an assumption that 25 ha of arable cropland would be replaced by 15 ha of neutral grassland and 10 ha of mixed scrub. It is assumed that these habitats would be in good condition.

Southleigh Forest is approximately 3 km from the Reservoir Site. It contains areas of broadleaf woodland and coniferous plantation on an ancient woodland site. It lies within a core area for Bechstein's bats, so habitat enhancement would be valuable at this location. Habitat areas were not available to inform this metric calculation, so an indicative assumption is being made that 30 ha of coniferous plantation would be converted to broadleaf woodland and the remaining 45 ha is assumed to be lowland mixed deciduous woodland, and the condition of this habitat would be enhanced from poor to moderate. These figures are illustrative only. As a precaution, the condition of the enhanced habitats has been limited to moderate.

Together, the aim would be to develop 25 ha within a site to be secured by HIWWT, and with the 75 ha at Southleigh Forest these interventions would total 100 ha of offsite interventions.

Portsmouth Water is committed to work with partners to deliver such valuable offsite interventions.

Table 3-5 shows the combined results of onsite and indicative offsite interventions, giving the results using both the standard reservoir difficulty multiplier and the revised one (see Section 3.4 above) for the onsite element of the results.

Table 3-5 - Predicted Biodiversity Metric 2.0 Results for the Reservoir Site and Offsite Interventions

On-Site Baseline	Total Site Area (ha)	156.99	Total Baseline Habitat Units	1,311.58
On-Site Post Intervention Including Retention, Creation, Enhancement	Total Site Area (ha)	156.99	Total Post Intervention Habitat Units	1,045.89 (standard metric) or 1,304.52 (revised multiplier for reservoir)
Off-site assumed baseline	Total Site Area (ha)	100	Total Baseline Habitat Units	465.55
Off-site indicative Post intervention	Total Site Area (ha)	100	Total Post Intervention Habitat Units	687.72
			Net change at off-site locations	+ 222.17
			Total Net Unit Change	-43.53 (standard metric) or +215.11 (revised multiplier for reservoir)
			Total Net % Change	-3.32 % (standard metric) or +16.40 % (revised multiplier for reservoir)

This indicative metric calculation suggests that the interventions would result in a situation close to no net loss, based on the Biodiversity Metric 2.0. If the multiplier for the reservoir open water habitat is altered as discussed, the combination of onsite and offsite interventions would be predicted to result in a net gain of more than 15%.

3.6. Commentary on Changes in Habitat Types

To meet good practice guidance, interventions to deliver biodiversity net gain should not just take the headline numbers into account, but also consider the effects on individual habitat types to avoid 'trading down', where loss of a habitat of higher distinctiveness is compensated by creating larger areas of lower distinctiveness habitats. On the Reservoir Site, the largest area of habitat loss is other neutral grassland. Taking the offsite habitat interventions into account, there would still be a substantial loss of grassland.

The interventions envisaged at Southleigh Forest would result in gains relating to lowland mixed deciduous woodland, a habitat of higher distinctiveness (therefore 'trading up') and the woodland and wood-pasture creation project being developed with HIWWT includes grassland creation. However, there would still be a net loss of units relating to grassland that are not balanced by these interventions. It would therefore be beneficial to undertake additional grassland interventions. This net loss of grassland was taken into account in outlining the Capital Grants Scheme, as described

in Chapter 9 Biodiversity in the Havant Thicket Reservoir Project Environmental Statement Volume 2:

"The application of the Capital Grants scheme will be based on a series of criteria to be developed with Natural England and other stakeholders, to ensure that the funding delivers genuine benefits to biodiversity and the local community. These are likely to include criteria scoring that prioritises the following:

- *proximity to the scheme site. In particular, effort should be made to offset habitat losses within the same local planning authority (i.e. Havant Borough Council and East Hampshire District Council) or National Character Area (i.e. South Hampshire Lowlands).*
- *value for money and deliverability.*
- *grassland enhancement and creation projects will be prioritised.*
- *interventions benefiting bats and grassland birds will be prioritised.*
- *contribution to local policies and targets for biodiversity. For example, opportunities to contribute to targets set out in the Hampshire Biodiversity Opportunity Areas may be prioritised. In the context of the site's location, it would be of relevance to explore opportunities within the following BOAs:*
 - *the Forest of Bere Biodiversity Opportunity Area – e.g. restoration of lowland meadow and lowland dry acid grassland;*
 - *Portsdown Hill Biodiversity Opportunity Area – e.g. restoration of lowland calcareous grassland;*
 - *Chichester/Langstone Harbours and Hayling Island Biodiversity Opportunity Area – e.g. the restoration of PMGRP."*

The offsite interventions included in the indicative metric calculation in section 3.5 are hypothetical. However, in both cases, interventions are planned that would create / enhance areas to provide high nature conservation value. Whether or not the metric calculations are used to influence final designs, a range of other biodiversity priorities must also be taken into account. For the woodland and wood-pasture creation project being developed with HIWWT, priorities will be influenced by the location selected. For Southleigh Forest, the Bechstein's bat must be a priority influencing decisions. The application of the Capital Grants Scheme will provide further benefits to biodiversity, whether this forms habitat interventions, such as grassland creation and enhancement, or other measures.

4. Conclusions

The Biodiversity Metric 2.0 (Beta version) has been applied to the proposed Scheme at the Havant Thicket Reservoir Site, based on the design at the time of publication of the 2020 Environmental Statement.

Biodiversity Net Gain cannot be achieved in relation to irreplaceable habitat, such as ancient woodland. Losses of this habitat have been reduced as far as practicable, and bespoke compensation would be provided. The loss of ancient woodland and the bespoke compensation for that loss is excluded from the metric calculations. Areas of purple moor-grass and rush pasture, a priority habitat of very high distinctiveness would also be lost. In accordance with guidance embedded within the Biodiversity Metric 2.0, these losses have also been subject to bespoke compensation and are excluded from the metric calculations.

For the Reservoir Site itself, the Biodiversity Metric 2.0 calculator predicts a net loss of 265.70 units, equivalent to a -20.26% loss.

The results of the calculator are influenced by various fixed and variable factors. One of the fixed factors is a multiplier applied to created and enhanced habitat, which is set based on the difficulty of creation/enhancement of each habitat type. For this project, engineering and environmental expertise will be used to design a reservoir that includes features, such as the wetland area, specifically incorporated to improve its value for nature conservation. It is therefore suggested that the standard difficulty multiplier of 0.67 (the same as used for other habitats such as reedbed) is unnecessarily pessimistic, and a multiplier of 1 (as used for ponds) could be justified. For comparative purposes, a multiplier of 1 instead of 0.67 to the reservoir open water has been tested. With this adjustment, for the Reservoir Site itself, the Biodiversity Metric 2.0 calculator predicts a net loss of 7.06 units, equivalent to a -0.54% loss.

Indicative metric calculations have also been undertaken for interventions envisaged at a woodland and wood-pasture creation project being developed in partnership with Hampshire and Isle of Wight Wildlife Trust (HIWWT) and enhancement of Southleigh Forest, a woodland owned by Portsmouth Water. These are hypothetical, as no details are available at this stage, but they are included for information.

Taking the indicative offsite elements into account, using the Biodiversity Metric 2.0 calculator in its published form predicts a net loss of 43.53 units, equivalent to a -3.32% loss. If the difficulty multiplier for the reservoir habitat is amended from 0.67 to 1 for project-specific reasons, the metric calculations would predict a net gain of 215.11 units, equivalent to a +16.40% gain.

The offsite interventions included in the indicative metric calculation in section 3.5 are hypothetical. However, in both cases, interventions are being developed that would create / enhance areas to provide high nature conservation value. Whether or not the metric calculations are used to influence final designs, a range of other biodiversity priorities must also be taken into account. For the woodland and wood-pasture creation project being developed in partnership with HIWWT, priorities will be influenced by the location selected. For Southleigh Forest, the Bechstein's bat must be a priority influencing decisions.

The application of the Capital Grants Scheme will provide further benefits to biodiversity, whether this forms habitat interventions, such as grassland creation and enhancement, or other measures. Given the net loss of grassland at the Reservoir Site, grassland enhancement and creation have correctly been identified as a funding priority.

Appendices

Appendix A. Habitat Conversions Table

Table A-1 – Broad Habitat Types Conversion to UK Habitat Classification and Summary of Compensation Strategy

Vegetation type as described by ECOSA (with predominant NVC types)	Translation to UK Habitat Classification		Rationale for translation	Nature conservation importance	Biodiversity Metric 2.0 broad habitat	Biodiversity Metric 2.0 habitat type	Biodiversity Metric 2.0 habitat distinctiveness	Compensation strategy
WOODLAND including all areas on ancient woodland sites								
Broadleaved woodland including plantation (W10 Quercus robur-Pteridium aquilinum-Rubus fruticosus woodland)	The Avenue	w1f Lowland mixed deciduous woodland	Canopy dominated by mature pedunculate oak; understorey with hazel, hawthorn, holly and blackthorn; field layer dominated by bracken, bramble, common ivy and honeysuckle.	IRREPLACEABLE HABITAT Ancient semi-natural woodland ¹⁶ Priority Habitat – Lowland mixed deciduous woodland Thicket Bottom SINC Local Ecological Network of Hampshire – Core Non-statutory Site component	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation.
	Middle Clearing	w1g Other woodland; broadleaved	Plantation of pedunculate oak; sparse understorey of hazel and hawthorn; grass-dominated field layer.	IRREPLACEABLE HABITAT Ancient semi-natural woodland ¹⁶ Middle Clearing SINC Local Ecological Network of Hampshire – Core Non-statutory Site component	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation
	Round Wood	w1g Other woodland; broadleaved	Plantation of pedunculate oak; sparse understorey of holly and	IRREPLACEABLE HABITAT	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be

¹⁶ As identified on Natural England's Ancient Woodland Inventory

Vegetation type as described by ECOSA (with predominant NVC types)	Translation to UK Habitat Classification		Rationale for translation	Nature conservation importance	Biodiversity Metric 2.0 broad habitat	Biodiversity Metric 2.0 habitat type	Biodiversity Metric 2.0 habitat distinctiveness	Compensation strategy
			hawthorn; grass-dominated field layer.	Ancient semi-natural woodland ¹⁶ Thicket Bottom Woods and Lake SINC Local Ecological Network of Hampshire – Core Non-statutory Site component				delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation.
	Havant Thicket (ECOSA compartment W9)	w1f Lowland mixed deciduous woodland	Canopy dominated by mature pedunculate oak and silver birch; understorey with hazel; field layer dominated by bracken, bramble and honeysuckle.	IRREPLACEABLE HABITAT Plantation on Ancient Woodland Site ¹⁶ Havant Thicket SINC Local Ecological Network of Hampshire – Core Non-statutory Site component	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation.
	Havant Thicket (ECOSA compartment W12)	w1g Other woodland; broadleaved	Plantation of beech; understorey of holly; sparse field layer of calcifugous vegetation.	IRREPLACEABLE HABITAT Plantation on Ancient Woodland Site ¹⁶ Havant Thicket SINC Local Ecological Network of Hampshire – Core Non-statutory Site component	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation.
Coniferous plantation (field layer conforming to W10 Quercus robur-Pteridium aquilinum-	Corsican pine plantation	w2c Other coniferous woodland	Plantation of Corsican pine with a field layer dominated by bracken and bramble.	IRREPLACEABLE HABITAT Plantation on Ancient Woodland Site ¹⁶)	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat

Vegetation type as described by ECOSA (with predominant NVC types)	Translation to UK Habitat Classification		Rationale for translation	Nature conservation importance	Biodiversity Metric 2.0 broad habitat	Biodiversity Metric 2.0 habitat type	Biodiversity Metric 2.0 habitat distinctiveness	Compensation strategy
Rubus fruticosus woodland)				Havant Thicket SINC Local Ecological Network of Hampshire – Core Non-statutory Site component				Ancient woodland losses to be compensated by bespoke compensation.
	Havant Thicket (ECOSA compartment W10)	w2c Other coniferous woodland	Plantation of spruce sp. with a field layer of bracken, bramble and honeysuckle.	IRREPLACEABLE HABITAT Plantation on Ancient Woodland Site ¹⁶ Havant Thicket SINC Local Ecological Network of Hampshire – Core Non-statutory Site component	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation.
Former heathland developing into scrub and secondary woodland (W4 Betula pubescens-Molinia caerulea woodland))	Havant Thicket (ECOSA compartment H3)	w1d Wet woodland	Regenerating thicket dominated by downy birch with grey willow; purple moor-grass present in field layer.	IRREPLACEABLE HABITAT Plantation on Ancient Woodland Site ¹⁶ PRIORITY HABITAT – Wet woodland Havant Thicket SINC Local Ecological Network of Hampshire – Core Non-statutory Site component	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat Ancient woodland losses to be compensated by bespoke compensation.
	Havant Thicket (ECOSA compartment H5)	w1d Wet woodland	Regenerating thicket dominated by downy birch with grey willow	IRREPLACEABLE HABITAT Plantation on Ancient Woodland Site ¹⁶	Not applicable	Not applicable	Not applicable	Bespoke Compensation Excluded from BNG metric calculations as BNG cannot be delivered in relation to loss of irreplaceable habitat

Vegetation type as described by ECOSA (with predominant NVC types)	Translation to UK Habitat Classification	Rationale for translation	Nature conservation importance	Biodiversity Metric 2.0 broad habitat	Biodiversity Metric 2.0 habitat type	Biodiversity Metric 2.0 habitat distinctiveness	Compensation strategy
			PRIORITY HABITAT – Wet woodland Havant Thicket SINC Local Ecological Network of Hampshire – Core Non-statutory Site component				Ancient woodland losses to be compensated by bespoke compensation.
GRASSLANDS							
Species-rich marsh and rush pasture (M23 Juncus effusus/acutiflorus-Galium palustre rush-pasture)	f2b Purple moor-grass and rush pastures	Species-rich sward with sharp-flowered rush, soft-rush, compact rush and velvet bent. Other purple moor-grass and rush pasture indicator species include greater bird's-foot-trefoil, lesser spearwort, common marsh-bedstraw and water mint. Habitat not considered irreplaceable; it comprises a rush-pasture vegetation community that has developed in small areas along the margins of the streams and in hollows with impeded drainage. The extents do not comprise contiguous rush-pasture that could be considered to reflect historical management practices of an ancient pastoral landscape.	PRIORITY HABITAT – Purple moor-grass and rush pastures Local Ecological Network of Hampshire – Core Non-statutory Site component	Wetland	Purple moor-grass and rush pastures	Very high	Bespoke Compensation Excluded from metric calculations in accordance with Natural England guidance as a Priority Habitat of very high distinctiveness
Damp to wet grassland and developing rush pasture (MG10 Holcus lanatus-Juncus effusus rush-pasture & MG9 Holcus lanatus-Deschampsia cespitosa grassland)	g3c Other neutral grassland (a mosaic of g3c8 Holcus-Juncus neutral grassland and g3c7 Deschampsia neutral grassland)	Sward dominated by Yorkshire-fog with abundant rough meadow-grass and creeping buttercup, frequent soft-rush and compact rush. Semi-improved wildflower indicator species include cuckooflower and red clover. Coarser swards of Yorkshire-fog and tufted hair-grass locally dominant.	Non-Priority Habitat Local Ecological Network of Hampshire – Network Opportunity Area component (neutral grassland)	Grassland	Other neutral grassland	Medium	Same broad habitat or a higher distinctiveness habitat (like-for-like or better) required. Some grassland to be created on-site. Grassland will be one of the targets for creation / enhancement in off-site interventions that would contribute to metric calculations.

Vegetation type as described by ECOSA (with predominant NVC types)	Translation to UK Habitat Classification	Rationale for translation	Nature conservation importance	Biodiversity Metric 2.0 broad habitat	Biodiversity Metric 2.0 habitat type	Biodiversity Metric 2.0 habitat distinctiveness	Compensation strategy
		Transition to less mesotrophic rush-pasture (M23) swards indicated by presence of marsh thistle, velvet bent, greater bird's-foot-trefoil and lesser spearwort. These transitional swards are relatively species-poor with the indicator species not sufficiently frequent to conform to purple moor-grass and rush pastures Priority Habitat.					
Dry neutral to acid grassland (MG6 Lolium perenne-Cynosurus cristatus grassland & MG1 Arrhenatherum elatius grassland)	g3c Other neutral grassland (a mosaic of g3c5 Arrhenatherum neutral grassland and g3c6 Lolium-Cynosurus neutral grassland)	Majority of sward dominated by common bent with crested dog's-tail, red fescue and sweet vernal-grass. Semi-improved wildflower indicator species include red clover, common sorrel, ribwort plantain, common cat's-ear and meadow buttercup. Lowland meadow indicator species, including common knapweed and common bird's-foot-trefoil, locally frequent but not constant throughout sward. Ranker swards dominated by false oat-grass and cock's-foot.	Non-Priority Habitat Local Ecological Network of Hampshire – Network Opportunity Area component (neutral grassland)	Grassland	Other neutral grassland	Medium	Same broad habitat or a higher distinctiveness habitat required (like-for-like or better). Some grassland to be created on-site. Grassland will be one of the targets for creation / enhancement in off-site interventions that would contribute to metric calculations.
Species-poor rush pasture and wetland vegetation (MG10 Holcus lanatus-Juncus effusus rush-pasture)	g3c Other neutral grassland (g3c8 Holcus-Juncus neutral grassland)	Sward dominated by Yorkshire-fog with frequent soft-rush and compact rush.	Non-Priority Habitat Local Ecological Network of Hampshire – Network Opportunity Area component (neutral grassland)	Grassland	Other neutral grassland	Medium	Same broad habitat or a higher distinctiveness habitat (like-for-like or better) required. Some grassland to be created on-site. Grassland will be one of the targets for creation / enhancement in off-site interventions that would contribute to metric calculations.

Vegetation type as described by ECOSA (with predominant NVC types)	Translation to UK Habitat Classification	Rationale for translation	Nature conservation importance	Biodiversity Metric 2.0 broad habitat	Biodiversity Metric 2.0 habitat type	Biodiversity Metric 2.0 habitat distinctiveness	Compensation strategy
OTHER HABITATS							
Willow scrub	h3h Mixed scrub	Predominantly grey willow along watercourses and field boundaries ¹⁷	Non-Priority Habitat Local Ecological Network of Hampshire – Hedgerow component	Heathland and shrub	Mixed scrub	Medium	Same broad habitat or a higher distinctiveness habitat (like-for-like or better) required. Some scrub to be created on-site. Scrub & Woodland will be among the targets for creation / enhancement in off-site interventions that would contribute to metric calculations.
Other scrub	h3d Bramble scrub	Linear scrub forming boundary features ¹⁷	Non-Priority Habitat Local Ecological Network of Hampshire – Hedgerow component	Heathland and shrub	Bramble scrub	Medium	Same broad habitat or a higher distinctiveness habitat (like-for-like or better) required. Some scrub to be created on-site. Scrub & Woodland will be among the targets for creation / enhancement in off-site interventions that would contribute to metric calculations.
Pond (Upper Lake)	r1a Eutrophic standing waters	Pond "this feature was considered to be of limited ecological value and is not considered to conform to the 'ponds' Priority Habitat"	Non-Priority Habitat Local Ecological Network of Hampshire – Core Non-statutory Site component	Lakes	Ponds (Non-Priority Habitat)	High	Same habitat required. Wetland Area and pond enhancement areas on site will offset loss, contributing to metric calculations.
Made-up tracks with grass verges	u1e Built linear features	Forestry gravel track	N/A	Urban	Built linear features	Very low	Compensation not required.

¹⁷ BNG reporting and delivery could either be reported in hedgerow units or habitat units as these are tree lines. However, this would result in elements of double counting with the watercourses (for which separate compensation is being provided). For initial calculations these have therefore been reported as areas of scrub in the area calculations.

Appendix B. Biodiversity Metric 2.0 Calculations for the Reservoir Site

Havant Thicket Reservoir - onsite calculations

Headline Results

Return to results menu

On-site baseline	Habitat units	1311.58
	Hedgerow units	0.00
	River units	0.00
On-site post-intervention (Including habitat retention, creation, enhancement & succession)	Habitat units	1045.89
	Hedgerow units	0.00
	River units	0.00
Off-site baseline	Habitat units	0.00
	Hedgerow units	0.00
	River units	0.00
Off-site post-intervention (Including habitat retention, creation, enhancement & succession)	Habitat units	0.00
	Hedgerow units	0.00
	River units	0.00
Total net unit change (including all on-site & off-site habitat retention/creation)	Habitat units	-265.70
	Hedgerow units	0.00
	River units	0.00
Total net % change (including all on-site & off-site habitat creation + retained)	Habitat units	-20.26%
	Hedgerow units	0.00%
	River units	0.00%

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Recent Thicket Reservoir - profile calculations

A-3 Site Habitat Enhancement

General / View Columns

General / View Rows

Main Menu

Instructions

Post development/ post intervention habitats															
	Describe habitats	Change in distinctiveness and condition				Area (hectares)	Distinctiveness	Condition	Ecological context/ Ecological connectivity score	Strategic significance	Temporal multiplier for target condition/age	Difficulty multiplier of enhancement	Habitat units delivered	Comments	
Rank or ref	Baseline habitat	Proposed habitat (Pre-populated but can be overridden)	Distinctiveness change	Condition change	Assessor comments									Reviewer comments	
5	Grassland - Other neutral grassland	Wetland - Purple moor grass and rush pastures	Medium - Very high	Lower Distinctiveness Habitat - Good	129	Very High	Good	Medium	Within area formally identified in local strategy	25	High	17.25			
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
					Total site area	129							Enhancement total	17.25	

Appendix C. Biodiversity Metric 2.0 calculations for the Reservoir Site and Indicative Offsite Interventions

On-site baseline	Habitat units	1311.58
	Hedgerow units	0.00
	River units	0.00
On-site post-intervention (Including habitat retention, creation, enhancement & succession)	Habitat units	1045.89
	Hedgerow units	0.00
	River units	0.00
Off-site baseline	Habitat units	465.55
	Hedgerow units	0.00
	River units	0.00
Off-site post-intervention (Including habitat retention, creation, enhancement & succession)	Habitat units	687.72
	Hedgerow units	0.00
	River units	0.00
Total net unit change (including all on-site & off-site habitat retention/creation)	Habitat units	-43.53
	Hedgerow units	0.00
	River units	0.00
Total net % change (Including all on-site & off-site habitat creation + retained habitats)	Habitat units	-3.32%
	Hedgerow units	0.00%
	River units	0.00%

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Recent Thicket Reservoir - profile calculations

A-3 Site Habitat Enhancement

Control / Base Values

Current / Value from

Main Menu

Instructions

Post development/ post intervention habitats															
Baseline ref	Baseline habitats	Change in distinctiveness and condition			Area (hectares)	Distinctiveness score	Condition	Ecological context/ Ecological connectivity score	Strategic significance	Temporal multiplier for target condition/ score	Difficulty multiplier of enhancement	Habitat units delivered	Comments		
	Baseline habitat	Proposed habitat (Pre-populated but can be overridden)	Distinctiveness change	Condition change					Strategic significance	Temporal multiplier for target condition/ score	Difficulty multiplier of enhancement		Assessor comments	Reviewer comments	
1	Grassland - Other neutral grassland	Vetland - Purple moor grass and rush pastures	Medium - Very high	Lower Distinctiveness Habitat - Good	129	Very high	Good	Medium	Within area formally identified in local strategy	20	High	17.28			
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
							Good		Within area formally identified in local strategy						
					Total site area	129							Enhancement total	17.28	

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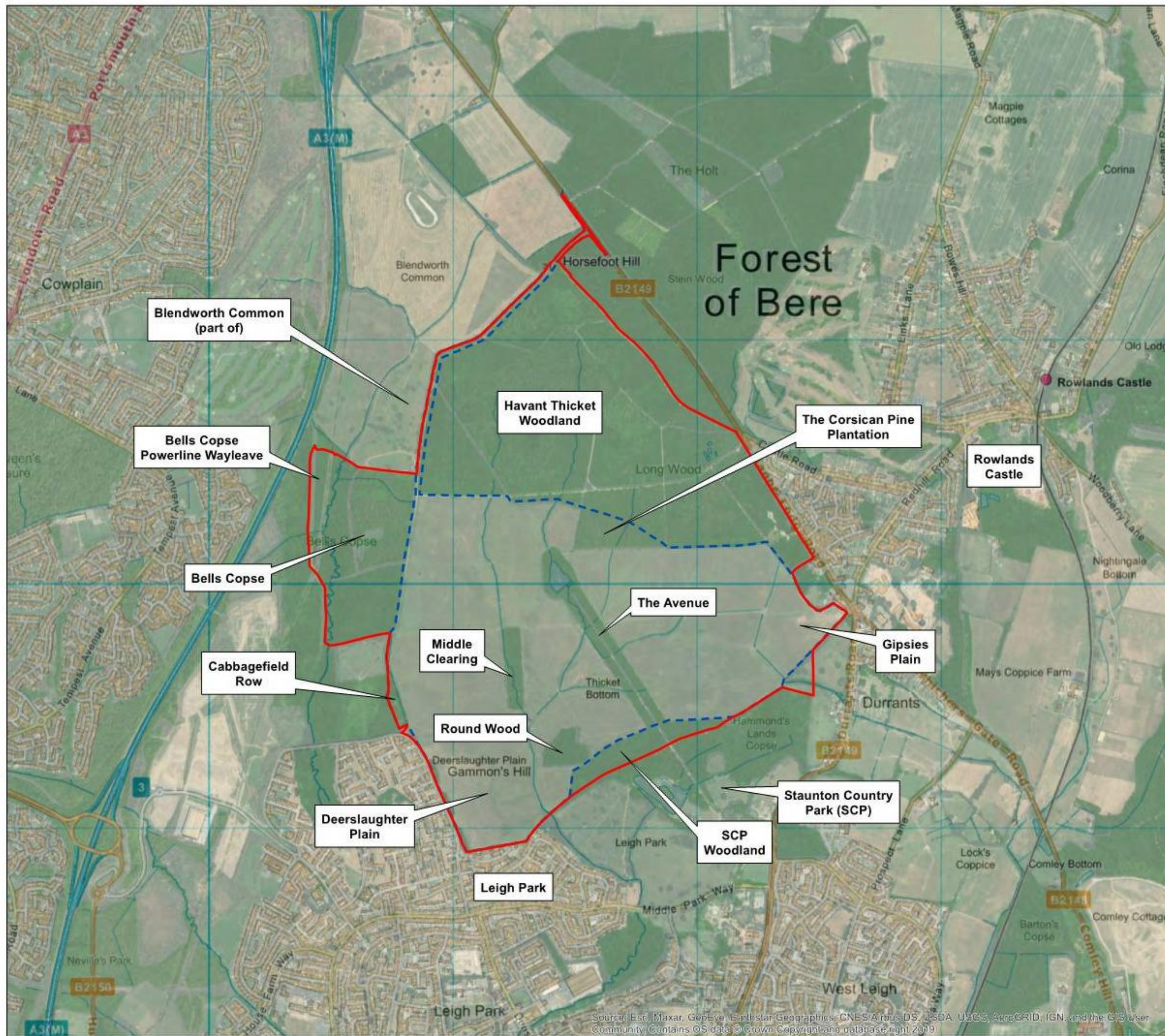
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The Hub
500 Park Avenue
Aztec West
Bristol
BS32 4RZ

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Map 1 Site Location Plan



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 1 - Site Location Plan

Client:	Portsmouth Water
Date:	July 2020
Status:	Draft

KEY

-  Site Boundary (wider site)
-  Reservoir Site (the site)

Scale at A3: 1:15,000

0 0.25 0.5
Km

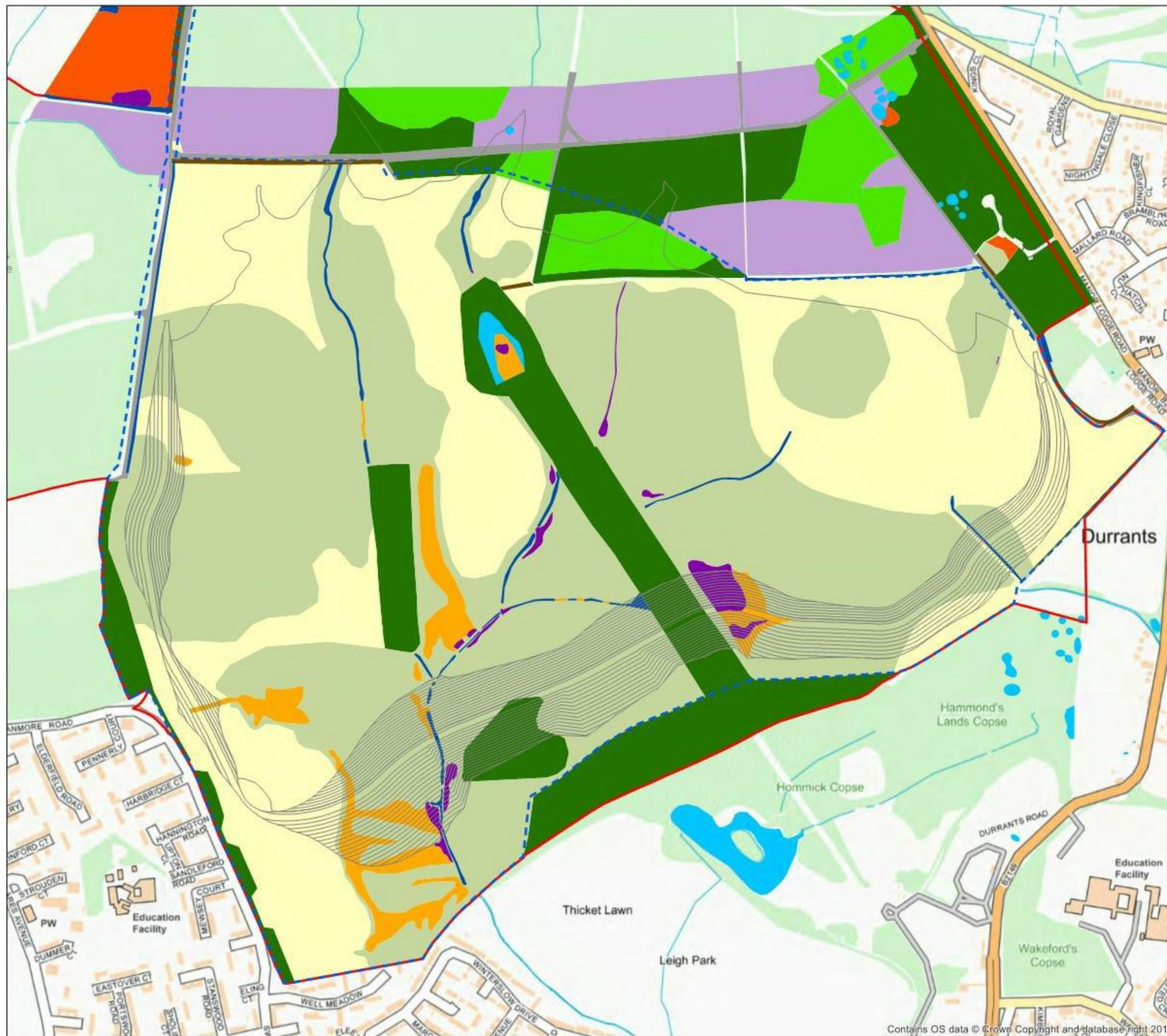


ECOSA
Ecological Survey & Assessment
A Trinity Consultants Company

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

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Map 2 On Site Habitat Baseline



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 2 - On Site Habitat Baseline

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Reservoir Top Water Level and Embankment
- Broadleaved Woodland including Plantation
- Coniferous Plantation
- Former Heathland developing into scrub and Secondary Woodland
- Dry Neutral to Acid Grassland
- Dry Acid Grassland and Bracken
- Damp to Wet Grassland and Developing Rush Pasture
- Species Rich Marsh and Rush Pasture
- Species Poor Rush Pasture and Wetland Vegetation
- Made-up Tracks with Grass Verges
- Willow Scrub
- Other Scrub
- Pond

Scale at A3: 1:6,500

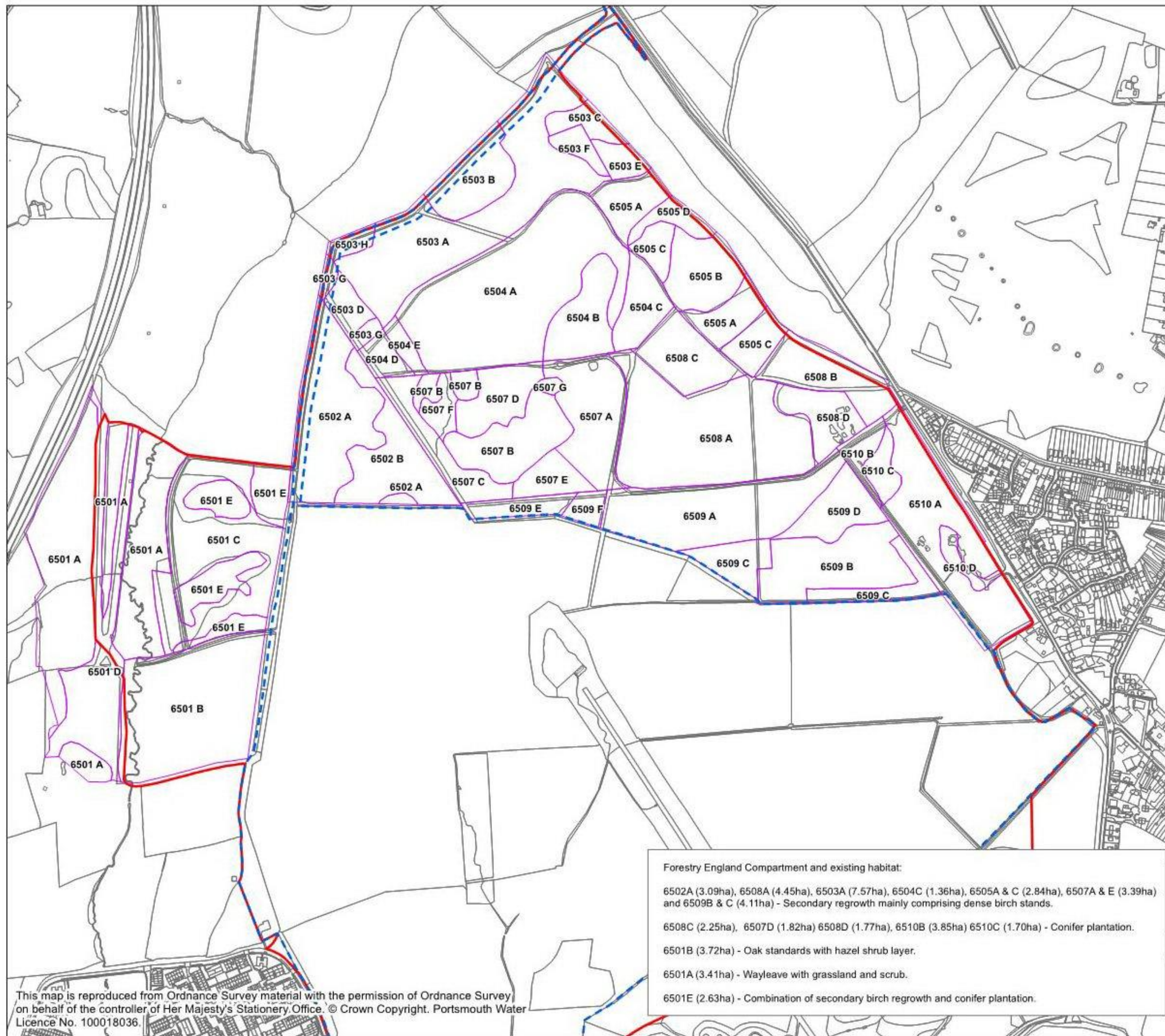
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ECOSA
Ecological Survey & Assessment
A Trinity Consultants Company

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

Map 3 Havant Thicket Woodland: Habitat Baseline



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 3 - Havant Thicket Woodland: Habitat Baseline

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Forestry Commission Compartments (as labelled on map)

Scale at A3: 1:8,000

0 100 200
Metres



Forestry England Compartment and existing habitat:

6502A (3.09ha), 6508A (4.45ha), 6503A (7.57ha), 6504C (1.36ha), 6505A & C (2.84ha), 6507A & E (3.39ha) and 6509B & C (4.11ha) - Secondary regrowth mainly comprising dense birch stands.

6508C (2.25ha), 6507D (1.82ha) 6508D (1.77ha), 6510B (3.85ha) 6510C (1.70ha) - Conifer plantation.

6501B (3.72ha) - Oak standards with hazel shrub layer.

6501A (3.41ha) - Wayleave with grassland and scrub.

6501E (2.63ha) - Combination of secondary birch regrowth and conifer plantation.

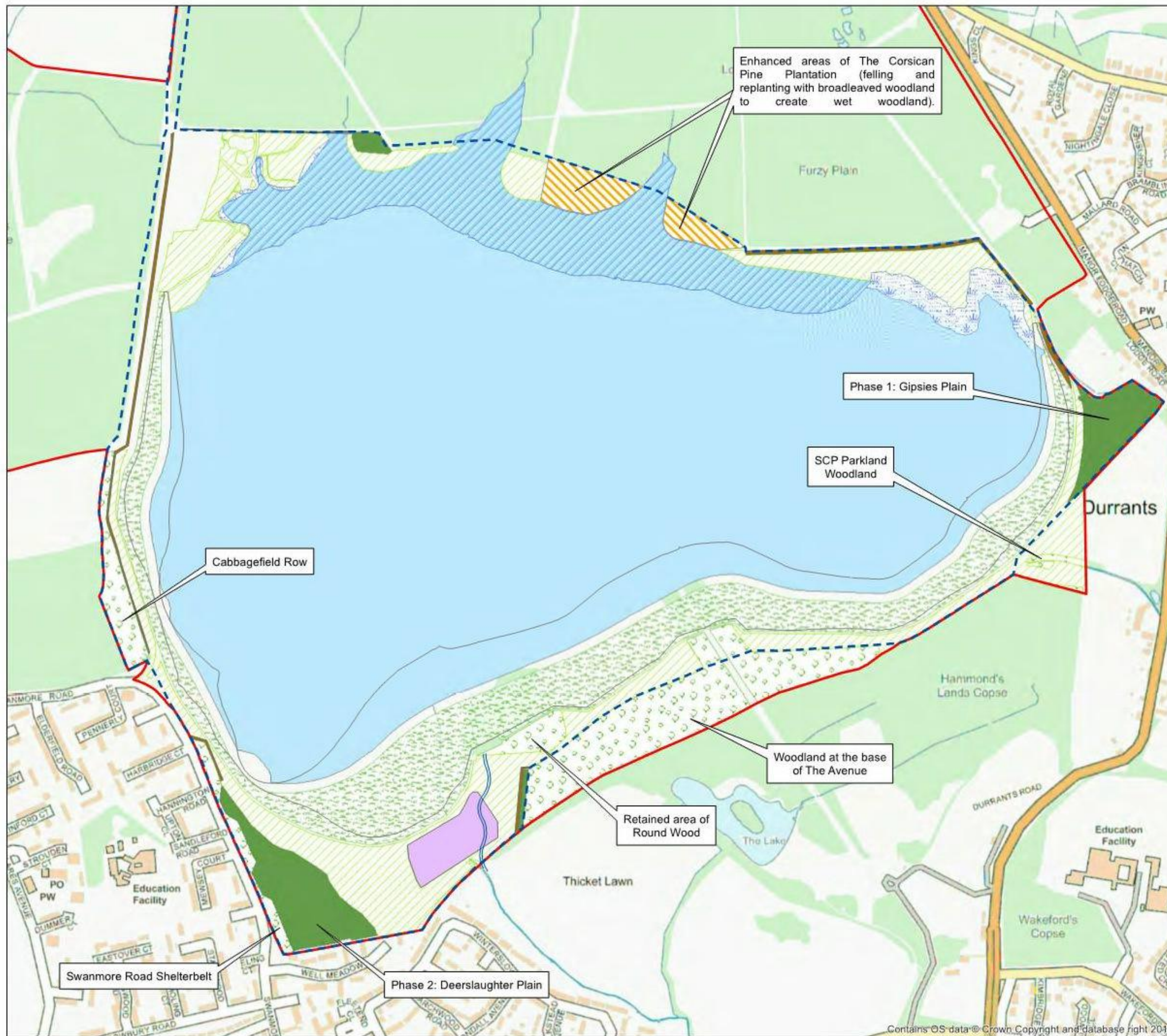
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A Trinity Consultants Company

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

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Map 4 On Site Retained, Enhanced and Created Habitat



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 4 - On Site Retained, Enhanced and Created Habitat

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Reservoir Top Water Level
- Outer Reservoir Embankment
- Retained and Enhanced Grassland
- Retained Woodland
- Retained Species Poor Rush Pasture to be Enhanced to Priority Habitat: Purple Moor Grass Rush Pasture
- Conifer Clearfell Area
- Created Grassland
- Created Woodland/Woodpasture
- Created Shoreline Ephemeral Shallows
- Created Scrub/Bolstered Edge Habitat
- Wetland Area with Retained Wet Woodland Fringes
- Created Stream

Scale at A3: 1:6,500

0 50 100 200 Metres



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Flexford Road, North Baddesley, Hampshire SO52 9DF
Telephone: 02380 261065 Email: info@ecosa.co.uk
Web: www.ecosa.co.uk

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Map 5 Southleigh Forest



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

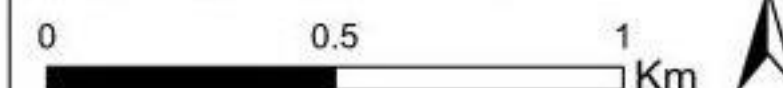
Map 5 - Southleigh Forest

Client:	Portsmouth Water
Date:	August 2020
Status:	Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Southleigh Forest

Scale at A3: 1:17,500



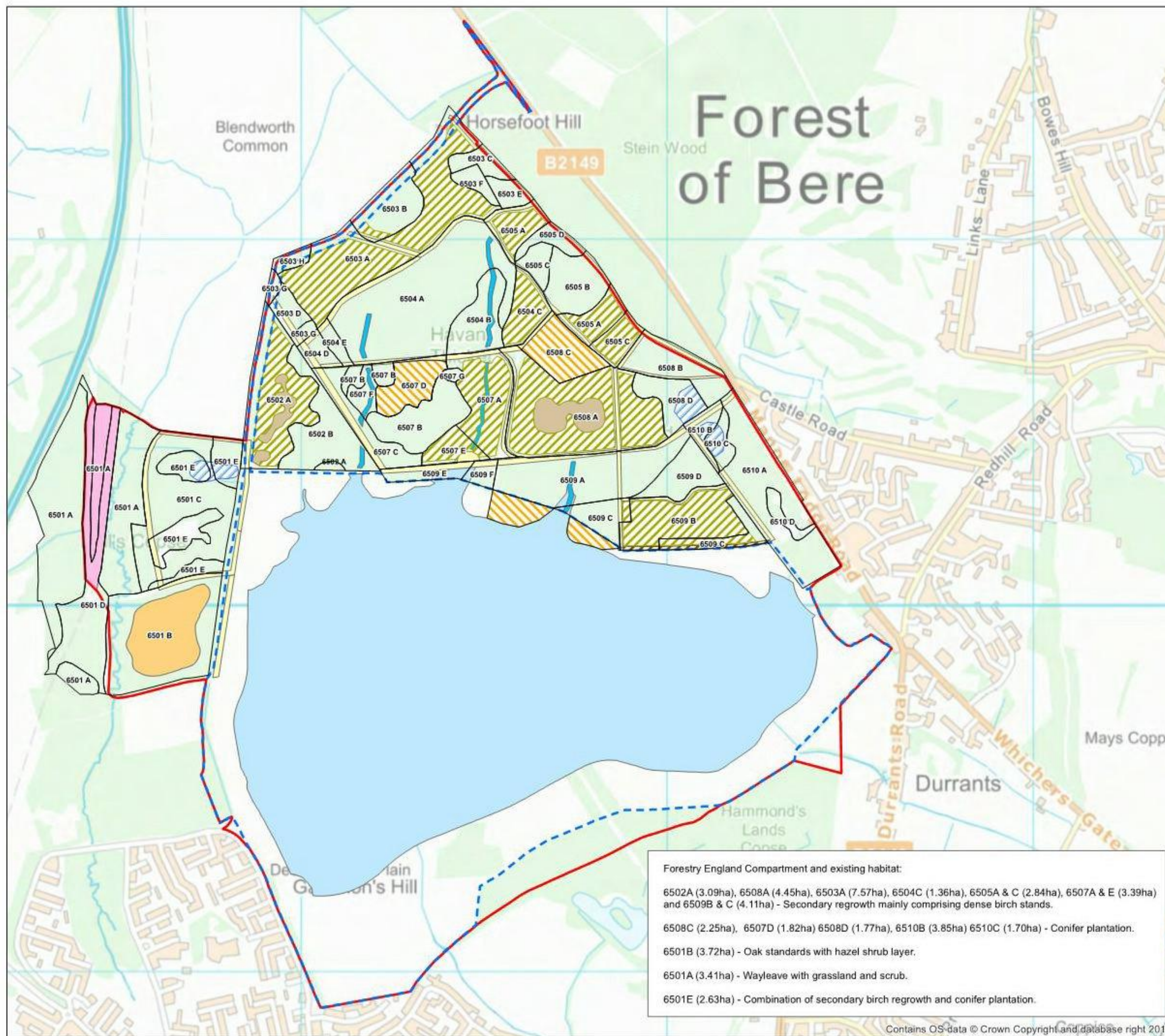
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Map 6 Havant Thicket Woodland: Habitat Enhancement Plan



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 6 - Havant Thicket Woodland: Habitat Enhancement Plan

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Reservoir Top Water Level
- Forestry Commission Compartments (as labelled on map)
- Birch Dominated Compensation Areas (28.7ha)
- Conifer Clearfell Areas (any existing broadleaved trees retained and area re-planted with deciduous trees) (5.75ha)
- Path Removed (new graded scrub edge created) (0.37ha)
- Ecological Corridor Enhancement Area (9.62ha)
- Forest Meadow Creation (indicative areas) (2.22ha)
- Grassland/Scrub Mosaic Management Area (3.41ha)
- Pond Enhancement Areas (1.57ha)
- Stream Corridor Enhancement Area (1.12ha)
- Bell's Copse Woodland Management Area (3.87ha)

Scale at A3: 1:10,000

0 100 200 400 Metres



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Forestry England Compartment and existing habitat:

6502A (3.09ha), 6508A (4.45ha), 6503A (7.57ha), 6504C (1.36ha), 6505A & C (2.84ha), 6507A & E (3.39ha) and 6509B & C (4.11ha) - Secondary regrowth mainly comprising dense birch stands.

6508C (2.25ha), 6507D (1.82ha), 6508D (1.77ha), 6510B (3.85ha), 6510C (1.70ha) - Conifer plantation.

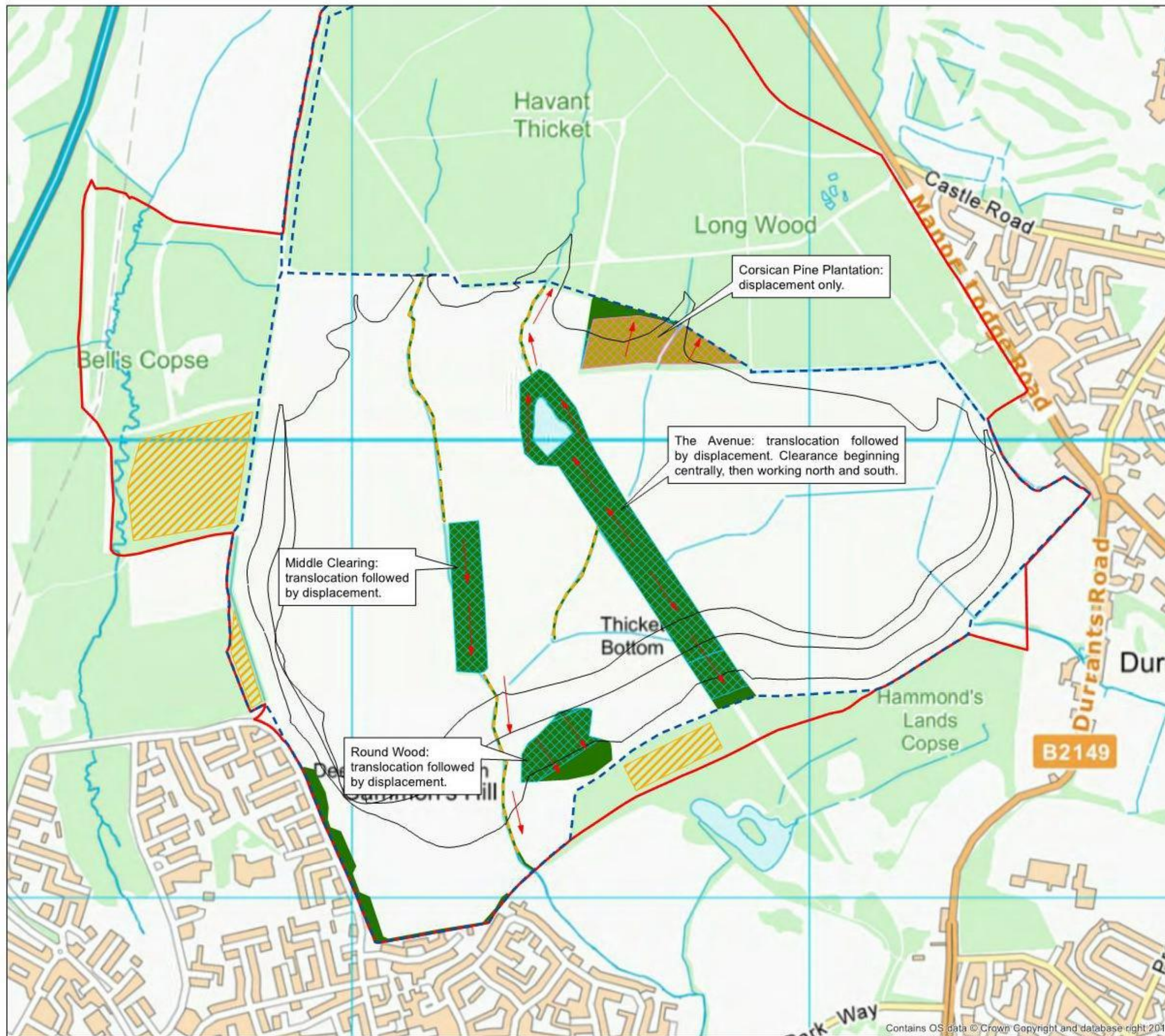
6501B (3.72ha) - Oak standards with hazel shrub layer.

6501A (3.41ha) - Wayleave with grassland and scrub.

6501E (2.63ha) - Combination of secondary birch regrowth and conifer plantation.

Map 7 Habitat Compensation for Bats

Map 8 Hazel Dormouse Translocation and Displacement Plan



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 8 - Hazel Dormouse Translocation and Displacement Plan

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Reservoir Top Water Level and Embankment
- Suitable Hazel Dormouse Habitat**
 - Broadleaved Woodland (including plantation)
 - Coniferous Woodland
 - Treelines
- Capture and Exclusion**
 - Semi-natural Broadleaved Woodland, Single Stage Clearance or Two Stage, Clearance depending on time of year
 - Coniferous Woodland, Single Stage Clearance or Two Stage, Clearance depending on time of year
 - Treelines, Single Stage Clearance or Two Stage, Clearance depending on time of year
 - Hazel Dormouse Displacement
 - Soft Release Pens for translocated hazel dormouse within areas marked

N.B. All impacts will destroy dormouse habitat. Where dormouse habitat is to be destroyed, dormouse will be captured and excluded as per the marked areas on the plan, and removed to nearest and/or adjacent areas of suitable habitat.

Scale at A3: 1:8,000

0 200 400 Metres

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Map 9 Habitat Mitigation and Compensation for Hazel Dormouse

HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 9 - Habitat Mitigation and Compensation for Hazel Dormouse

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Site Boundary (wider site)
- Reservoir Site (the site)
- Reservoir Top Water Level
- Embankment
- Retained Woodland
- Created Scrub/Bolstered Edge Habitat
- Birch Dominated Compensation Areas
- Conifer Clearfell Areas (any existing broadleaved trees retained and area re-planted with deciduous trees)
- Path Removed (new graded scrub edge created)
- Ecological Corridor Enhancement Area
- Forest Meadow Creation (indicative areas)
- Grassland/Scrub Mosaic Management Area
- Pond Enhancement Areas
- Stream Corridor Enhancement Area
- Bell's Copse Woodland Management Area
- Created Woodland/Woodpasture

Scale at A3: 1:10,000

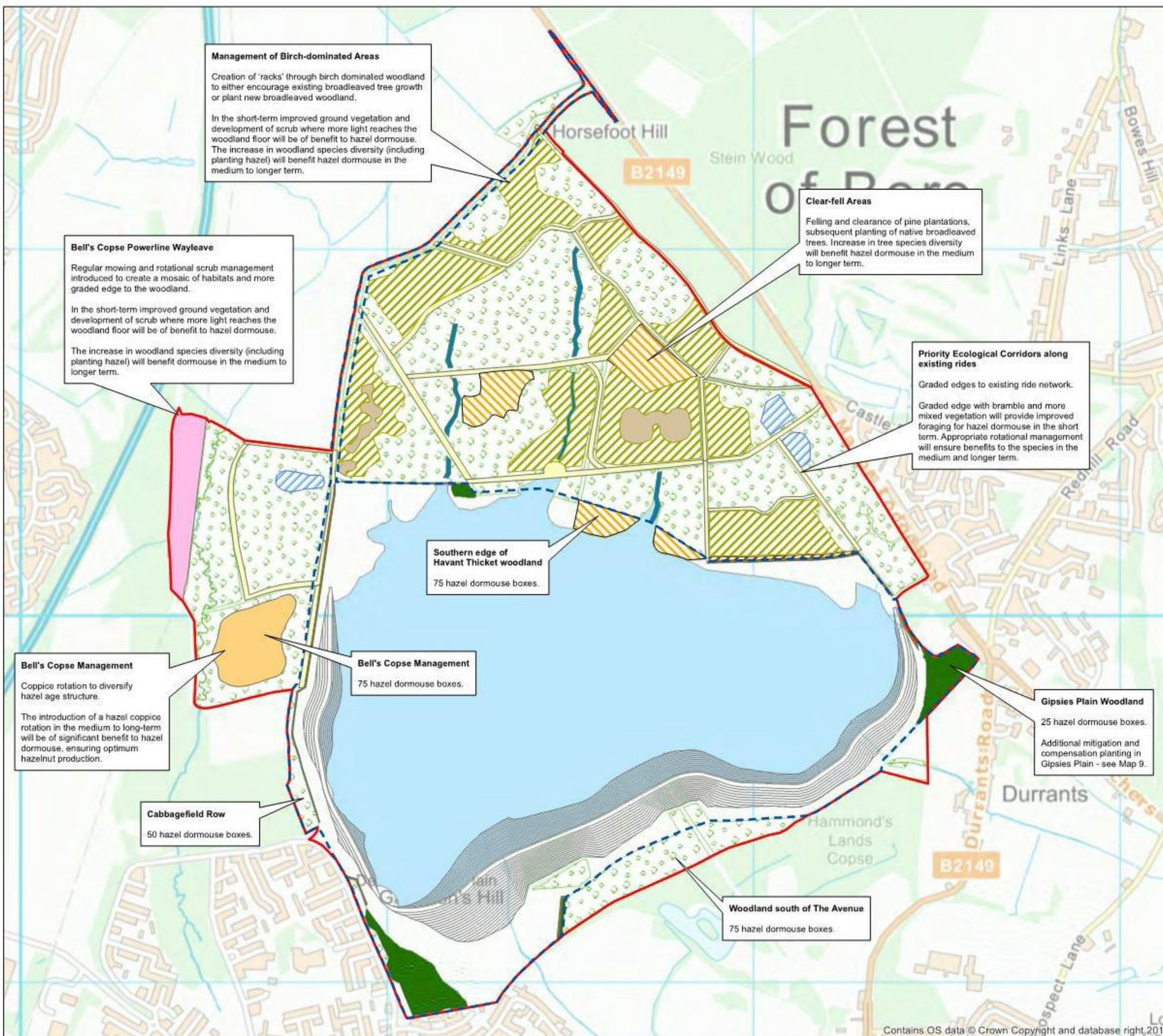
0 100 200 400 Metres



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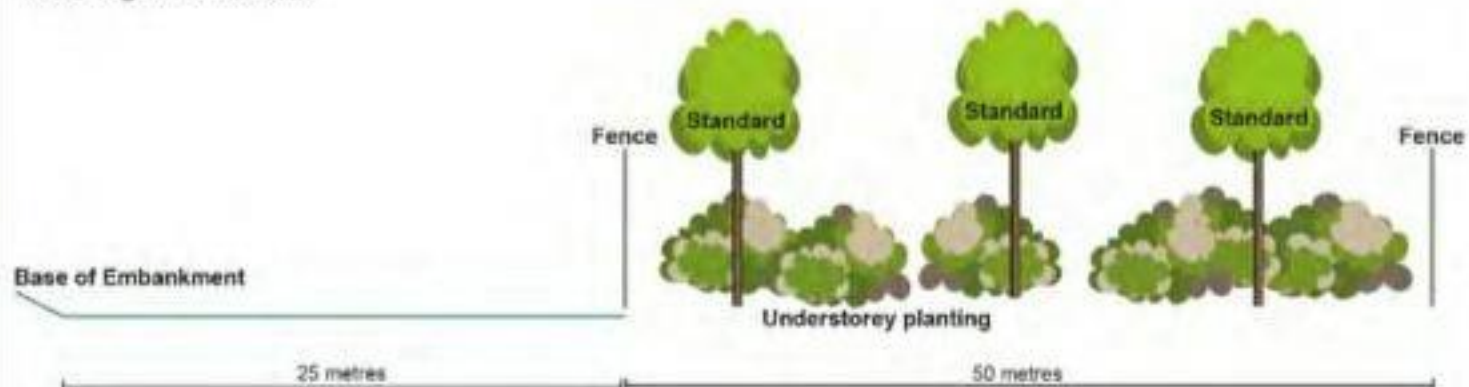
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Map 10 Phase 1 Planting Area

Cross Section A

Inset Diagram not to scale



SPECIES COMPOSITION

Wood Pasture (Parkland)

Total 12 Standards at 3 metres in height, planted as three clumps of four trees:

Pedunculate Oak (8)
Common Lime (2)
Sweet Chestnut (2)

Note: Species mix reflects existing Regency period parkland planting.

Woodland Canopy

Total 30 Standards at 3 metres in height:

Pedunculate Oak (9)
Hornbeam (3)
Sweet Chestnut (6)
Common Lime (4)
Field Maple (5)
Downy / Silver Birch (3)

Woodland Understorey Planting

Trees to be spaced in accordance with guidance provided by the Forestry Commission:

Pedunculate Oak (3%)
Field Maple (20%)
Hazel (33%)
Hawthorn (7%)
Guelder Rose (6%)
Holly (5%)
Wild Privet (2%)
Dog Rose (3%)
Downy Birch (8%)
Alder (2% in wet areas)
Grey / Goat Willow (3% in wet areas)
Wild Cherry (4% on edges)
Rowan (3% on edges)
Honeysuckle (Planted throughout x50 specimens)

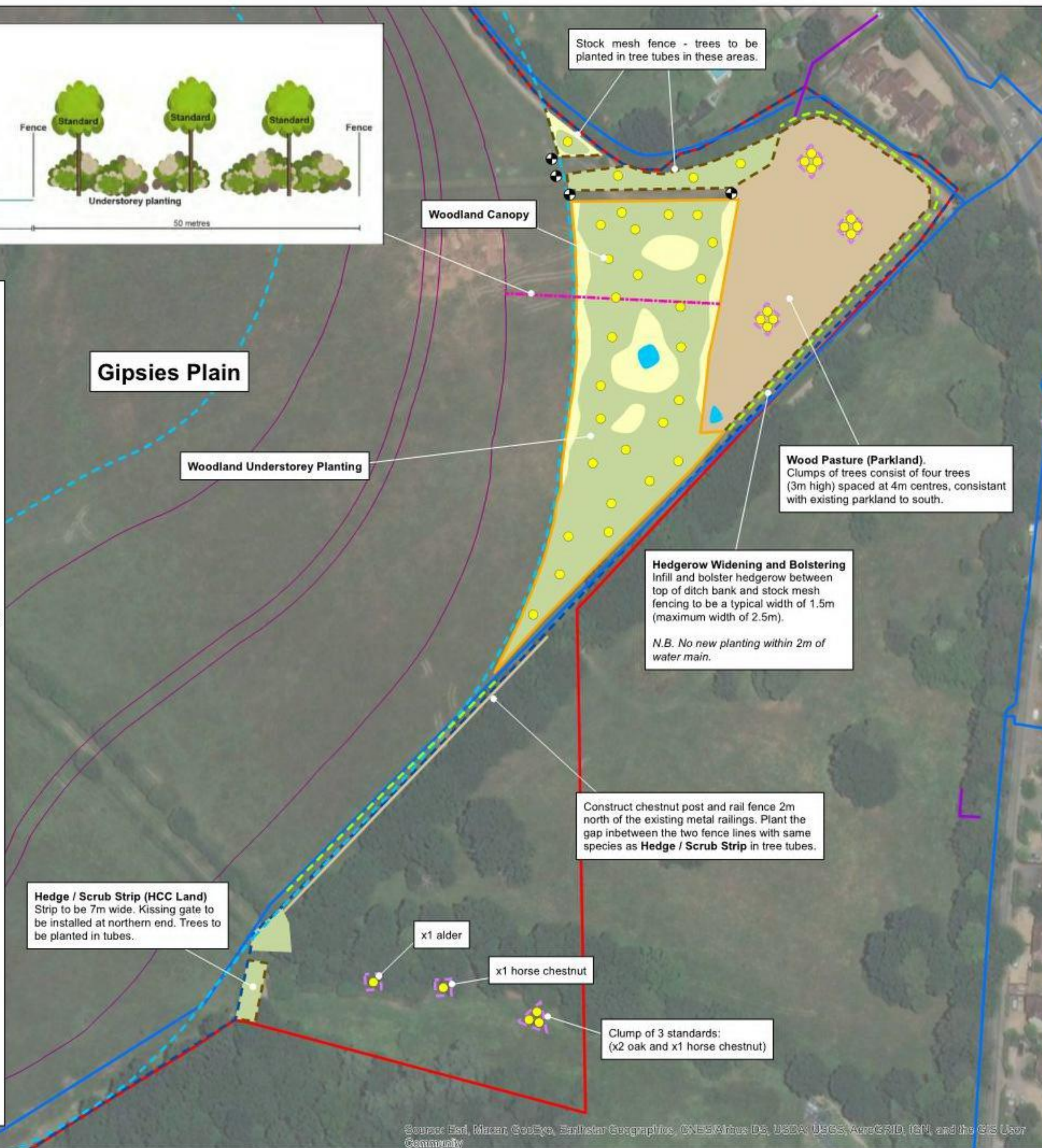
Hedgerow Bolstering

Field Maple (5%)
Hazel (30%)
Hawthorn (40%)
Guelder Rose (3%)
Holly (5%)
Wild Privet (2%)
Dog Rose (3%)
Downy Birch (2%)
Alder (2% in wet areas)
Grey / Goat Willow (2% in wet areas)
Wild Cherry (2%)
Crab Apple (2%)
Rowan (2%)

Hedge / Scrub Strip (HCC Land)

7m wide. To be planted with mix of:

Hawthorn
Hazel
Crab Apple
Wild Cherry
Blackthorn
Alder (in wetter area)



HAVANT THICKET WINTER STORAGE RESERVOIR

ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 10 - Phase 1 Planting Area

Client: Portsmouth Water

Date: July 2020

Status: Draft

KEY

- Reservoir Site (the site)
- Water Main
- Private Water Main
- Reservoir Embankment
- Embankment Buffer: 25 metres
- Cross Section A (see inset)
- Wood Pasture
- Understorey Planting
- Area of Natural Regeneration (to form a more natural, graded edge / mosaic)
- Pond (ephemeral)
- Hedgerow Bolstering
- Stock Mesh Fencing (trees to be planted in tree tubes)
- Chestnut Post and Rail Fence
- Deer Fencing
- Protection Fencing (to be consistent with HCC lottery funded planting)
- Location of Standard (3 metres in height)
- Gate (to allow passage of livestock)

Scale at A3: 1:1,500

0 510 20 30 40
Metres

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