

Havant Thicket Reservoir Project

Environmental Statement Volume 2 - Main Report Chapter 9 Biodiversity

Portsmouth Water Ltd.

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Notice

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9. Biodiversity

9.1. This Biodiversity Chapter 9 of the ES Volume 2 presents the results of the Ecological Impact Assessment for the Scheme and considers both terrestrial and aquatic ecological receptors which include designated and non-designated sites for nature conservation, terrestrial and freshwater habitats and plant and animal species. Further detailed information is provided in the Appendices which can be found in the ES Volume 4. The Appendices are listed below:

- Appendix A9.1: Desk study.
- Appendix A9.2: Vegetation survey report.
- Appendix A9.3: Aquatic ecology.
- Appendix A9.4: Bat survey report.
- Appendix A9.5: Hazel dormouse survey report.
- Appendix A9.6: Otter survey report.
- Appendix A9.7: Water vole survey report.
- Appendix A9.8: Badger survey report (Confidential Appendix).
- Appendix A9.9: Bird survey report.
- Appendix A9.10: Reptile survey report.
- Appendix A9.11: Great crested newt survey report.
- Appendix A9.12: Invertebrates survey report.
- Appendix A9.13: Pipeline Preliminary Ecological Appraisal.
- Appendix A9.14: Arboricultural Impact Assessment.
- Appendix A9.15: Information to inform Habitats Regulations Assessment.

Competent expert evidence

9.2. This Biodiversity Chapter 9 of the ES Volume 2 has been prepared by the following individuals who have used their knowledge and professional judgement to undertake this assessment:

- a Chartered Ecologist and Full Member of the Chartered Institute for Ecology and Environmental Management (CIEEM), with 17 years' experience in ecology consultancy.
- an Ecologist who is a graduate member of CIEEM and the Chartered Institute of Water and Environmental Management (CIWEM) with 5 years' experience in ecology consultancy has written the aquatic habitats and species assessment sections. They are also an Environment Agency accredited River Habitat Surveyor (surveyor number FA056).
- the Atkins' Arboricultural Team Leader who has 15 years experience in arboriculture has written the Arboricultural Impact Assessment. They are a Professional Member of the Arboricultural Association (since 2008), have the Level 6 certificate (ABC) in Arboriculture and are a Lantra accredited Professional Tree Inspector. They manage a team of full time and sub-consultant Arboriculturists to deliver surveys in accordance with BS5837:2012 (Trees in relation to design, demolition and construction), and tree risk management surveys of large tree populations.

Legislative and policy framework

9.3. This Biodiversity Chapter 9 of the ES Volume 2 provides an assessment of the effects of the Scheme on biodiversity resources to support the planning application by Portsmouth Water for the Scheme in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the "EIA Regulations 2017"). See Chapter 5 EIA Process, Approach and Methodology in ES Volume 2 for further details. A summary of relevant legislation relating to designated sites for nature conservation, protected species and Invasive Non-Native Plant Species (INNPS) is provided in Appendix A9.1 Desk study in ES Volume 4. In order to understand the potential implications of the Scheme on European sites designated under the Conservation of Habitats and Species Regulations 2017 (as amended), such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and on Wetlands of International Importance (Ramsar sites) an Information to Inform a Habitats Regulations Assessment (HRA) Screening and Stage 2

Appropriate Assessment has been undertaken. This concluded that there would be no adverse effects on European site integrity (see Appendix A9.15 Information to inform Habitats Regulation Assessment in ES Volume 4).

- 9.4. The following legislation and policies have been consulted in preparing this chapter, with relevant portions summarised in Table 9-1 below.

Table 9-1 - Legislation, regulatory and policy framework for the biodiversity assessment

Legislation/ Regulation / Policy	Summary of requirements
National	
The National Planning Policy Framework (2019)	The National Planning Policy Framework (NPPF) – revised 19 June 2019 ¹ , sets out the Government's planning policies for England and provides a framework within which the appropriate local authority can produce local and neighbourhood plans; the NPPF is a material consideration in making planning decisions. Key guidance on biodiversity is in Chapter 15 (Conserving and enhancing the natural environment).
Local planning policy² (current)	
Havant Borough Core Strategy (2011)	The Havant Borough Core Strategy³ is the current planning policy for Havant along with the 'Local Plan (Allocations)' which is discussed below. The Core Strategy was adopted in 2011 and sets out the planning framework until 2026. The Local Plan 2036 (currently in draft format) will replace the core strategy and is hoped to be adopted in 2020. Policies within the Core Strategy that are relevant to the biodiversity assessment are provided below, with further detail of the policy specific to Havant Thicket Reservoir: • Policy CS11 Protecting and Enhancing the Special Environment and Heritage of Havant Borough. • Policy CS13 Green Infrastructure. • DM8 Conservation, Protection and Enhancement of Existing Natural Features. • Policy CS18 Strategic Site Delivery (Strategic Site 2 Havant Thicket Reservoir). The specific points of the Policy CS18 Strategic Site 2 Havant Thicket Reservoir which relate directly to ecology include: • Natural and rural character should be conserved in particular by limiting impacts on biodiversity including the creation of additional habitats; compensating for the loss of, and effects on, sites of importance for nature conservation, the listed park and conservation area; enhancing adjacent sites of importance for nature conservation; ensuring that the pipeline avoids Great Copse, which should be protected during construction; integrating the reservoir and the new landscape with the historic landscape of the Sir George Staunton Conservation Area and existing woodland; minimising the loss of ancient woodland and trees. • The potential impacts on the Langstone and Chichester Harbours as well as the Hermitage Stream should be

¹ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

² The site boundary straddles two Hampshire districts, Havant and East Hampshire. The boundary of these districts passes through the centre of The Avenue, effectively splitting the site in half. As a result, Local Planning Policy from both Havant Borough Council and East Hampshire District Council has been included.

³ <https://www.havant.gov.uk/sites/default/files/documents/ADOPTED%20CORE%20STRATEGY%20.pdf>

Legislation/ Regulation / Policy	Summary of requirements
	minimised in terms of ecology, water quality and flow effects. • Opportunities for biodiversity enhancements associated with the reservoir and the Hermitage Stream should be realised wherever possible. • Opportunities arising from the new pipe works are taken to enhance the habitats along the stream corridors.
Havant Borough Council Local Plan (Allocations) Adopted Version (2014)	The Havant Borough Council Local Plan (Allocations)⁴ follows on from the Havant Borough Core Strategy; together the documents provide up to date policies for the borough. The Local Plan (Allocations) was adopted in 2014. Policies within the Local Plan (Allocations) that are relevant to the biodiversity assessment are: • Policy AL6 Havant Thicket Reservoir Pipeline. • Policy AL7 Hermitage Stream. • Policy AL8 Local Green Spaces. • Policy DM23 Sites for Brent Geese and Waders
East Hampshire District Council Local Plan: Joint Core Strategy (2014)	The Joint Core Strategy⁵ is the current Local Plan for East Hampshire, created as a joint effort between East Hampshire District Council and the South Downs National Park Authority. It was adopted in 2014 and replaced the previous 2006 local plan. A new draft local plan is due to be adopted by the end of 2020 this follows the Government's legal requirements introduced in 2018 that local plans must be reviewed every five years. The South Downs National Park have subsequently adopted a separate local plan in 2019 (as discussed below). Policies within the Joint Core Strategy that are relevant to the biodiversity assessment are: • Policy CP21 Biodiversity. • Policy CP22 Internationally Designated Sites. • Policy CP28 Green Infrastructure.
Local (Draft to be adopted)	
Havant Borough Council Local Plan 2036 – Pre-submission Draft (2019)	The Havant Borough Council's Local Plan 2036⁶ is currently in draft form and will replace the Havant Borough Core Strategy (2011). It is hoped the Local Plan will be formally adopted in 2020. The draft Local Plan sets out the council's strategic development vision up to 2036. Policies within the draft Local Plan that are relevant to the biodiversity assessment are provided below, with further detail of the policy specific to Havant Thicket Reservoir: • KP9 Havant Thicket Reservoir. • E14 The Local Ecological Network. • E15 Protected species. • E18 Trees, hedgerows and woodland.

⁴ <https://www.havant.gov.uk/local-plan-allocations>

⁵ <https://www.easthants.gov.uk/sites/default/files/documents/DP01%20East%20Hampshire%20District%20Local%20Plan%20Joint%20Core%20Strategy%20COMPLETE.pdf>

⁶ https://www.havant.gov.uk/sites/default/files/documents/Sustainability%20Appraisal%20of%20the%20Pre-Submission%20HBLP%202036%20%28January%202019%29_0.pdf

Legislation/ Regulation / Policy	Summary of requirements
	The specific points of the policy KP9 Havant Thicket Reservoir which relate directly to ecology include the requirement that the natural character is conserved in particular by: • Limiting impacts on biodiversity including the creation of additional habitats; • Compensating for the loss of, and effects on, Sites of Importance for Nature Conservation (SINCs); • Ensuring that the pipeline avoids Great Copse, which should be protected during construction; • Integrating the reservoir into the existing landscape of the area; • Minimising the loss of ancient woodland and trees; • Appropriate mitigation measures, including buffers, are put in place for Bechstein's bat in line with Policy E15; • The potential impacts on the Langstone and Chichester Harbours as well as the Hermitage Stream have been assessed under the appropriate regulations and any necessary avoidance and mitigation measures included in the scheme design; • Opportunities for biodiversity enhancements associated with the reservoir and the Hermitage Stream are realised wherever possible; and • Opportunities arising from the new pipe works are taken to enhance the habitats along the stream corridors.
East Hampshire District Council Draft Local Plan 2017-2036 (2019)	East Hampshire District Council have produced a draft Local Plan which is due to be adopted by the end of 2020⁷. The draft Local Plan sets out the council's strategic development vision up to 2036. Policies within the draft Local Plan that are relevant to the biodiversity assessment are provided below, with further detail of the policy specific to Havant Thicket Reservoir: • Policy DM26: Trees, hedgerows and woodland. ◦ Policy S22: Solent Special Protection Area. ◦ Policy S23: Green infrastructure. ◦ Policy S31: Havant Thicket reservoir. Policy S31 Havant Thicket reservoir states that the scheme should conserve natural and rural character in particular by: • Limiting impacts on biodiversity including the creation of additional habitats; • Compensating for the loss of, and effects on, Sites of Importance for Nature Conservation (SINCs), the listed park and conservation area; • Enhancing adjacent sites of importance for nature conservation; • Minimising the loss of ancient woodland and trees; • Opportunities for biodiversity enhancements associated with the reservoir are realised wherever possible.

⁷ <https://www.easthants.gov.uk/draft-local-plan>

Study area

- 9.5. The site (as illustrated by the red line boundary in Figure 2.1 Site Location in ES Volume 3) is divided into a number of different areas. Below is a summary of the terminology used throughout this chapter to identify the different parts of the site:
- The ‘site’ includes all the land in the red line boundary: the reservoir footprint, the pipeline corridor as well as land around the reservoir footprint being used for ecological mitigation and compensation.
 - The ‘reservoir site’ excludes the pipeline corridor but does include:
 - The reservoir footprint and other areas used for built development and habitat creation (referred to as the ‘reservoir footprint’), including the access roads.
 - Ecological enhancement areas, which are purely included in the red line boundary for habitat works, including the majority of land within Havant Thicket woodland to the north and Bells Copse to the west and part of Staunton Country Park to the south of the reservoir footprint (referred to as the ‘Ecological Enhancement Area’).
 - The ‘pipeline corridor’ is the working corridor of the pipeline route between the reservoir and the boundary of Bedhampton Pumping Station.
- 9.6. Ecological studies commenced in 2005 before the red line boundary was confirmed and, therefore, the technical appendices to this chapter include maps showing how the key areas were referred to at the time of the surveys: these include the core development part of the reservoir site (referred to by ECOSA as “the site”) and Ecological Enhancement Areas (referred to by ECOSA as the “wider site”). The pipeline corridor is shown in a separate technical appendix by ECOSA (Appendix A9.13 in ES Volume 4). The terminology described above (i.e. site, reservoir site, Ecological Enhancement Area and pipeline corridor) is used in this chapter.
- 9.7. The study area for the assessment of potential effects on biodiversity resources has been identified by determining the predicted ecological zones of influence encompassing all the predicted impacts and potential adverse effects of the Scheme on biodiversity resources. The zone of influence also includes potential beneficial effects associated with the Scheme as a result of habitat creation and the establishment of new ecological networks. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change. Therefore, it is appropriate to identify different zones of influence for different features.
- 9.8. The technical appendices Appendix A9.2 and A9.4 to A9.13 in ES Volume 4 prepared by ECOSA describe the desk study areas and survey areas used for each ecological feature in the work undertaken between 2005 and 2019. The survey areas included the site, but due to the relative importance of some biodiversity resources and the mobility of some species, the survey area was extended beyond the site in some cases. These distances were determined based on the professional judgement of the ecologist leading the assessment, taking into account the characteristics of the site subject to appraisal, its surroundings and the nature and scope of the development proposals (as known at the time) and the ecology of the species of focus.
- 9.9. The data search areas used for the desk study were reviewed and an updated desk study was undertaken by Atkins in April 2020, taking account of the confirmed red line boundary. The search areas for this desk study are provided in Table 9-2 and reflect the predicted ecological zones of influence encompassing all the predicted impacts and potential adverse effects of the Scheme on biodiversity resources, as well as providing wider context for the assessment.

Table 9-2 - 2020 Desk Study Search Areas

Data Type	Search area – distance from red line boundary
SACs where bats are one of the qualifying species	30 km
Statutory designated sites for nature conservation: Special Areas of Conservation (SACs and cSACs), Special Protected Areas (SPAs and pSPAs), Wetlands of International Importance (Ramsar sites) and potential Ramsar sites	5 km

Data Type	Search area – distance from red line boundary
Statutory designated sites for nature conservation: Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs)	2 km
Non-statutory designated sites for nature conservation and ancient woodland	2 km
Records of bat species:	
Bechstein's bat and barbastelle bats	10 km
Other bat species	3 km
Legally protected species (except bats)	2 km
Priority habitats and species and invasive non-native plant and animal species	1 km
Waterbodies that may potentially be utilised by breeding great crested newts	500 m
Veteran and Notable Trees	50 m
Aquatic habitats and species (watercourses and standing waterbodies) ⁸	2 km

- 9.10. The Survey Area for the Phase 1 habitat survey included the reservoir site and land beyond the proposed footprint (see Figure 9.1 Broad vegetation areas in ES Volume 3) and the pipeline corridor (see Appendix A9.13 Pipeline Ecological Appraisal in ES Volume 4). The design evolved following the ECOSA studies and where necessary additional field surveys were undertaken between 2018 and 2020. Key changes to the Scheme during this period include:
- A number of access roads have been assessed with a northern and southern road being included within the planning application for the reservoir site.
 - Potential car parking areas within Bells Copse and the south-east part of Blendworth Common have been removed from the Scheme due to their predicted ecological impacts.
 - The zone of influence for bats was extended following identification of rare bats (Bechstein's and barbastelle) during bat surveys.

Assessment methodology

- 9.11. The following sections summarise the methodologies of the various ecological surveys undertaken within the Study Area.

Ecological desk study and consultation

- 9.12. Baseline data has been gathered from a range of sources through data requests, consultation, and using online resources as outlined below. This included data gathering in relation to statutory and non-statutory designated sites for nature conservation and protected and priority species.
- 9.13. Desk study information was obtained from Hampshire Biodiversity Information Centre (HBIC) by ECOSA in April 2018. Due to the age of this data and changes to the design, the desk study was updated by Atkins in April 2020. Whilst the 2018 desk study information is included within the species Appendices A9.4 to A9.12 and Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4, the information is superseded by the updated May 2020 desk study report in Appendix A9.1 Desk study in ES Volume 4.

⁸ An initial desk study area of 150 m was used for the identification of aquatic features (watercourses and standing waterbodies) that could potentially be affected by the Scheme. Where a watercourse was identified within 150 m of the Scheme, the desk study area was extended up to 2 km upstream and downstream on that watercourse to identify any species/habitat records for the specific feature to inform the baseline conditions. Further details on aquatic ecology study area are provided in **Appendix A9.3**.

- 9.14. The following data was requested from HBIC and Sussex Biodiversity Record Centre (SxBRC) in May 2020:
- Records of non-statutory designated sites for nature conservation (Local Wildlife Sites (LWSS), Sites of Importance for Nature Conservation (SINCs))
 - Records of priority habitats and legally protected and priority flora;
 - Records of Bechstein's bat and barbastelle bats within 10 km of site and other bat species within 3 km of site; and,
 - Priority habitats and species and invasive non-native plant and animal species within 1 km of site.
- 9.15. Veteran and notable tree records within 50 m of site were sourced from the Woodland Trust publicly accessible ancient tree inventory website⁹ in May 2020.
- 9.16. The study areas used for the data gathering in 2020 are detailed in Table 9-2 (above). For species records, only those within 10 years of the data collection date have been considered within the assessment.
- 9.17. The Multi-Agency Geographic Information for the Countryside (MAGIC) online resource was reviewed on several occasions with the latest review in May 2020 to establish the following:
- The location of statutory designated sites: SPAs, pSPAs, SACs, cSACs, Ramsar sites, potential Ramsar sites, SSSIs, NNRs and LNRs;
 - Ancient woodland; and
 - European Protected Species Mitigation (EPSM) licences.
- 9.18. Due to uncertainty of the accuracy of the classification of some woodland blocks within site on the Ancient Woodland Inventory, consultation was undertaken with Natural England (NE) in 2019. It was agreed that Portsmouth Water would commission independent specialists Andy Cross and Neil Sanderson to survey six plots of woodland in and adjacent to the reservoir site to establish if the woodland blocks affected by the proposals should be designated as ancient woodland and their condition. They also assessed the condition of the woodland and checked for the presence of veteran trees. This study was undertaken by:
- A review of historic documents (primarily maps);
 - A review of information on the Ancient Woodland Inventory;
 - A review of botanical reports compiled by ECOSA as part of the studies for this Scheme; and
 - A site visit to all six plots of woodland by Sanderson and Cross in November 2019. The plots were scoped for habitat that could support lichen species and communities of conservation interest. Areas with potential to support lichen species and communities of conservation interest were then surveyed in more detail, searching for trees with lichens and targeting species of conservation interest. The lichen assemblage was used to assess the ecological continuity of the woodlands.
- 9.19. Further details of the methodology can be found in Section 2 of the report in Appendix D in Appendix A9.1 Desk study in ES Volume 4. The report on the findings of this study¹⁰ was forwarded to NE for their response in early 2020. A summary of the findings of the report and response from NE are provided in the baseline conditions section below.
- 9.20. Online mapping resources, including aerial photography, at an appropriate scale, were used to identify the presence of habitats such as woodland blocks, waterbodies, watercourses and hedgerows, in the vicinity of site. These habitats may offer resources and connectivity between site and suitable habitat in the local area for a variety of species including bats, hazel dormice and great crested newts. The presence of waterbodies within a 500 m radius of the reservoir footprint is particularly important in relation to great crested newt as the species typically uses suitable

⁹ <https://ati.woodlandtrust.org.uk/tree-search/?v=1693508&ml=map&z=16&nwLat=50.878633181474946&nwLng=-0.9931598476358383&seLat=50.873623466042936&seLng=-0.9660588077493637>

¹⁰ Cross, AM & Sanderson, NA. (June 2020). Review of six plots of woodland in and adjacent to the Proposed Havant Thicket reservoir site, Hampshire for their ancient woodland status; the significance and value of their lichen flora and vegetation; the presence of veteran trees and the condition of the woodlands.

terrestrial habitat up to 500 m from a breeding pond. However, there is a notable decrease in great crested newt abundance beyond a distance of 250 m from a breeding pond¹¹.

9.21. Baseline information obtained in relation to other developments or surveys by others were also reviewed where appropriate. Key other sources of information reviewed are as follow:

- Surveys by White, Young, Green (WYG, 2014) in relation to an outline planning application for new homes at Land East of Horndean (East Hampshire District Planning application reference: 55562/001) and surveys by EPR (EPR, 2018), located to the north-west of the reservoir site.
- Surveys by RPS (RPS, 2017) in relation to the proposed restoration of Staunton Country Park. This is to the south of the reservoir site.
- A review of planning applications with bat trapping and/or tracking of Bechstein's bat as outlined in Table D1 in Appendix A9.4 Bat survey report in ES Volume 4.
- Hampshire Ornithological Society and other local bird recorders as listed in Appendix A9.9 Bird survey report in ES Volume 4.
- Forestry England information regarding great crested newt surveys of a pond in Havant Thicket woodland as described in Appendix A9.11 Great crested newt survey report in ES Volume 4.
- Information from relevant documents and recorders of invertebrates as described in Appendix A9.12 Invertebrate Survey Report in ES Volume 4.

Field surveys

9.22. Ecological surveys undertaken between 2005 and 2009, and between 2017 and 2020 have been used to obtain the baseline conditions for this Scheme. Table 9-3 provides a summary of the surveys undertaken. Within the Table, 'F' refers to full surveys and 'C' refers to casual observations made during other surveys/visits. Survey areas are illustrated in the relevant survey reports in Appendices A9.2 – A9.12 in ES Volume 4.

Table 9-3 - Vegetation and protected species surveys undertaken 2005 - 2020

Survey Type	Surveyor	2005	2006	2007	2008	2009	2018	2019	2020
Vegetation – Phase 1	ECOSA	F	-	-	-	-	Update 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 ¹²	-	-
Bechstein's Bats - Radio-tracking Survey (within 3 km)	ECOSA	-	-	-	F	F	F ¹³	-	-
Bats - Static Detector Survey	PW	-	-	-	-	-	F	F ¹⁴	-

¹¹ Natural England (2004). An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt (ENRR576). <http://publications.naturalengland.org.uk/publication/134002>.

¹² Only Bechstein's bat were radio-tracked during 2009 and 2018, additional species radio-tracked in 2008

¹³ One Bechstein's bat tracked from Staunton Country Park to Southleigh Forest roost and back (17th-20th July 2018)

¹⁴ Targeted surveys in 2019 in Havant Thicket woodland by Portsmouth Water's Ecologist to assess the level of bat activity within a dense secondary woodland block and an area of pine plantation (to be enhanced as part of the proposals) compared to woodland ride/forest track approximately 50m away.

Survey Type	Surveyor	2005	2006	2007	2008	2009	2018	2019	2020
Bats - Roost Inspections in Woodlands (Hibernation)	ECOSA	-	-	-	-	F ¹⁵	-	-	-
Ground Level Tree Assessment for bats	ECS ¹⁶	-	-	-	-	-	-	-	F
Bat emergence update survey at Manor Lodge	PW	-	-	-	-	-	-	-	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 ¹⁷
Hazel Dormouse Survey	ECOSA	F	F	F ¹⁸	C/F	C ¹⁹	-	-	-
Breeding Bird Survey - All Species	ECOSA	F	-	-	F	-	F	-	-
Breeding Bird Surveys - Nightjar	ECOSA/ PW ²⁰	-	F	-	F	-	C	C	-
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 ²¹	F ²¹	-	-
Great Crested Newt Survey – Habitat Assessment	ECOSA	F	F	-	-	-	F ²²	-	-
Great Crested Newt Survey - eDNA	ECOSA	-	-	-	-	-	F ²³	-	-
Great Crested Newt Survey - Population Assessment	ECOSA	F	F	-	-	-	F	-	-
Invertebrates - Daytime Visual Survey	ECOSA	F	C	C	C	-	F ²⁴	-	-

¹⁵ 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

¹⁶ Ecological Consultancy Services Limited

¹⁷ Surveys were undertaken by a Portsmouth Water Ecologist in May 2020 covering the edges of The Avenue and northern edge of Staunton Country Park woodlands to the south of the reservoir site, the whole of the northern boundary of the proposed reservoir footprint and the northwest corner of Havant Thicket woodland where the proposed access road enters, including a wider area either side of the access road.

¹⁸ Havant Thicket woodland and Staunton Country Park only

¹⁹ One date - 5th June 2008

²⁰ Casual nightjar surveys on one occasion in July 2018, and two occasions in July 2019 by Portsmouth Water Environment Lead & retired Hampshire County Council Ranger

²¹ Targeted transects in Havant Thicket woodland

²² The 2018 great crested newt survey followed a very wet spring and as a result more ponds were identified during the survey. A Habitat Suitability Index was completed for each pond where there was access

²³ One pond at northern end of Bells Copse surveyed in 2019 results reported with 2018 data in **Appendix A9.11**

²⁴ Survey effort was targeted to where priority species were recorded previously and to habitat with high suitability on the site

Survey Type	Surveyor	2005	2006	2007	2008	2009	2018	2019	2020
Invertebrates - Aquatic Survey	ARUP 2009 APEM 2020	-	-	-	F ²⁵	-	-	-	F ²⁶
Rivers and Streams (Baseline Geomorphology and RHS) (ARUP, 2009)	ARUP	-	-	-	F ²⁵	-	-	-	-
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	-

Phase 1 habitat surveys

- 9.23. An ecological walkover survey of areas within the reservoir site (reservoir footprint, access roads, southern edge of Havant Thicket woodland and corner of Blendworth Common, as illustrated in Figure 9.1 Broad vegetation areas in ES Volume 3) was initially undertaken, by ECOSA, in 2005 and updated in 2018. Habitats were mapped in accordance with the JNCC Phase 1 habitat survey methodology²⁷. It is evident from Table 9-3 that initial ecological walkover survey assessed the suitability of the habitats present for protected and priority species as a range of further surveys were undertaken in 2005 and later years.
- 9.24. A field survey of the pipeline corridor was undertaken during November 2018. This used the standard Phase 1 habitat survey methodology²⁷ as guidance and included a search for evidence of, and an assessment of, the pipeline corridor's suitability to support, protected and priority species as recommended by CIEEM²⁸. The field survey covered all accessible areas of the route, including boundary features, as well as contiguous habitat surrounding the proposed route where relevant.

National Vegetation Classification (NVC) survey

- 9.25. NVC surveys were carried out, by ECOSA between 9th May and 26th June 2018 with an additional survey visit carried out in July 2019 to map areas of species-rich marsh and rush pasture along the watercourses. Previous surveys were undertaken in 2006, 2008 and 2009. Details are provided in Table 9-4.

Table 9-4 - Summary of Vegetation Surveys

Survey Period	Areas Surveyed
16 th August – 8 th September 2006	Whole of proposed reservoir footprint (all grassland and three main woodlands).
18 th October 2008	Update visit mainly to the reservoir footprint.
28 th April – 29 th May 2009; 2 nd June – 9 th July 2009	All woodlands in the reservoir site, including Havant Thicket woodland.

²⁵ Targeted to select reaches on site and downstream of the site based on professional judgement of the surveyor

²⁶ Survey locations agreed in consultation with the Environment Agency. Surveys were undertaken in accordance with the Environment Agency's Monitoring Intermittent Streams index (MIS-index) survey method that is being piloted for invertebrate surveys within ephemeral catchments. The MIS-index survey methodology was sent to Portsmouth Water and Atkins by the Environment Agency on the 23 March 2020 and are provided in **Appendix A9.3**.

²⁷ JNCC (2010). Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit. Peterborough: Joint Nature Conservation Committee.

²⁸ CIEEM (2017). Guidelines for Preliminary Ecological Appraisal. 2nd Ed. Winchester: Chartered Institute of Ecology and Environmental Management.

9 th May – 26 th June 2018	Entire reservoir footprint, selected areas within Havant Thicket woodland, Staunton Country Park and south-east part of Blendworth Common.
22 July 2019	All watercourses within the grassland areas, plus Upper Lake. These areas are within the reservoir footprint.

- 9.26. Further details of the methodology can be found in Appendix A9.2 Vegetation survey report in ES Volume 4.

Habitat Classification in relation to Biodiversity Net Gain

- 9.27. The Scheme will result in the unavoidable loss of ancient woodland (including veteran trees) which is an irreplaceable habitat. Therefore, Biodiversity Net Gain cannot be achieved in relation to this habitat; any losses that cannot be avoided will require bespoke compensation.
- 9.28. In order to inform the design of compensatory habitat, habitats (other than ancient woodland) were reviewed against the guidance for the Biodiversity Metric 2.0²⁹. Any habitats that would be classified as having very high distinctiveness under that guidance were identified, as these would be subject to bespoke compensation, aiming to achieve net area gain of that habitat.

Arboricultural survey

- 9.29. Atkins undertook a tree survey in accordance with the British Standard BS 5837:2012 'Trees in Relation to Design, Demolition and Construction – Recommendations' in support the Scheme to produce an Arboricultural Impact Assessment (AIA), that focuses on the trees within the Scheme extents. This report can be found in Appendix A9.14 Arboricultural Impact Assessment in ES Volume 4.
- 9.30. It reports on the impacts on the recorded trees from the proposed Scheme and is supplemented by the production of Tree Protection Plans (TPPs), which are included within Appendix C of the AIA report (Appendix A9.14 in ES Volume 4).
- 9.31. It also confirms whether any of the recorded trees could be classified as veteran specimens. The veteran classification includes trees which might also be classified as ancient.
- 9.32. This tree survey has been undertaken in accordance with BS 5837:2012 Trees in Relation to Design, Demolition and Construction – Recommendations. The Standard gives recommendations and guidance on the relationship between trees and the design, demolition and construction process, setting out the principles and procedures to be applied to achieve a harmonious and sustainable relationship between trees and structures.
- 9.33. BS 5837:2012 does not set explicit parameters for measuring the sensitivity of an arboricultural resource; nor does it assess the magnitude of impact of a proposed development on trees (other than by providing a record of the number of trees that would need to be removed to facilitate the development). Rather, the British Standard provides parameters which enable the arboriculturist to assess the quality of all the trees and other arboricultural features that may be affected by the development that is proposed.
- 9.34. Whilst the BS categories are open to varied interpretation, the guidelines in the cascade chart of BS 5837:2012 (see insert A.1 in Appendix A of the AIA report (Appendix A9.14 in ES Volume 4)) provide details on how to determine tree qualities and can be used to inform the design process to retain those trees of higher quality where possible.

Priority and protected species surveys

Priority plant species

- 9.35. Priority plant species were identified during the vegetation surveys as outlined in Table 9-4 - Summary of Vegetation Surveys for the reservoir site and in further detail in Appendix A9.2 Vegetation survey report and for the pipeline corridor in Appendix A9.13 Pipeline Preliminary Ecological Appraisal Report in ES Volume 4.

²⁹ <http://publications.naturalengland.org.uk/publication/5850908674228224>

Aquatic habitats and species

- 9.36. River Habitat Surveys (RHS) and aquatic invertebrate surveys were undertaken in 2008 for five representative reaches on the watercourses within, adjacent and downstream of the reservoir site.
- 9.37. To provide an updated assessment of the baseline conditions of the watercourses and standing waterbodies potentially affected by the Scheme, a bespoke walkover survey was undertaken on the 20 November 2019. Habitat characteristics were recorded broadly following habitat descriptors outlined in River Habitat Survey (RHS) methodology, by an accredited RHS surveyor.
- 9.38. Following the walkover survey and consultation with the Environment Agency on the 5 March 2020 and 20 March 2020, it was determined that further aquatic invertebrate surveys were required to inform the baseline. As such, eight aquatic invertebrate surveys were undertaken on 14 April 2020 in accordance with the Environment Agency's Monitoring Intermittent Streams index (MIS-index) survey method that is being piloted within ephemeral catchments. Further information on survey methodology is provided in Appendix A9.3 Aquatic Ecology in ES Volume 4.
- 9.39. In addition to the walkover survey, Modular River Surveys (MoRPh) were undertaken on the 26 June, 29 June and 02 July 2020 to provide a river condition assessment to feed into the beta version of Defra's Biodiversity Metric 2.0. The results of the MoRPh surveys can be found in Appendix A15.4 Biodiversity Net Gain for Rivers in ES Volume 4. A summary of river condition for each watercourse determined from MoRPh survey outputs is provided in the baseline section of this report.

Bats

- 9.40. Bat surveys were undertaken at the reservoir site between 2005 and 2020. These surveys are listed below in Table 9-5. Surveys followed guidance current at the time. Some surveys used bespoke methodologies, with the scope of these agreed in advance with NE, the local planning authority and Hampshire and Isle of Wight Wildlife Trust.

Table 9-5 - Summary of Bat Surveys

Survey Period	Type of survey
June - September 2005	Seven transect surveys at the reservoir site
May – August 2006	Four transect surveys at the reservoir site
2008	Walkover of the reservoir site and woodlands within a 3 km radius
April 2008 – March 2009	'Fixed Area' and transect surveys at the reservoir site
April – August 2008	Mist netting/harp trapping at the reservoir site
September 2008	Acoustic lure and harp trap/nets surveys at selected woodlands within 3 km of the reservoir site
April – August 2008	Radio tracking surveys focussed on the reservoir site, with at least one emergence survey at all identified roosts
February – March 2009	Endoscope investigations of trees with suitable bat features at the reservoir site
April – August 2009	Bechstein's bat radio-tracking within 3km radius of the reservoir site.
April – October 2018	Automated detector surveys at the reservoir site, with a total of 340 recording nights spread across 10 detector locations
May – August 2018	Trapping and radio tracking for Bechstein's bats focussed on the reservoir site
May – August 2018	Vantage point surveys at the reservoir site to assess roosting activity within individual woodland blocks
May – September 2018	Bat emergence/re-entry surveys at trees where Bechstein's bat roosts had previously been recorded

June 2018	Ground level tree assessment of trees where roosts had previously been identified
June – July 2018	Climb and endoscope surveys of bat boxes and tree 1604
November 2018	Assessment of suitability of trees and buildings intersecting or abutting the pipeline route to support roosting bats and of suitability of the route and surrounding landscape to support foraging and/or commuting bats
July – August 2019	Targeted surveys in Havant Thicket woodland by Portsmouth Water's Ecologist to assess the level of bat activity within a dense secondary woodland block and an area of pine plantation (to be enhanced as part of the proposals) compared to woodland ride/forest track approximately 50m away.
March 2020	Survey to update the ground level tree assessment within the reservoir site
June 2020	Update emergence survey of the buildings at Manor Lodge
June 2020	Ground level tree assessment of trees to be removed and adjacent to the northern access road

- 9.41. Surveys were undertaken by ECOSA, supported by Portsmouth Water's ecologist, apart from the March 2020 ground level tree assessment, which was undertaken by Ecological Consultancy Services Ltd, and the surveys in June 2020, which were undertaken by the Portsmouth Water's Ecologist. Further details of the bat survey methodologies are provided in Appendix A9.4 Bat Survey Report and the details of the pipeline survey are in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Hazel dormice

- 9.42. Hazel dormouse surveys were undertaken by ECOSA, using dormouse nest tubes and boxes, following NE guidance (Bright et al, 2006) in 2005 and 2007. Dormouse tubes and boxes were erected in The Avenue and Staunton Country Park woodland (to the south of The Avenue) in 2005 with the survey area expanded to include the edges of woodlands surrounding the reservoir footprint (Staunton Country Park woodland, Cabbagefield Row, Bells Copse and Havant Thicket woodland) in 2007. In 2018 a field survey was undertaken to reassess the suitability of habitats to support hazel dormouse within site.
- 9.43. An appraisal of the suitability of habitat along the pipeline corridor to support hazel dormice was undertaken in November 2018.
- 9.44. Further detail of the survey methodology is provided in Appendix A9.5 Hazel Dormouse survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Otters

- 9.45. The watercourses within the reservoir footprint were surveyed, following the NE standing advice for surveying otter³⁰, by ECOSA in 2005, 2009, 2017 and 2018. The watercourses in Havant Thicket woodland, were only surveyed in 2018. The otter surveys were based on suitability of habitat present within site and the potential of these habitats to support otter.
- 9.46. An appraisal of the suitability of habitat along the pipeline corridor to support otter was undertaken in November 2018. A detailed inspection of both embankments of a stretch of the Hermitage Stream (in proximity to a proposed outfall) and a stretch of Riders Lane Stream (where the pipeline will cross the stream) was undertaken for evidence of otters by two Portsmouth Water Ecologists in June 2019. The survey involved inspection of any suitable structures that provided opportunities for otters to mark their territories or shelter.

³⁰ Natural England (2018). Guidance – Otters: surveys and mitigation for development projects. [online]. Available <https://www.gov.uk/guidance/otters-protection-surveys-and-licences> [Accessed April 2018]

- 9.47. Further detail of the survey methodology is provided in Appendix A9.6 Otter survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4. The June 2019 otter survey was combined with a water vole survey and the methodology is included as an appendix to Appendix A9.7 Water Vole Survey Report in ES Volume 4.

Water voles

- 9.48. The watercourses within the reservoir footprint were surveyed by ECOSA in 2005, 2009, 2017 and 2018. The watercourses in Havant Thicket woodland, were only surveyed in 2018. The water vole surveys were based on suitability of habitat present within site and the potential of these habitats to support water vole. The surveys followed the guidelines in the Water Vole Conservation Handbook³¹ and The Water Vole Mitigation Handbook³².
- 9.49. An appraisal of the suitability of habitat along the pipeline corridor to support water vole was undertaken in November 2018. A detailed inspection of stretches of the Hermitage Stream and Riders Lane Streams for evidence of water vole was undertaken by two Portsmouth Water Ecologists in June 2019.
- 9.50. Further detail of the survey methodology is provided in Appendix A9.7 Water vole survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Badgers

- 9.51. A badger survey of land within the reservoir footprint and Havant Thicket woodland was undertaken by ECOSA in 2018. Where relevant the survey extended beyond the boundary of the site and Havant Thicket woodland. The survey was undertaken in accordance with guidance by Reynolds and Harris³³.
- 9.52. A motion-activated wildlife surveillance camera was installed to monitor the use of a potential sett within the reservoir footprint. The camera was in place between 24 May 2018 – 6 June 2018 and 20 June – 12 July 2018.
- 9.53. An appraisal of the suitability of habitat along the pipeline corridor to support badgers was undertaken in November 2018. Evidence of badger was recorded as an incidental result of the Phase 1 habitat survey and included locating badger setts, paths, and signs of territorial activity such as latrines.
- 9.54. In addition, in May 2020 a Portsmouth Water ecologist visited a previously identified main sett in Staunton Country Park and undertook a badger survey around the whole boundary of the reservoir footprint, across the site where fences are present including the edges of The Avenue and within 50m of the proposed northern access road.
- 9.55. Further detail of the survey methodology is provided in the confidential Badger Survey Report in Appendix A9.8 and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Birds

- 9.56. Bird surveys were undertaken by ECOSA. A wintering bird survey was undertaken between November and March 2017 throughout the proposed reservoir footprint. This included a walked transect with the surveyors scanning the site using binoculars to identify bird species utilising the site. Wintering bird surveys were also undertaken between 2005/2006 and 2008/2009.
- 9.57. Breeding bird transects surveys were undertaken using a modified version the British Trust for Ornithology (BTO) Breeding Bird Survey³⁴. The transect covered the proposed reservoir footprint as well as following the route of the proposed northern access road along the western edge of Havant Thicket woodland. Given that the site was assessed as having suitability for a range of breeding birds, six visits were undertaken between April and June 2018. Surveys were also undertaken in 2005 and 2008.
- 9.58. Nightjar surveys were undertaken in Havant Thicket woodland by ECOSA in 2006 and ad hoc surveys by Tracey Viney of Portsmouth Water and Richard Levett (retired Hampshire County

³¹ Strachen, R., Moorhouse, T. & Gelling, M. (2011). Water Vole Conservation Handbook 3rd ed. Oxford: Wildlife Conservation Research Group.

³² Dean, M., Strachen, R., Gow, D. & Andrews, R., 2016. The Water Vole Mitigation Handbook. London: The Mammal Society.

³³ Reynolds, P. & Harris, M., 2005. Inverness Badger Survey. Scottish Natural Heritage Commissioned Report No. 096, Inverness: Scottish Natural Heritage

³⁴ Baillie, S. R. et al. (2012). Bird Trends 2001. BTO Research Report No 609, Thetford: BTO.

Council Senior Ranger) on one occasion in July 2018, and two occasions in July 2019. Some incidental bird records were also taken by the Portsmouth Water ecologists during site visits in 2019 and 2020.

- 9.59. An appraisal of the suitability of habitat along the pipeline corridor to support nesting bird communities was undertaken in November 2018. The presence of bird species that may potentially nest within the available habitat and evidence of nesting such as old or currently active nests was recorded during the survey. In addition, an assessment of the suitability of the habitat to support important wintering bird species and populations was undertaken. Particular attention was paid to the suitability of habitats to support wintering farmland bird species, waders and wildfowl.
- 9.60. Further detail of the survey methodology is provided in Appendix A9.9 Bird Survey Report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Reptiles

- 9.61. Reptile surveys were undertaken by ECOSA between 2005 and 2018 in accordance with best practice guidance³⁵. Surveys undertaken in 2005 and 2006 were aimed at establishing presence/likely absence of reptiles within the reservoir footprint, with a subsequent population assessment carried out between August and October 2007 and April and June 2008. This survey involved 1,600 refugia laid on a grid system. In 2008, the survey was extended north into Havant Thicket woodland to ascertain the suitability of habitats to act as receptor sites for reptiles displaced by and translocated from the Scheme, and to compensate, through appropriate management, for loss of onsite reptile habitat. A total of 554 refugia were distributed across optimal and sub-optimal habitat.
- 9.62. Two separate reptile surveys were undertaken in 2018, one within the reservoir footprint and the other within Havant Thicket woodland. A total of 417 reptile refugia were distributed across various suitable habitats within the reservoir footprint and reptile surveys were carried out over nine visits between May 2018 and October 2018. Reptile surveys within Havant Thicket woodland were carried out over seven visits between September and October 2018. A total of 229 reptile refugia were distributed across various sub-optimal habitats within the woodland on 23 August 2018.
- 9.63. An appraisal of the suitability of habitat along the pipeline corridor to support reptiles was undertaken in November 2018.
- 9.64. Further detail of the survey methodology is provided in Appendix A9.10 Reptile survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Great crested newts

- 9.65. ECOSA undertook great crested newt surveys within site and also surveyed waterbodies within 500 m of the reservoir footprint during 2005 and 2006, with survey methodology based on current Natural England guidance³⁶. The survey methods employed industry accepted methods of torching, egg searching, sweep netting and bottle trapping.
- 9.66. In 2018/19 waterbodies located within a 500 m radius of the reservoir footprint, were subject to a Habitat Suitability Index (HSI) assessment³⁷. In addition to the HSI assessment, 24 waterbodies were subject to environmental DNA (eDNA) sampling to establish the presence/likely absence of great crested newt. The eDNA survey was undertaken following best practice guidelines³⁸.
- 9.67. Following the results of the eDNA analysis, further great crested newt surveys were undertaken (where appropriate) to establish the population size class present for those waterbodies with a positive eDNA result and associated nearby (within 20 m) waterbodies. The survey methods employed industry accepted methods of torching, egg searching, sweep netting and bottle trapping.
- 9.68. An appraisal of the suitability of habitat along the pipeline corridor to support great crested newts was undertaken in November 2018. The suitability of intersecting or abutting waterbodies and

³⁵ Froglife (2015). Surveying for Reptiles: Tips, techniques and skills to help you survey for reptiles, Peterborough: Froglife

³⁶ English Nature, 2001. Great Crested Newt Mitigation Guidelines. Peterborough: English Nature.

³⁷ Oldham, R. S., Keeble, J., Swan, M. J. S. & Jeffcote, M., 2000. Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). *Herpetological Journal*, 10(4), pp. 143-155.

³⁸ Biggs, J. et al., 2014. Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA. Oxford: Freshwater Habitats Trust.

terrestrial habitat was considered in relation to the presence of waterbodies within the wider area, as identified within the desktop study and their suitability to be used as a network.

- 9.69. Further detail of the survey methodology and location of waterbodies surveyed is provided in Appendix A9.11 Great crested newt survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Terrestrial invertebrates

- 9.70. Terrestrial invertebrate surveys were carried out between 2005 and 2008 by ECOSA, to assess the presence / likely absence of notable invertebrate species and assemblages within the reservoir footprint. In 2005, invertebrate surveys were undertaken; these comprised a total of six visits, commencing in April and continuing until late August. During 2006, 2007 and 2008 invertebrate surveys were limited to observations recorded during the course of other ecological surveys.
- 9.71. Follow up invertebrate surveys were carried out on four dates between early June and mid-August 2018. Survey methods involved visual searching of nectaring sites and basking areas, the use of a hand net or pooter to capture individual species, sweeping vegetation, beating foliage and grubbing.
- 9.72. An appraisal of the suitability of habitat along the pipeline corridor to support invertebrates was undertaken in November 2018.
- 9.73. Further detail of the survey methodology is provided in Appendix A9.12 Invertebrate Survey Report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Invasive non-native species

- 9.74. Notes of the locations of invasive plant species were taken by ECOSA, where these were noted during the vegetation surveys of the reservoir site and pipeline corridor. A further inspection of waterbodies within Havant Thicket woodland for evidence of aquatic invasive species was undertaken on 4 May 2020 by a Portsmouth Water ecologist.

Assessing value of resources and receptors

- 9.75. A number of criteria have become accepted as a means of assessing the nature conservation importance of a defined area of land which are set out in A Nature Conservation Review³⁹ and include diversity, rarity and naturalness.
- 9.76. The nature conservation importance or potential importance of an ecological feature is determined within the following geographic context:
- International (e.g. Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites);
 - National (e.g. Sites of Special Scientific Interest (SSSI));
 - Regional (e.g. Environment Agency regional biodiversity indicators);
 - County a (e.g. Sites of Importance for Nature Conservation (SINC));
 - Local (undesigned ecological features e.g. old hedges, woodlands, ponds);
 - The Site and its immediate environs (e.g. small pond, marshy grassland); and
 - Negligible (e.g. areas of hardstanding and amenity grassland).
- 9.77. Features that have been identified to be of less than local importance are not considered to be important ecological features and as such have not been considered within the impact assessment. Where mitigation of impacts on these features is required for legal reasons this is made clear in the mitigation section below.

Impact assessment

- 9.78. The assessment of the potential effects of the Scheme takes into account both onsite impacts and those that may occur to adjacent and more distant ecological features.
- 9.79. The zone of influence is an area within which ecological features may be subject to biophysical changes as a result of the Scheme. Throughout the impact assessment process the zone of influence was regularly reviewed. The zone of influence for the impact assessment is typically the same as the field survey area, as the likely impacts of the Scheme were considered when

³⁹ Ratcliffe, D. (1977) A Nature Conservation Review. Cambridge University Press.

establishing the field survey areas. However, this was reviewed during the impact assessment, based on further understanding of the Scheme impacts and on the results of the desk study, field surveys and consultation.

- 9.80. Where impacts have been identified, details are provided within the assessment to characterise these in terms of their extent and magnitude, duration, frequency and timing, and reversibility. Both positive and negative impacts are discussed. Impacts were also characterised in terms of how they occur, i.e. direct, indirect secondary or cumulative. Impacts can be permanent or temporary and can include:
- Direct loss and degradation of wildlife habitats;
 - Fragmentation and isolation of habitats;
 - Mortality and injury to species;
 - Disturbance to species from noise, light or other visual stimuli;
 - Changes to key habitat features; and
 - Changes to the local hydrology, water quality and/or air quality.
- 9.81. A review of the findings of the air quality and noise and vibration assessments (Chapter 7 Air Quality and Chapter 12 Noise and Vibration in ES Volume 2) of the Scheme was undertaken by an ecologist to identify potential impacts of changes in air quality, noise and vibration on ecological receptors.
- 9.82. For designated sites, effects are considered significant when a project and associated activities are likely to either undermine or support the conservation objectives or condition of the site(s) and its features of interest.
- 9.83. For ecosystems, effects are considered significant when a project and associated activities are likely to result in a change in ecosystem structure and function.
- 9.84. Consideration is given to whether:
- Any processes or key characteristics will be removed or changed;
 - There will be an effect on the nature, extent, structure and function of component habitats;
 - There is an effect on the average population size and viability of component species; and
 - Functions and processes acting outside the formal boundary of a designated site have also been considered, particularly where a site falls within a wider ecosystem e.g. wetland sites.
- 9.85. Some ecosystems can tolerate a degree of minor changes, such as localised or temporary disturbance or changes in physical conditions, without such changes harming their function or importance. For this ES, ecological effects have been considered in the light of any information available about the capacity of ecosystems to accommodate change. Significant effects have been determined as being either negative or positive.
- 9.86. The conservation importance of undesignated habitats and species within a defined geographical area (International to Local) has been used in this assessment to determine whether the effects of the proposals are likely to be significant:
- For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area; and,
 - For species, conservation status is determined by the sum of influences acting on the species that may affect its abundance and distribution within a given geographical area.
- 9.87. When assessing potential effects on conservation importance, the known or likely background trends and variations in status have been taken into account. The level of ecological resilience or likely level of ecological conditions, that would allow the population of a species or area of habitat to continue to exist at a given level or continue to increase along an existing trend or reduce a decreasing trend, has been estimated where appropriate to do so.
- 9.88. The level of significance of an effect would never be at a higher level than the conservation importance of the receptor. In some cases it will be lower, depending on the degree to which conservation status is affected and based on professional judgement.
- 9.89. The avoidance, mitigation, compensation and/or enhancement measures described within the ES have been incorporated into the design and operational phasing programme and taken into account in the assessment of the significance of effects. These mitigation measures include those required

to achieve the minimum standard of established good practice together with additional measures to further reduce any negative impacts of the Scheme. The mitigation measures include those required to reduce or avoid the risk of committing legal offences.

- 9.90. In addition to measures required to ameliorate negative effects on important ecological features, further biodiversity enhancement measures have been identified and will be incorporated into the Scheme as it is progressed.
- 9.91. The impact assessment has taken account of cumulative effects. In order to identify potential projects which could have a cumulative effect a review was undertaken of the development land and planning applications within 2 km of site.

Mitigation hierarchy

- 9.92. The principles of the mitigation hierarchy^{40,41} have been adopted and used when considering impacts and subsequent effects on important ecological features within the zone of influence.
- 9.93. The principles of the mitigation hierarchy are that in order of preference impacts on biodiversity should be subject to:
- Avoidance,
 - Mitigation, and
 - Compensation.
- 9.94. Opportunities for enhancement were also sought during design.

Biodiversity Net Gain

- 9.95. The beta version of Defra's Biodiversity Metric 2.0 was used by Portsmouth Water to assess the habitat changes, excluding those relating to loss of ancient woodland and habitat of very high distinctiveness, to help shape plans for a Capital Grants scheme for offsite works outside the mitigation and compensation measures reported in this ES. The method and results of this exercise are reported separately and will be made available on request. The Capital Grants approach is set out in the Outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications.

Assessment assumptions and limitations

- 9.96. This section identifies any limitations to the surveys or assessment and provides an explanation of the effects of these on the assessment.
- 9.97. Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. The ecological surveys undertaken to support this EclA have not therefore produced a complete list of plants and animals, and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. Nevertheless, surveys for this Scheme have been undertaken over a long time period (2005 – 2020) and, therefore, it is anticipated that a good understanding of habitat and species that would be affected by the Scheme has been obtained.
- 9.98. Guidance from CIEEM indicates that where survey data is 18 months to three years old 'A professional ecologist will need to undertake a site visit and may also need to update desk study information', but also indicates that the potential for mobile species, changes in conditions and local context should be taken into account. During the field surveys in 2019 and 2020, and subsequent visits to site, any changes in the habitats within and adjacent to site boundary since the most recent extended Phase 1 habitat survey (2018) were recorded. No changes in the baseline habitats were identified. A number of site visits were undertaken by a Portsmouth Water ecologist in May 2020, to assess if there had been any significant changes to the ecological baseline conditions. Significant changes were not noted, and the results of these site visits have been incorporated into the baseline reporting. Additional information obtained during these site visits is outlined in the baseline sections below.

⁴⁰ Department of Communities and Local Development (2018). National Planning Policy Framework, Paragraph 118. <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

⁴¹ CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, Paragraph 1.19. Chartered Institute of Ecology and Environmental Management, Winchester.

- 9.99. The detailed (Phase 2) survey work for habitats and species focussed on the area proposed for construction activities; the Ecological Enhancement Area, which will be subject to ecological enhancement and recreational impacts, was subject to less intensive survey work. The scope of the survey work within the Ecological Enhancement Area was considered appropriate given the nature of the interventions.
- 9.100. The vegetation survey focussed on identifying important habitat and plant species within the reservoir footprint and adjacent land within Havant Thicket woodland. The survey did not aim to identify all higher and lower plants supported by the site. However detailed vegetation surveys of site, undertaken by experience botanists, have spanned multiple years and therefore the scope of the surveys is considered adequate.
- 9.101. Due to the large size of the site and the presence of complex patterns of vegetation (particularly over the grassland areas) it was not possible to carry out fine scale mapping to NVC level for the whole site; however, notes were made on NVC communities and sub-communities during all of the vegetation surveys and the species rich marsh was mapped in detail during the visits in 2018 and 2019.
- 9.102. Some of the survey areas described in the technical appendices are not in line with current guidance. The survey areas for otters and birds did not extend beyond the site boundary and for birds, no targeted species surveys were undertaken. For reptiles, the 2018 survey did not include all suitable habitat for reptiles, relying on the fact that habitats had not changed significantly since the 2005 and 2008 surveys. However, there had been a reduction in grazing pressure, so the habitats had changed and are likely to have increased in suitability for reptiles. The impact assessment therefore takes a precautionary approach, as does the proposed mitigation. Given the desk study records, the overall suitability of habitats and this precautionary approach, this is not considered a significant limitation to the assessment.
- 9.103. During 2018, only a small number of ecological surveys were undertaken within the Ecological Enhancement Area, as identified in Table 9-3 - Vegetation and protected species surveys undertaken 2005 - 2020. These areas are included in the red line boundary but they are not within the reservoir footprint; they are part of the wider site subject to mitigation and compensation works. However, these areas were subject to vegetation and protected species surveys between 2006 and 2009⁴². The ECOSA dormouse survey report (Appendix A9.5 Hazel dormouse survey report in ES Volume 4) indicated the Corsican Pine Plantation had been thinned since the 2005-2009 surveys, resulting in a dense understorey of bramble. In addition, Forestry England undertook some wood harvesting during winter 2019/20, mainly within Bells Copse, and it is anticipated the thinned areas will result in an increase in ground flora vegetation. Where birch regeneration has taken place over heathland habitats, typical representative blocks were surveyed by ECOSA in 2018; this provided a good indication of how such habitats have developed over time.
- 9.104. The June 2018 site visits were undertaken during a long, hot dry spell when many spring and mid-summer flowering species are highly likely to have died back and would have become difficult to detect. Therefore, it is considered likely that some flowering plant species will not have been recorded by the 2018 surveys. Later flowering species may also have been unrecorded during the 2018 surveys. Considering the intensive survey effort of the site and surrounding areas over the last 10 years, both by ECOSA and Hampshire Biodiversity Information Centre surveyors, this is not considered to be a significant limitation to the overall assessment.
- 9.105. Habitat and species-specific assumptions and limitations are discussed in further detail in Appendices A9.1 to A9.13 in ES Volume 4. Where necessary, a precautionary approach to the assessment and mitigation has been taken and therefore the assessment is considered robust.

⁴² ECOSA (January 2013). Havant Thicket Winter Storage Reservoir. Ecology Report – Chapter A – Introduction – Final. Appendix A1: Summary of Ecological Survey Work 2005 to 2009.

Baseline conditions including value/sensitivity of resources and receptors

Internationally and nationally designated sites

- 9.106. A desk study report providing information from the 2020 desk study undertaken by Atkins is included in Appendix A9.1 Desk study in ES Volume 4. This report includes further information on the designated sites, habitats and animals and plant species identified in the desk study.
- 9.107. There are three SACs with bats listed as a reason for designation within 30 km of site, these are:
- Singleton and Cocking Tunnels SAC located approximately 15.7 km east of site;
 - Briddlesford Copses SAC located 20 km south of site and is located on the Isle of Wight and separated from the mainland by the Solent, (approximately 6 km of open sea water); and,
 - Ebernoe Common SAC located approximately 29 km east of site.
- 9.108. The closest international designated sites within 5 km of site are the Chichester and Langstone Harbours SPA and Ramsar site and Solent Maritime SAC, located approximately 1 km downstream from site at Bedhampton and Havant Springs (the pumping site and most southerly point of the pipeline) and approximately 3.85 km from the reservoir site. These designated sites also have a hydrological connection to the reservoir site and Pipeline corridor, via the Riders Lane Stream and Hermitage Stream.
- 9.109. The Solent and Dorset Marine Coast SPA is located approximately 4.2 km south west from the pipeline corridor.
- 9.110. The Solent and Isle of Wight Lagoon SAC includes fourteen coastal lagoons. Shut Lake is the nearest lagoon to site. The Shut Lake lagoon is located approximately 5 km west of the southern end of the pipeline corridor.
- 9.111. There are two SSSIs within 2 km of site. These are Langstone Harbour SSSI which is 1 km south of the pipeline corridor and Chichester Harbour SSSI which is 2 km southeast of the pipeline corridor.

Locally and non-statutory designated sites

- 9.112. There are three LNRs located within 2 km of site. Hazelton Common LNR is located approximately 890 m north west of the reservoir site. Dell Piece West LNR is located approximately 1.8 km north west of the reservoir site and Farlington Marshes is located approximately 1.6 km south west of the pipeline corridor.
- 9.113. The desk study identified 60 SINC (in Hampshire) and one LWS (in Sussex), within 2 km of the reservoir site and 65 SINC within 2km of the pipeline corridor.
- 9.114. There are eight SINC, selected predominately for supporting woodland, wholly or partially within the reservoir site. These are Middle Clearing SINC, Thicket Bottom SINC, Thicket Bottom Woods and Lake SINC, Havant Thicket SINC, Havant Thicket (South-West Corner) SINC, Idsworth Common SINC, Bell's Copse SINC and Cabbagefield Row SINC.
- 9.115. A further seven SINC are immediately adjacent to the reservoir site. These are Blendworth Common (North) SINC, Blendworth Common (South) SINC, Meadow by Bell's Copse SINC, Dunsbury Hill Wood SINC, Dunsbury Hill Grassland 2 SINC, Thicket Lawn SINC and Hammond's Lands Copse SINC.
- 9.116. There are three SINC partially within the pipeline corridor. These are Thicket Lawn SINC, High Lawn SINC and Great Copse, Havant SINC.
- 9.117. Figures illustrating the locations of these locally and non-statutory sites and further information on the designations are provided in Appendix A9.1 Desk Study in ES Volume 4.

Ancient woodland

- 9.118. The desk study identified nine areas on the Ancient Woodland Inventory within site, including six Ancient Semi Natural Woodlands (ASNW): The Avenue, Middle Clearing, Round Wood, part of Bells Copse, part of Cabbagefield Row and part of Idsworth Common, and three Ancient Re-Planted Woodlands (Plantations on Ancient Woodland Sites, PAWS), including the Forest of Bere (Havant Thicket), part of Bells Copse and a site located within Staunton Country Park adjacent to The Avenue. Another 26 ancient woodland sites, of which 17 are ASNW and 8 are PAWS, are located within 2 km of site. There is also an area of ASNW on the Ancient Woodland Inventory close to the pipeline corridor, within Great Copse SINC.

- 9.119. Due to some uncertainty of the accuracy of the Ancient Woodland Inventory, Portsmouth Water commissioned an independent specialist to survey six plots of woodland in and adjacent to the reservoir site. The report⁴³ concluded The Avenue and Bells Copse fragment are ASNW and the Corsican Pine Plantation is PAWS. Middle Clearing, Round Wood and Blendworth Fragment were not considered to be ancient woodland. However, NE were of the opinion⁴⁴ that there had not been sufficient evidence submitted for the removal of any of the woodland blocks from the Ancient Woodland Inventory and, therefore, they will be treated as ancient woodland within this assessment. It was noted that Round Wood was categorised as PAWS woodland on the inventory, however as it is a plantation of native oak trees NE consider it to be best described as ASNW and the Ancient Woodland Inventory was updated.
- 9.120. A copy of the woodland report and correspondence from NE are included in the in Appendix A9.1 Desk Study in ES Volume 4.

Veteran and notable trees

- 9.121. A search for veteran⁴⁵ and notable trees⁴⁶ within 50 m of site using the Woodland Trust's ancient tree inventory concluded that a single veteran tree was immediately adjacent to the reservoir site along the north eastern edge of Havant Thicket woodland and a notable tree was recorded 50 m north of the pipeline corridor at the junction of Highway Lane and Dunsbury Way.
- 9.122. Cross and Sanderson (2020) identified a total of 18 veteran trees as part of their assessments. These are all located within The Avenue and considered to be part of the pre-enclosure trees in this locality. The trees contain various decay features that provide saproxylic habitat value, but in their reporting, it was confirmed that these were few in number. Only one of these trees has been recorded individually as part of the AIA report. That tree is referenced as tree W127V in Appendix A9.14 Arboricultural Impact Assessment in ES Volume 4. The rest of the Cross and Sanderson veteran trees fall within woodland reference W128 which has been recorded as a group in line with BS5837:2012 guidance. The tree locations are shown within the woodland on the submitted tree protection plans.
- 9.123. Those individual trees that have been classified as veteran specimens as part of the AIA report (Appendix A9.14 Arboricultural Impact Assessment in ES Volume 4) are referenced as 'V' within the life stage classification column of the survey schedule. A total of 8 veteran trees were identified as part of this assessment. All these trees are growing within or adjacent to the pipeline corridor.

Priority habitats

- 9.124. The desk study identified three priority habitats within the reservoir site. These were lowland dry acid grassland located in the south west corner of Havant Thicket Woodland, wood-pasture and parkland (within The Avenue woodland) and seven parcels of deciduous woodland. Coastal and floodplain grazing marsh and lowland meadow were also recorded within 1 km of the reservoir site.
- 9.125. The desk study identified three priority habitats within the pipeline corridor: wood-pasture and parkland (associated with Staunton Country Park), deciduous woodland (associated with Staunton Country Park and Great Copse) and coastal and floodplain grazing marsh (associated with the Hermitage Stream). Lowland meadow and mudflat habitats are also recorded within 1 km of the pipeline corridor.
- 9.126. Further information including a map of the priority habitats is included in Appendix A9.1 Desk Study in ES Volume 4.
- 9.127. Findings of the vegetation survey within site by ECOSA supersede the less accurate desk study information, which was not informed by field surveys. ECOSA identified four priority habitats within the reservoir site: lowland mixed deciduous woodland (The Avenue and Cabbagefield Row), wet woodland (developed from natural succession of remnant heathland habitat within Havant Thicket SINC), lowland dry acid grassland (patches with Havant Thicket woodland and outside site adjacent to the northern access road) and purple moor-grass and rush pasture. Developing rush-pasture forms a substantial component of the grassland within the reservoir footprint; however, these

⁴³ Cross and Sanderson (2020). Review of six plots of woodland in and adjacent to the Proposed Havant Thicket reservoir site, Hampshire for their ancient woodland status; the significance and value of their lichen flora and vegetation; the presence of veteran trees and the condition of the woodlands.

⁴⁴ Dr Marion Bryant of Natural England on 16th April 2020

⁴⁵ <https://ati.woodlandtrust.org.uk/what-we-record-and-why/what-we-record/veteran-trees/>

⁴⁶ <https://ati.woodlandtrust.org.uk/what-we-record-and-why/what-we-record/notable-trees/>

transitional swards are relatively species-poor, and purple moor-grass and rush pasture indicator species are not sufficiently frequent to conform to the priority habitat type. Smaller areas along the margins of the streams and in hollows with impeded drainage are species-rich and do conform to purple moor-grass and rush pasture priority habitat. These areas of purple moor-grass and rush pasture habitat are classified as a habitat of very high distinctiveness under Biodiversity Metric 2.0⁴⁷.

- 9.128. The vegetation surveys of the pipeline corridor by ECOSA concluded that the grassland adjacent to the Hermitage Stream did not conform to the priority habitat of coastal and floodplain grazing marsh that was identified in the desk study.
- 9.129. Further details can be found in Appendix A9.2 Vegetation survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Vegetation

- 9.130. The results of the 2018 survey work indicate that the majority of the reservoir footprint comprises low quality semi-improved neutral grassland. Wetter grassland areas tend to be more species and herb rich, but this is not always the case for the wet species-poor grassland recorded in the west and south of the site.
- 9.131. As discussed above four priority habitats are present within the reservoir site: lowland mixed deciduous woodland, wet woodland, purple moor-grass and rush pastures, and lowland dry acid grassland and the reservoir site also includes ancient woodland.
- 9.132. There are three watercourses which enter the north of the reservoir footprint and converge into a single watercourse towards the southern boundary. The watercourses are very narrow, typically around 1 m in width, and are generally dry from May to October. Most of the watercourses are shaded by willow scrub. As a result, there is limited riparian vegetation along most of the watercourse channels. In small more open sections of the watercourses there is some more localised species-rich marsh and rush pasture vegetation.
- 9.133. Upper Lake is an area of standing water within the reservoir footprint, comprising a man-made shallow pond with willow scrub and a small area of rush pasture and wetland vegetation. A second pond within the reservoir footprint is a medium sized, completely shaded waterbody with moderate water quality and no macrophyte cover close to the southern edge of Havant Thicket woodland.
- 9.134. The majority of the pipeline corridor is road, hardstanding and amenity grassland, or poor semi-improved grassland typical of an urban setting, although parts of the route also support a number of habitats of greater ecological importance. The northern part of the route passes through areas supporting agriculturally unimproved grassland (Thicket Lawn SINC) and semi-improved grasslands which retain a significant element of unimproved grassland (High Lawn SINC) and in a small working area associated with work on a culvert would also impinge on Great Copse SINC, in close proximity to Great Copse ancient semi-natural woodland. In addition, the Hermitage Stream corridor supports semi-improved neutral grassland and scattered trees.
- 9.135. Further details can be found in Appendix A9.2 Vegetation survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Priority plant species

- 9.136. HBIC provided 174 records of flowering plants within 1 km of site (the reservoir site and the pipeline corridor). None of these were priority species. However, some, as listed below are of interest.
- 9.137. Four priority plant species are recorded within the reservoir site in Havant Thicket woodland and Bells Copse, these were:
- Butcher's broom, listed on Annex 5 of the Habitats Directive, 1992 (as amended).
 - Chaffweed, listed as endangered on the IUCN Red List species (2001);
 - Rush hybrid sp. (*Juncus effusus* x *conglomeratus* = *J. x kern-reichgeltii*), Critically Rare (CR) in Hampshire; and,
 - Lesser spearwort, listed as vulnerable on the IUCN Red List species (2001).

⁴⁷ <http://publications.naturalengland.org.uk/publication/5850908674228224>

- 9.138. Three priority plant species are located immediately adjacent to the Bedhampton and Havant Springs pumping site. These were:
- Strawberry clover, listed as vulnerable on the IUCN Red List species (2001);
 - Wild celery, Critically Scarce in Hampshire; and,
 - Divided sedge, recorded '*In and around the brackish ditches and depressions*' and a species of principal importance, a nationally scarce species and listed as vulnerable on the IUCN Red List species (2001).
- 9.139. The most recent vegetation surveys (2018) have recorded sixteen plant species within the reservoir site which are listed as either 'Vulnerable' or 'Near Threatened' on the Vascular Plant Red List for England⁴⁸. or valuation, impact assessment and mitigation, notable plants are taken into account as part of the habitat supporting them within this chapter.
- For valuation, impact assessment and mitigation, notable plants are taken into account as part of the habitat supporting them within this chapter.
- 9.140. Further details can be found in Appendix A9.2 Vegetation survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.
- Aquatic habitats and species*
- 9.141. The desk study identified the following watercourses which are potentially affected by the Scheme within the aquatic ecology study area:
- Five intermittent headwaters of Riders Lane Stream (named Headwater Streams 1-5 (HS1-HS5));
 - Riders Lane Stream;
 - An unnamed tributary of Riders Lane Stream (sometimes referred to as The Lake Stream); and
 - Hermitage Stream.
- 9.142. Two ponds were identified as being potentially affected by the Scheme within the study area. Upper Lake, a shaded ephemeral pond within woodland clearing in The Avenue (containing some locally uncommon plants) and a medium sized, completely shaded waterbody in Havant Thicket woodland.
- 9.143. These aquatic features, along with Environment Agency monitoring sites and the aquatic invertebrate survey locations for the April 2020 surveys are shown on Figure 9.2 Aquatic habitats in ES Volume 3.
- 9.144. One Environment Agency River Habitat Survey (RHS) monitoring site was identified on the central intermittent headwater of Riders Lane Stream (HS2) which identified this watercourse as being Significantly Modified.
- 9.145. No Environment Agency aquatic invertebrate, fish or macrophyte monitoring sites were identified on the intermittent headwaters of Riders Lane Stream.
- 9.146. The aquatic ecology surveys carried out in 2008 and 2020 identified the watercourses within the reservoir site as small intermittent streams, with varying planforms and habitat availability. Much of the extent of these streams flow through open grassland habitat along narrow, often undefined channels with shallow, slow flowing water. However, there are also reaches within the study area which are more heavily modified, with straightened planforms and are shaded as a result of flowing through areas of woodland, such as The Avenue. The MoRPh survey identified these headwater streams as being of fairly good to moderate condition for their typology.
- 9.147. Aquatic invertebrate surveys undertaken in April 2020 on the intermittent headwaters of Riders Lane Stream identified seven species of at least regional importance, as assigned under the Community Conservation Index (CCI)⁴⁹. Of these there are two beetles listed as Nationally Scarce⁵⁰ (*Ochthebius pusillus* and *Hydrochus angustatus*⁵¹) and one Nationally Scarce caddisfly

⁴⁸ Stroh, P.A., Leach, S.J., August, T.A., Walker, K.J., Pearman, D.A., Rumsey, F.J., Harrower, C.A., Fay, M.F., Martin, J.P., Pankhurst, T., Preston, C.D. & Taylor, I. 2014. *A Vascular Plant Red List for England*. Botanical Society of Britain and Ireland, Bristol.

⁴⁹ Chadd, R.P. and Extence, C.A. (2004). The conservation of freshwater macroinvertebrate populations: a community-based classification project. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 14, pp. 597-624.

⁵⁰ Listed in: Foster, G.N. 2010. A review of the scarce and threatened Coleoptera of Great Britain Part (3) – Water beetles of Great Britain. Species Status 1. Joint Nature Conservation Committee, Peterborough.

⁵¹ Identification has been verified by Garth Foster of the of the Aquatic Coleoptera Conservation Trust.

(*Limnephilus bipunctatus*) as listed on the Joint Nature Conservation Committee (JNCC) conservation designation spreadsheet⁵². There are also three Nationally Notable beetles (*Ilybius chalconatus*, *Ochthebius marinus* and *Hydraena testacea*) as listed on the Natural History Museum's UK species database. The Nationally Notable designation has been superseded by the Nationally Scarce designation. In the absence of an updated status it is assumed that these species are also Nationally Scarce.

- 9.148. Small numbers of stickleback (*Gasterosteus* species) and bullhead (*Cottus gobio*) were observed at the downstream extent of the headwaters within the reservoir site during the aquatic invertebrate surveys in April 2020.
- 9.149. The intermittent nature of the streams coupled with the presence of several culvert structures downstream result in these watercourses being considered suboptimal for most fish species. However, that does not preclude the presence of small, commonly occurring species, such as stickleback within the wider headwater network which they could colonise during appropriate flow conditions.
- 9.150. Given the ephemeral nature of the intermittent headwaters of Riders Lane Stream, as well as their position within a more rural setting in an otherwise predominantly urban catchment, these watercourses are considered to be intrinsically important. They provide a unique habitat, that acts to improve aquatic species diversity and functional habitat resilience as a potential primary colonisation source for the catchment.
- 9.151. Downstream of the reservoir site, the intermittent headwaters converge to form Riders Lane Stream. There are no Environment Agency monitoring sites on Riders Lane Stream. The aquatic ecology surveys carried out in 2008 and 2020 identified the watercourse as Significantly to Severely Modified. A number of culverts are present within the Riders Lane Stream conveying flow under roads and footpaths. Despite the urban catchment, the watercourse provides a continuous green riparian corridor of woodland and grassland.
- 9.152. MoRPh survey identified Riders Lane Stream as being of moderate to fairly poor condition for its typology which is reflective of its modifications.
- 9.153. No regionally notable invertebrate taxa were recorded within Riders Lane Stream during the aquatic invertebrate surveys in April 2020, however, the survey indicated a moderate species richness.
- 9.154. South of the reservoir site is an unnamed tributary of Riders Lane Stream (The Lake Stream) which connects to Leigh Lake. The watercourse is tree lined and forms a field boundary. Given its location in the catchment, and in the absence of targeted habitat or species surveys this watercourse is considered likely to be similar in character to the intermittent headwaters of Riders Lane Stream.
- 9.155. Riders Lane Stream joins Hermitage Stream at Leigh Park. Several Environment Agency monitoring sites are situated on Hermitage Stream, namely two invertebrate, three fish and one macrophyte monitoring sites. The Hermitage Stream has been straightened and reinforced with a concrete bed and banks throughout much of the study area.
- 9.156. MoRPh survey identified Hermitage Stream as being of fairly poor to poor condition for its typology which is reflective of its position within an urban setting and associated modifications.
- 9.157. Environment Agency fish records identified the presence of European eel (*Anguilla anguilla*) and bullhead within the Hermitage Stream. European eel is a Critically Endangered species on the IUCN Red List of Threatened Species (2010) and a species of Principal Importance under Section 41 for the Natural Environment and Rural Communities (NERC) Act 2006.
- 9.158. Bullhead is designated an Annex 2 non-priority species under the Habitats Directive (1992 as amended). However, like European eel, it is considered to be relatively well distributed throughout the region.
- 9.159. Further details on the aquatic ecology baseline can be found in Appendix A9.3 Aquatic ecology in ES Volume 4. Additional details regarding the vegetation within Upper Lake and along the watercourses in the reservoir site are provided in Appendix A9.2 Vegetation survey **report** in ES Volume 4.

⁵² JNCC (2020) Conservation designations for UK taxa [online] Available at: <https://hub.jncc.gov.uk/assets/478f7160-967b-4366-acdf-8941fd33850b> [Accessed 13 May 2020].

Bats

- 9.160. The desk study identified records of 13 species of bat within 3 km of site; of these 12 species were recorded within the reservoir site including Bechstein's bat, Brandt's bat, barbastelle, brown long-eared bat, common pipistrelle, Daubenton's bat, noctule, Nathusius's pipistrelle, Natterer's bat, serotine, soprano pipistrelle and whiskered bat. Alcahoie bat was recorded 1.8km south east of the reservoir site. Only common pipistrelle, Nathusius's pipistrelle and soprano pipistrelle were recorded within the pipeline corridor. A large proportion of the desk study records are records from the extensive surveys undertaken for this project that have been shared with the local record centre.
- 9.161. The desk study identified 91 records of bat roosts within 5 km of the reservoir site; of these, 21 records are maternity roosts, including five Bechstein's bat roosts, one soprano pipistrelle roost, two serotine roosts and one brown long-eared roost. The nearest maternity roost to the reservoir site is a Bechstein's bat roost located immediately east and on the edge of The Holt. Seventy of the records are non-maternity roost sites, including Bechstein's bat, common pipistrelle, serotine, soprano pipistrelle, Daubenton's bat, Natterer's bat, noctule and brown long-eared bat. Two Bechstein's bat roosts and a soprano pipistrelle bat roost were recorded within the reservoir site.
- 9.162. The desk study identified 66 records of bat roosts within 5 km of the pipeline corridor, of which 22 are maternity roosts. The nearest maternity roost is located approximately 120 m east of the pipeline corridor and the nearest non-maternity roost to the pipeline corridor is approximately 280 m north and located within the reservoir site.
- 9.163. The desk study identified 130 records of Bechstein's bat within 10 km of the reservoir site, of which 23 records are within the reservoir site including two roost sites. These are also the nearest Bechstein's bat records to the pipeline corridor, located approximately 250 m to the north.
- 9.164. The desk study identified 80 records of barbastelle within 10 km of the reservoir site, five of which are within the reservoir site itself. Only 78 of the records are within 10 km of the pipeline corridor and the nearest record is approximately 650 m north of the pipeline corridor and within the reservoir site.
- 9.165. The desk study identified five EPSM licences for bat species including common pipistrelle, brown long-eared and serotine within 2 km of site; all licences identified have ended.
- 9.166. Between 2008 and 2018 bat trapping, radio-tracking, vantage-point, tree climbing, transect and static detector surveys were undertaken. A total of at least 13 species have been recorded foraging, commuting and / or roosting, including barbastelle, Bechstein's bat, Brandt's bat, brown long-eared bat, common pipistrelle, Daubenton's bat, Leisler's bat/noctule, Nathusius' pipistrelle, Natterer's bat, noctule, serotine, soprano pipistrelle and whiskered bat. Additional bat trapping and back-tracking surveys will be undertaken in 2020 to inform the EPSM licence application.
- 9.167. The reservoir site contains woodland areas suitable for roosting bats. In total, the following bat roosts have been recorded within it: four Bechstein's bat day roosts, one Bechstein's bat night roost, one Natterer's bat day roost, one maternity roost (single colony, using two known roosting trees) of brown long-eared bats and six day/night roosts of brown long-eared bats. The brown long-eared bat maternity roosts were recorded in a single year but not concurrently, so they are considered to be the same roost. Given the woodland present, a small number of other lower status bat roosts used by these species and common pipistrelle, soprano pipistrelle and *Myotis* sp. may be present on site. Further roosts of all these species were also recorded in surrounding areas.
- 9.168. A Bechstein's bat maternity roost was recorded approximately 1.7 km to the south east in 2018, and some day roosts were recorded in Staunton Country Park. These bats mainly foraged in woodland within Staunton Country Park.
- 9.169. Ground level tree assessment surveys were undertaken in March 2020 (see Appendix D11 in Appendix A9.4 Bat survey report in ES Volume 4) to reassess potential of trees to be felled. Within The Avenue, Round Wood, Middle Clearing and the Corsican Pine Plantation, 181 trees were considered to have high potential for roosting bats, 68 were considered to have moderate potential and 16 were considered to have low potential. A ground level tree assessment was also undertaken of trees to be felled along the northern access road, but all these trees were assessed as having negligible potential.
- 9.170. The pipeline corridor runs through urban areas with low suitability for bats, but does include areas of grassland that could contribute to the foraging and commuting habitat of bats.

- 9.171. Further details can be found in the in Appendix A9.4 Bat survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Hazel dormice

- 9.172. The desk study undertaken identified six records for hazel dormouse within 2 km of site, with the closest and most recent record from 2015, located approximately 1 km south-west of site associated with an area of woodland. A review of aerial imagery revealed that there is good connectivity between these habitats, and habitats located on or adjacent to the reservoir site, particularly via roadside vegetation along the A3.
- 9.173. The desk study identified three EPSM licences in respect of hazel dormouse within 2 km of site. All of these are to the west, between 1.3 km and 1.5 km of site.
- 9.174. The hazel dormouse surveys carried out between 2005 and 2009 concluded that site supports a population of hazel dormouse. The 2018 field survey concluded that woodland suitable for hazel dormouse is still present within The Avenue woodland; this area has a well-developed understorey. The Corsican Pine Plantation along the northern boundary of site has been thinned since the 2005-2009 surveys; this has resulted in a dense understorey of bramble which is suitable habitat for hazel dormouse. A proportion of the wooded stream corridors, especially those in close proximity to broadleaved woodland are also suitable for hazel dormouse.
- 9.175. No evidence of hazel dormice was recorded during the survey of the pipeline corridor. The scrub, hedgerow and treeline habitats within the northern sections (Sections H and I illustrated in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4) were considered to be suitable for hazel dormice. The remainder of the pipeline corridor was considered unlikely to support hazel dormice.
- 9.176. Further details can be found in Appendix A9.5 Hazel dormouse survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Otters

- 9.177. The desk study identified no records of otter within 2 km of site.
- 9.178. Riparian habitat within the reservoir footprint and Havant Thicket woodland consists of a number of narrow streams and ditches and a small lake at the northern end of The Avenue (The Upper Lake). A small number of ponds are also present in Havant Thicket woodland. No evidence of otter was recorded during surveys of the Reservoir site in 2005, 2009 and 2018, and all watercourses within the reservoir footprint and Havant Thicket woodland were generally dry from May to October. These habitats were considered to offer limited suitability for otter given the narrow and ephemeral nature of the streams and ditches.
- 9.179. Otters are currently considered to be absent from site, although given otters are increasing in numbers and geographic range⁵³ and are known to travel long distances⁵⁴, and given that there is suitable secluded habitat within site and direct links between marine habitats and the reservoir site there is potential for them to make occasional use of the habitats on the reservoir site.
- 9.180. No evidence of otter was recorded during the surveys of the pipeline corridor. However, the Hermitage Stream which runs parallel to the pipeline corridor for part of the route does offer some suitability for otter. Where the pipeline crosses the Riders Lane Stream, a survey of the bankside did not record evidence of otter.
- 9.181. Further details can be found in Appendix A9.6 Otter Survey Report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Water voles

- 9.182. The desk study identified no records within 2km of the reservoir site.
- 9.183. Within 2km of the pipeline corridor the desk study identified 62 records of water vole; all predominantly around the Lavant Stream between Solent Retail Park at the OSGR: SU715060 and Langstone Harbour on the south coastline, OSGR: SU715048. The nearest record is approximately 740 m to the east of the pipeline corridor. Culverting of large sections of streams within the urban

⁵³ Matthews. F. (2018). British Mammals 2018. The Mammal Society's Guide to their Population and Conservation Status. S./The Mammal Society.

⁵⁴ http://mammal.org.uk/sites/default/files/factsheets/otter_complete.pdf

areas of Havant has resulted in poor habitat connectivity between this known population and site. The only hydrological pathway is via the south coastline; the mouths of the Lavant Stream and Hermitage Stream are separated by approximately 1.3 km of coastal flood plain and grazing marsh, amenity woodland and deciduous woodland and scrub. Further information is provided in Appendix A9.1 Desk Study Report in ES Volume 4.

- 9.184. No evidence of water vole was recorded during field surveys undertaken in 2005, 2009 and 2018. Given the limited suitability of habitats, the previously recorded drying of these watercourses, lack of previous evidence of the species and remoteness of the nearest records from site, it is considered likely that water vole are absent from site.
- 9.185. Further information regarding the water vole survey and results is provided in Appendix A9.7 Water vole survey report and Pipeline Preliminary Ecological Appraisal in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Badgers

- 9.186. The desk study identified three records of badger within 2 km of site. The nearest record is located approximately 670 m from the reservoir site.
- 9.187. All areas of site were assessed to have suitability for foraging and commuting badger. The onsite woodland and boundary vegetation provide suitable habitats for badger setts.
- 9.188. The badger survey work carried out at the reservoir site during 2018 recorded two inactive and one disused⁵⁵ outlier setts within or adjacent to the footprint of the proposed reservoir. All outlier setts comprised a maximum of three holes. A single active main sett was recorded outside the reservoir site. Badger activity levels at the main sett was high at the time of the survey and the number of holes had increased from two to 11 since a previous survey undertaken by RPS during 2017. A survey by a Portsmouth Water ecologist in May 2020 found the sett to be inactive, although badger hair was recorded on barbed wire in the south-west of site.
- 9.189. Evidence of badger activity in 2018 (i.e. footprints and a badger skull) was recorded within The Avenue. It was considered that this activity was from badgers associated with the main sett outside site. From the results described, it is clear that there is badger activity within the reservoir site and that this activity changes frequently.
- 9.190. No evidence of badger setts or activity was recorded during surveys by ECOSA in land surveyed within Havant Thicket woodland despite extensive investigation of the area between 2005 and 2018. ECOSA acknowledged that given the size of Havant Thicket woodland it is possible that badgers are present within the interior of inaccessible woodland compartments. Evidence of an inactive outlier sett, badger dung and possible badger foraging signs was found during site visits in Havant Thicket woodland by the Portsmouth Water ecologist in May and June 2020.
- 9.191. No signs or direct evidence of badger activity (including setts) were recorded during the survey of the pipeline corridor. The habitat present was suitable for badger (e.g. grassland, scrub and woodland), particularly at the northern end of the route. Given the habitats present along the pipeline corridor, it is considered likely that badger would use the area for foraging and commuting and possibly sett construction.
- 9.192. Full details of the badger surveys are provided in Appendix A9.8 Badger survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4. Due to the vulnerability of badgers to persecution, Appendix A9.8 is confidential, but is available on request if required.

Birds

- 9.193. The desk study indicated that a range of priority bird species have been recorded from site. Eight protected bird species listed on Annex 1 of the Birds Directive⁵⁶, 10 species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and 10 bird species of principal importance⁵⁷ were recorded within the reservoir site. Kingfisher, a species listed on Annex 1 of the Birds

⁵⁵ Disused holes have not been used for some time, are partially or completely blocked, and could not be used without a considerable amount of clearance.

⁵⁶ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147>

⁵⁷ Species of principal importance for the conservation of biodiversity are identified by the Secretary of State for England, in consultation with Natural England, are referred to in S.41 of the NERC Act for England. The list, known as the 'England Biodiversity List', of habitats and species can be found on the Natural England web site.

Directive⁴⁴, a Schedule 1 species and species of principal importance⁴⁵ is the priority species recorded nearest to the pipeline corridor. A large number of records of protected, priority and notable bird species were identified within 2 km of site including ground nesting birds such as skylark and lapwing. Further information is provided in Appendix A9.1 Desk study in ES Volume 4.

- 9.194. A field survey in December 2017 concluded that the habitats on site remain broadly similar to those recorded in previous surveys in 2008 – 2009 and include a combination of neutral grassland, rush pasture, woodland, stream corridors, ditches and boundary vegetation; these are suitable habitats for a range of breeding and wintering birds.
- 9.195. The 2018 breeding bird surveys recorded a total of 29 bird species holding territory or breeding within the survey area. Whilst the breeding bird surveys focussed on the reservoir footprint a number of priority species records were made beyond this area as part of other survey work or as an incidental result of the breeding bird survey. This included one firecrest territory immediately to the south of The Avenue woodland and at least two nightjar territories within the Havant Thicket/Bells Copse woodland complex in 2018. Nightjar were recorded foraging over the reservoir footprint during bat surveys in 2005 – 2008. In 2019 there were three records of nightjar on different dates in the north-east area of Havant Thicket woodland. Firecrest were also recorded singing in two locations (near northern access road at SU 714 113 and ponds at SU 721 104) in Havant Thicket woodland during a site visits by a Portsmouth Water ecologist on 4 May 2020 and within Staunton Country Park woodland on 13 May 2020.
- 9.196. A total of 55 species were recorded during the 2017/2018 wintering bird surveys. During the winter site supports a range of species typical of grassland and woodland habitats. No significant concentrations of priority species were recorded from site.
- 9.197. Species recorded during the wintering bird surveys that are listed in the Langstone and Chichester Harbours SPA/Ramsar site citations as qualifying or noteworthy species include black-headed gull, Mediterranean gull and teal. Forty-one black-headed gull and four Mediterranean gull were recorded roosting on site in March 2018 and both species were regularly recorded flying over the reservoir footprint. Teal and lapwing were recorded infrequently and in relatively low numbers. Mediterranean gull were recorded in higher numbers on a couple of occasions during site visits by the Portsmouth Water ecologist. In July 2019 over 50 were recorded hawking for insects over the site, on 13 May 2020 five birds were following the tractor working on the site and 35 feeding and loafing in Gipsies Plain on 16 June 2020.
- 9.198. Overall, low numbers of wintering birds were recorded during the wintering bird surveys. Small flocks of starling, redwing, fieldfare, meadow pipit and lapwing were noted on some, but not all visits. Low numbers of skylark were recorded foraging in grassland across site. Snipe and jack snipe were also recorded on the site on several occasions in 2019⁵⁸.
- 9.199. The habitat present along the pipeline corridor provides suitability for a range of bird species both for nesting and foraging. Suitable nesting habitat is present in the form of scattered trees, woodland associated with Great Copse, dense scrub and hedgerow. The grassland in Staunton Country Park at the northern end of the site is suitable for skylark, a ground nesting species.
- 9.200. Habitats along the pipeline corridor are unsuitable for wintering Brent geese and waders, which are qualifying features of the Langstone and Chichester Harbours SPA.
- 9.201. Further detail of the bird surveys is provided in Appendix A9.9 Bird survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Reptiles

- 9.202. The desk study identified records of slow worm, common lizard, grass snake and adder within 2 km of site. Further information is provided in Appendix A9.1 Desk study in ES Volume 4.
- 9.203. The results from reptile surveys undertaken between 2005 and 2008 identified an exceptional population⁵⁹ of all four common species of reptile; slow worm, common lizard, grass snake and adder within site. The surveys undertaken of the reservoir footprint in 2018 indicated that all four species remain present on site, with an exceptional population of slow-worm present, a good population of common lizard and a low population of adder and grass snake. There had been a

⁵⁸ Two snipe and one jack snipe 22/10/2019 and seven snipe 28/10/2019 recorded by Portsmouth Water's Ecologist.

⁵⁹ Froglife Advice Sheet 10. Reptile Survey An introduction to planning, conducting and interpreting surveys for snake and lizard conservation (https://www.wildcare.co.uk/media/wysiwyg/pdfs/froglife_advice_sheet_10_-_reptile_surveys.pdf).

reduction in grazing pressure in 2018 compared with 2005 and 2008, with a likely increase in habitat suitability for reptiles. It is therefore likely the reduced numbers in 2018 were due to fewer refugia being deployed and it is possible that there is an increase in numbers, rather than the apparent decline recorded. Peak counts of each species during the 2005-2008 survey and 2018 surveys of the reservoir footprint are provided in Table 9-6.

Table 9-6 - Peak Counts of Reptiles

Species	Peak Count (2005-2008)	Peak Count (2018)
Adder	11	4
Grass snake	13	4
Common lizard	48	7
Slow worm	48	41

- 9.204. There was a clear preference for 'edge' habitats within the reservoir footprint and these areas are likely to contain higher concentrations of reptiles across the site, especially the south-facing edges of Havant Thicket woodland and the Corsican Pine Plantation.
- 9.205. The areas surveyed within Havant Thicket woodland comprise sub-optimal reptile habitat in the form of mature conifer plantations, dense thickets dominated by regenerating birch species, shaded stream corridors and pond enhancement areas. In Havant Thicket woodland peak records were two slow worm and one grass snake. Two adders were also recorded along rides in Havant Thicket woodland during other surveys.
- 9.206. Habitat suitable for hibernating reptiles is present within the woodland habitat and would be particularly suitable for reptiles where located close to open habitats used by reptiles.
- 9.207. The pipeline corridor comprises semi-improved grassland and scrub along mown pathways, woodland edges associated with Great Copse and tussocky grassland within Staunton Country Park at the northern end of the route provide the necessary habitat required by common species of reptiles for basking, shelter and foraging. With the exception of mown amenity grassland, the route supports habitat which is considered to have suitability for reptiles.
- 9.208. Further detail of the reptile surveys is provided in Appendix A9.10 Reptile survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Great crested newts

- 9.209. Consultation with Forestry England provided a record of one female great crested newt recorded in a pond in Havant Thicket woodland (Pond 9a in Appendix 9.11 Great crested newt survey report in ES Volume 4) during April 2009. The HBIC desk study identified three records of great crested within 2 km of the reservoir site and two records of great crested newt within 2 km of the pipeline corridor. A record located within Rowlands Castle approximately 535 m east of the reservoir site is the nearest record to the reservoir site. The nearest record of great crested newt to the pipeline corridor is Pond 9a in Havant Thicket woodland which is approximately 1.5 km north of the pipeline corridor.
- 9.210. Two EPSM licences in respect of great crested newt were identified within approximately 1 km of site. One is located approximately 345 m north of the reservoir site and the other approximately 555 m to the east.
- 9.211. Hazelton Common LNR is located approximately 1.1 km north-north-west of site and the NE designation citation states that alongside ancient woodland species plants, terrestrial and aquatic invertebrates and bird interest, the main pond has records of great crested newt.
- 9.212. The 2005 and 2006 ECOSA surveys did not record any great crested newt in any of the waterbodies surveyed within 500 m of the reservoir footprint.
- 9.213. Three waterbodies returned positive eDNA results; Ponds 8, 9a and 10 in 2018. These waterbodies in Havant Thicket woodland are within the reservoir site and the nearest is approximately 120 m from the reservoir footprint. Breeding has not been confirmed within any of these ponds but the continued presence of the species (an individual seen in 2009 and positive eDNA results in 2018) and absence of other potential breeding ponds identified by the desk study makes it likely great crested newts are breeding within the pond complex in Havant Thicket woodland. The results of the presence/likely absence and population assessment concluded that a small population of great crested newt is present in Ponds 8, 9a and 10.
- 9.214. A range of habitats are present within 500 m of Ponds 8, 9a and 10 including woodland and semi-improved grassland, marshy grassland, scrub habitat, ponds and ditches; all of which are considered to provide suitable habitat for great crested newts to commute, forage, shelter and

hibernate. Therefore, any suitable habitat within the range of Ponds 8, 9a and 10 has potential to be used by great crested newts.

- 9.215. Habitats present along the pipeline corridor, including scrub, tussocky grassland and woodland, provide some suitability for great crested newt. Six waterbodies were identified in the desk study within 500 m of the pipeline. All but one of these waterbodies are located 250 m or more from the pipeline corridor and are separated by significant barriers to great crested newt movements such as large expanses of housing and roads. The single waterbody located within 250 m comprises an open-air swimming pool which is considered unsuitable for the species. As a result of these factors the likelihood of great crested newts being present within the pipeline corridor is considered low.
- 9.216. Further details can be found in Appendix A9.11 Great crested newt survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Invertebrates

- 9.217. Desktop study data indicated that a range of priority invertebrate species has been recorded within site and surrounding area. Further information is provided in Appendix A9.1 Desk Study in ES Volume 4.
- 9.218. Previous invertebrate surveys undertaken by ECOSA in 2005 recorded a small number of priority invertebrates within the onsite grassland and woodland. The invertebrate surveys carried out during 2018 recorded a total of four Red Data Book species, seven Nationally Scarce species, three S41 species and one Hampshire BAP species within the reservoir site. Five Nationally Scarce species and one S41 species were recorded in 2005, but not 2018.
- 9.219. Great Copse, located adjacent to the pipeline corridor, contains a large amount of dead wood which is considered to offer suitable habitat for a range of invertebrate species and assemblages, including stag beetle. However, the majority of habitat present along the route only provides suitability for common and widespread invertebrate species; rare or priority species are considered unlikely to be present.
- 9.220. Further information is provided in Appendix A9.12 Invertebrate survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.

Other species

- 9.221. The desk study identified the following priority species⁶⁰ of interest:
- one record of common toad within the reservoir site and three more common toad records within 1 km of site.
 - fifty-three records of European hedgehog, a species of principal importance, within 2 km of site. The nearest record to site is approximately 30 m east on the B2148 Manor Lodge Road. The nearest record to the pipeline corridor is approximately 460 m west of the boundary of Great Copse Ancient Woodland.
 - one record of common seal located approximately 1.5 km downstream (via the Hermitage Stream) of the Bedhampton and Havant Spring pumping site, within Langstone Harbour. Common seal is protected in Britain under the Conservation of Seals Act, 1970, and classified as a species of principal importance.
- 9.222. Other species of interest include one record of yellow-necked mouse, located approximately 1.9 km south east of the Bedhampton and Havant Spring pumping site. This species is considered to be scarce in Hampshire. A single active fox earth was also recorded by ECOSA on 16 November 2018 located on Deerslaughter Plain in the south-east corner of the site and a fox earth may also be present on the edge of The Avenue (see Appendix A9.8 in ES Volume 4 for further information) and a common toad was recorded in a hole by Upper Lake in The Avenue in April 2020. The reservoir site and pipeline corridor comprise habitats suitable for European hedgehogs and common toad.

Invasive non-native species

- 9.223. The desk study identified 48 records of invasive non-native plant species within 1 km of the reservoir site including cherry laurel and Turkey oak, within Bells Copse and Corsican pine, Holm oak, montbretia and rhododendron within Havant Thicket woodland. The desk study identified

⁶⁰ As listed on NERC Act 2006

- 18 records of non-native animal species within 1 km of the reservoir site and Egyptian goose and Mandarin duck, grey squirrel and horse chestnut leaf miner were recorded within the reservoir site.
- 9.224. The desk study identified 32 records of invasive non-native plant species within 1 km of the pipeline corridor. The nearest invasive non-native plant species to the pipeline corridor are butterfly bush, Corsican pine, false-virginia creeper, Himalayan balsam and Japanese knotweed, all recorded immediately south of the pipeline corridor within Bedhampton Water Treatment Works. The desk study identified no invasive animal species within the pipeline corridor and the nearest record of a non-native animal species to the pipeline corridor is grey squirrel within West Leigh, approximately 350 m east of the pipeline corridor.
- 9.225. Parrot's feather was recorded in a number of ponds within Havant Thicket woodland in May 2020⁶¹. Non-native oak, laurel and rhododendron have been reported as present within site⁶². Mandarin duck were recorded breeding in Upper Lake in The Avenue in spring 2020.
- 9.226. Whilst the pipeline preliminary ecological appraisal survey did not record any non-native plant invasive species, this may have been due to the fact the survey was undertaken in the winter when some species would not have been as visible. Himalayan balsam was confirmed as abundant along the Hermitage Stream in July 2020 by Portsmouth Water's Ecologist.
- 9.227. Further details can be found in Appendix A9.1 Desk study report, in Appendix A9.2 Vegetation survey report and in Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4.
- Evaluation of biodiversity resources*
- 9.228. The nature conservation value of the biodiversity resources within the ecological zone of influence is described in Table 9-7.

Table 9-7 - Nature conservation value of resources

Resource	Value	Justification
Internationally designated sites (Singleton and Cocking Tunnels SAC, Bridesford Copses SAC, Ebernoe Common SAC, Chichester and Langstone Harbours Ramsar site, The Solent Maritime SAC, The Solent and Isle of Wight Lagoon SAC and Solent and Dorset Coast SPA)	International	Internationally designated sites
Nationally designated sites (Langstone Harbour and Chichester Harbour SSSIs)	National	Nationally designated sites
Ancient woodlands and veteran trees. Includes The Avenue, the Corsican Pine Plantation, Round Wood, Middle Clearing, Havant Thicket woodland and Bells Copse. These ancient woodlands include lowland mixed deciduous woodland priority habitat; wet	Regional (and an irreplaceable habitat)	The Avenue - Semi-natural ancient woodland including a number of veteran trees The Corsican Pine Plantation is a PAWS Round Wood and Middle Clearing are young oak plantations on ancient woodland soils Havant Thicket woodland is large but has been subject to alterations through commercial forestry Bells Copse contains both semi-natural ancient woodland and PAWS

⁶¹ E-mail correspondence from Trevor Codlin of Portsmouth Water on 04/05/2020 indicating parrot's feather in Pond 8 with new shoots also in Pond 9. Pond numbers are as illustrated in the great crested newt survey report in Appendix A9.11.

⁶² Information supplied by Tracey Viney of Portsmouth Water

Resource	Value	Justification
woodland priority habitat, other broadleaved woodland and coniferous woodland.		Eight veteran trees were recorded outside ancient woodland areas, within or adjacent to the pipeline corridor.
SINCS/LWS (61 within 2 km of the reservoir site and 65 within 2 km of the pipeline corridor of which eleven are at least partially within site)	County	SINCS/LWS are considered to be of particular importance for nature conservation within Hampshire/Sussex. The SINCS within the reservoir footprint are also ancient woodland. Havant Thicket SINC has been designated as it retains significant remnants of heathland vegetation.
Local Nature Reserves (Hazelton Common, Dell Piece West and Farlington Marshes)	Local	Locally designated sites
Priority Habitat – Lowland mixed deciduous woodland Including an assemblage of England Red List plants, e.g. sanicle (NT); wood-sorrel (NT); wild strawberry (NT).	County	Priority habitat listed on Section 41 of the NERC Act 2006 Within site, these woodlands are semi-natural ancient woodlands and have been designated as SINCS. The woodlands supports notable plant species that would meet the criteria for selecting SINCS in Hampshire. They form a core non-statutory component of Hampshire's Local Ecological Network, which has been designed to identify and establish coherent ecological networks within Hampshire.
Priority Habitat – Wet woodland	County	Priority habitat listed on Section 41 of the NERC Act 2006 Within site, wet woodland has developed from natural succession of remnant heathland habitat within Havant Thicket SINC, which is of County value. It is a core non-statutory component of Hampshire's Local Ecological Network, which has been designed to identify and establish coherent ecological networks within Hampshire.
Priority Habitat – Purple moor-grass and rush pastures Including an assemblage of England Red List plants, e.g. lesser spearwort (VU); ragged-robin (NT); marsh pennywort (NT); marsh St John's-wort (NT).	County	Priority habitat listed on Section 41 of the NERC Act 2006 This habitat is classified as one of very high distinctiveness under Biodiversity Metric 2.0 ⁶³ . Wetland community, characteristic of unimproved and waterlogged conditions, that would meet the criteria for selecting SINCS in Hampshire. Supports notable plant species that would meet the criteria for selecting SINCS in Hampshire. A core non-statutory component of Hampshire's Local Ecological Network, which has been

⁶³ <http://publications.naturalengland.org.uk/publication/5850908674228224>

Resource	Value	Justification
		designed to identify and establish coherent ecological networks within Hampshire.
Priority Habitat – Lowland dry acid grassland Including an assemblage of England Red List plants, e.g. heather (NT); tormentil (NT); heath speedwell (NT).	County	Priority habitat listed on Section 41 of the NERC Act 2006 Agriculturally unimproved grassland that would meet the criteria for selecting SINCs in Hampshire. A core non-statutory component of Hampshire's Local Ecological Network, which has been designed to identify and establish coherent ecological networks within Hampshire.
Other neutral grassland Assemblage of England Red List plants, e.g. lesser spearwort (VU); ragged-robin (NT); heath speedwell (NT).	County	The grassland within site predominantly comprises a semi-improved neutral sward indicative of seasonally wet soils. This includes areas of developing rush pasture. Drier neutral grassland is present on higher ground. Supports notable plant species that would meet the criteria for selecting SINCs in Hampshire. Neutral grassland is a Network Opportunity Areas component of Hampshire's Local Ecological Network, which has been designed to identify and establish coherent ecological networks within Hampshire's local planning authorities' areas.
Upper Lake (a pond)	County	A precautionary approach to valuing this pond has been applied on the basis that it may be integral to the functioning of the intermittent headwaters of Riders Lane Stream, which have been ascribed a nature conservation value of county. This pond is an ephemeral online feature of the central headwater stream (HS2) and contains a noteworthy marginal plant assemblage. Given its connection to the headwater streams it is likely to provide habitat for a range of invertebrate and macrophyte species and deliver an important role in providing resilience for the intermittent habitats and associated species as a whole. Further discussion on the baseline of this pond is provided in Appendix A9.3 Aquatic ecology in ES Volume 4.
Intermittent headwaters of Riders Lane Stream	County	Desk study and survey have identified these headwater streams as being small intermittent watercourses with varying degrees of modification. A species rich aquatic invertebrate assemblage is present within these watercourses, with surveys yielding seven regionally notable or rarer taxa (as identified by the Conservation Scores ascribed by the Community Conservation Index). Of these, there are two Nationally Scarce beetles (<i>Hydrochus angustatus</i> and <i>Ochthebius pusillus</i>), a Nationally Scarce caddisfly (<i>Limnephilus</i>

Resource	Value	Justification
		<i>bipunctatus</i>) and three Nationally Notable⁶⁴ beetles (<i>Ilybius chalconatus</i>, <i>Ochthebius marinus</i> and <i>Hydraena testacea</i>). The intermittent habitat typology, including the presence of groundwater upwellings, and the associated aquatic invertebrate assemblage is considered unusual within the county context and would likely meet the criteria for selecting SINCs in Hampshire. Therefore, the headwaters of Riders Lane Stream are considered important for the maintenance of intermittent headwater habitat and the conservation status of associated aquatic invertebrates within the county. Further detail on the nature conservation criteria applied to aquatic habitats can be found in Appendix A9.3 Aquatic ecology in ES Volume 4.
Unnamed tributary of Riders Lane Stream (The Lake Stream)	County	A precautionary approach to valuing this watercourse has been applied on the basis that the watercourse is likely to exhibit similar habitat characteristics to the intermittent headwaters of Riders Lane Stream and could support a species assemblage of similar value. Further detail on the nature conservation criteria applied to aquatic habitats can be found in Appendix A9.3 Aquatic ecology in ES Volume 4.
Riders Lane Stream	Local	Survey has identified the watercourse as being modified, including the presence of a number of structures which may act as barriers to fish movement. No notable aquatic invertebrate species were recorded, however species richness was moderate. As such, the watercourse is likely to provide value as an aquatic habitat and wildlife corridor within a local context. Further detail on the nature conservation criteria applied to aquatic habitats can be found in Appendix A9.3 Aquatic ecology in ES Volume 4.
Hermitage Stream	Local	This modified watercourse has artificial banks and beds throughout much of its length. Despite this modification the Hermitage Stream supports a range of aquatic species and provides local habitat connectivity. No notable aquatic invertebrate species were recorded during survey. There are records of bullhead and European eel. However, despite their respective designations, these species are well distributed throughout Hampshire as indicated by Environment Agency routine monitoring data.

⁶⁴ Note that the Nationally Notable species were identified on the Natural History Museum's UK species database. This designation has been superseded by the Nationally Scarce designation. In the absence of an updated status it is assumed that these species are also Nationally Scarce.

Resource	Value	Justification
		As such, the watercourse is likely to provide value as an aquatic habitat and wildlife corridor within a local context. Further detail on the nature conservation criteria applied to aquatic habitats can be found in Appendix A9.3 Aquatic ecology in ES Volume 4.
Bats	National	At least 13 species have been recorded at the reservoir site. The Site is of value for bat foraging, commuting and roosting. Further details on individual bat species are provided in the discussion section of Appendix A9.4 Bat survey report in ES Volume 4. The valuation is for the bat assemblage as a whole in the zone of influence, and takes account of the known roosts in the surrounding area.
Hazel dormice	County	A widespread species in Hampshire, but development pressure in the local area is high and could result in local declines.
Otters	Site	Habitats have the potential to be used by otters but surveys over a number of years have not recorded the species on Site.
Water voles	Negligible	Surveys over a number of years have not recorded the species on Site.
Badgers	Negligible	Common species offered legal protection for welfare reasons.
Birds	County value for breeding birds Local value for wintering birds	The reservoir footprint in general supports low numbers of breeding birds of conservation concern and the species recorded are likely to be present throughout the surrounding area (Havant Thicket woodland and Staunton Country Park). However, there is a relatively dense skylark population and nightjar have been recorded within site in Havant Thicket woodland and foraging within the reservoir footprint. Therefore, site is considered to be of County value for breeding birds. The reservoir footprint supports a range of wintering species typical of grassland and woodland habitats and significant concentrations of priority species were not recorded. The species recorded are likely to be present within the wider countryside surrounding the site.
Reptiles	County	The Reservoir site meets the criteria of a Key Reptile Site⁶⁵ of supporting three or more species of reptile or an exceptional population of a single species. Havant Thicket woodland supported only low populations of reptiles. Other woodlands were not surveyed. The open grassland habitat has low suitability for hibernating reptile and it is,

⁶⁵ Froglife Advice Sheet 10. Reptile Survey An introduction to planning, conducting and interpreting surveys for snake and lizard conservation (https://www.wildcare.co.uk/media/wysiwyg/pdfs/froglife_advice_sheet_10_-_reptile_surveys.pdf).

Resource	Value	Justification
		therefore, likely reptiles hibernate within surrounding habitats.
Great crested newt	Local	Small population within Havant Thicket woodland. Havant Thicket woodland and the reservoir site, contain large areas of suitable habitat and is likely to provide an important resource for this small great crested newt population. Areas of the reservoir footprint within 500m of these ponds are of lower suitability for great crested newts than the retained habitat in Havant Thicket woodland.
Invertebrates	Local	Due to the presence of similar habitats such as broadleaved woodland, open grassland and waterbodies within the landscape, the onsite invertebrate assemblage is considered to be of local value. Individual priority species recorded during the survey and identified within the desktop study are also likely to be present within the local landscape and/or are relatively common and widespread within Hampshire.

Potential impacts

Internationally and nationally designated sites

Potential impacts of the reservoir site including reservoir and access roads

- 9.229. There would be no direct impact on any internationally or nationally designated nature conservation sites.
- 9.230. Chichester and Langstone Harbours SPA and Ramsar site are located approximately 3.85 km south of the reservoir site. The Information to Inform a Habitat Regulations Assessment report concluded that based on the irregular usage and low recorded numbers of qualifying bird species of the Chichester and Langstone Harbour SPA and Ramsar Site, birds are not reliant on the reservoir site as supporting habitat to ensure the integrity of these sites is maintained as part of the SPA and Ramsar Site's conservation objectives.
- 9.231. The construction of the reservoir site has the potential to result in water quality degradation of statutory designated sites through mobilisation of sediment and pollutants, via hydrological connectivity: the Riders Lane Stream and Hermitage Stream. Further details on construction activities which have the potential to affect the water environment and proposed mitigation and compensation measures are provided the aquatic habitats and species section below and in Chapter 15 Water in ES Volume 2.
- 9.232. The operational phase also has the potential to result in impacts to hydrologically connected statutory designated sites via impacts associated with the compensation flows, emergency drawdowns and non-emergency routine drawdowns. Further details on these are provided in the aquatic habitats and species section below and in Chapter 15 Water in ES Volume 2.
- 9.233. The Chichester and Langstone Harbours SPA and Ramsar Site, the Solent Maritime SAC, the Solent and Dorset SPA and underpinning SSSIs are sensitive to changes in nitrate pollution that could threaten the integrity of these sites. Nutrient overload creates vast mats of algae over the Solent's mudflats, stopping oxygen getting through to the animals in the sediment and causing mass mortality, especially in hot weather. The analysis undertaken as part of a water quality study (Atkins 2020), shows that nitrate inputs to the Langstone and Chichester harbours would decline as nitrogen would be lost in the new reservoir as a result of natural denitrification processes and transfer of reservoir water to supply for drinking water. It also concluded that phosphorus concentrations downstream of the reservoir would be reduced after the reservoir is built, due to low

phosphorous concentrations within the reservoir compared to those in existing stream flows. Therefore, construction of the Havant Thicket Reservoir would reduce nitrate loading to these European sites, resulting in a beneficial effect on these sites.

- 9.234. Input of phosphorus from wildfowl is a recognised cause of eutrophication of lakes and reservoirs. In general, wildfowl populations that feed on lakes are a limited source of nutrients as a whole because much of their food and associated phosphorus comes from the lake. There are circumstances in which inputs of phosphorus from wildfowl become significant. This is the case where birds feed elsewhere and transfer the phosphorus from other locations to the lake. This occurs when birds roost beside lakes; for example, gull roosts typically on islands. A large roost of gulls would be a risk to water quality and could shift the reservoir towards mesotrophic conditions⁶⁶.
- 9.235. Research undertaken by the Solent Disturbance and Mitigation Project (SDMP)⁶⁷ concluded that recreational pressures along the Solent coastline have an adverse effect on qualifying birds of the Chichester and Langstone Harbours SPA and Ramsar Site and the Solent and Dorset SPA. The research identified that any new residential development within 5.6 km of these European sites has the potential to result in a likely significant effect on these European sites either alone or in combination with other plans or projects. Projected visitor numbers for the reservoir are approximately 318,000 per annum, an increase of 225,000 on the current estimated users⁶⁸. Given the presence of a visitor centre associated with the reservoir, wetland and surrounding woodland it is likely that a proportion of these visitors would otherwise have visited these European sites. This would result in a beneficial effect on Chichester and Langstone Harbour SPA as a result of the proposals.
- 9.236. No impacts on internationally or nationally designated sites were identified in the air quality and noise assessments on this Scheme during the construction and operational phases. Further information can be found in Chapter 7 Air Quality and Chapter 12 Noise and Vibration in ES Volume 2.
- 9.237. The Singleton and Cocking Tunnels SAC is located 15 km east of the Scheme and comprises two tunnels that are hibernation roosts for an assemblage of bats including Bechstein's bat (a qualifying species). The Scheme would result in the loss of four known individual Bechstein's bat day roosts and a single night roost in The Avenue woodland and Round Wood. It is not known if Bechstein's bat recorded within the reservoir site use the SAC tunnels as hibernation roosts. The potential that Bechstein's bat may be indirectly functionally linked to Singleton and Cocking Tunnels SAC via Southleigh Forest cannot be ruled out. There is therefore theoretical potential for impacts on the favourable conservation status of Bechstein's bat that hibernate in Singleton and Cocking Tunnels SAC.

Potential impacts of the Pipeline

- 9.238. The closest part of the pipeline corridor is approximately 1 km north of Chichester and Langstone Harbours SPA and Ramsar site. The pipeline corridor does not provide suitable habitat for qualifying bird species supported by Chichester and Langstone Harbours SPA and Ramsar site. Therefore, the construction of the pipeline would not indirectly affect bird species which are part of the SPA/Ramsar site citation.
- 9.239. Without mitigation the construction of the pipeline has the potential to result in the degradation of water quality within statutory designated sites, through mobilisation of sediment and pollutants, via hydrological connectivity with the Riders Lane Stream and Hermitage Stream. During the operational phase maintenance requirements could also result in water quality issues.

Locally statutory designated sites

- 9.240. There would be no direct or indirect impact on any LNRs as the closest reserve is over 800 m away with no hydrological connection to site.

⁶⁶ Atkins (2020). Havant Thicket Winter Reservoir Storage, Early Start Studies. Water Quality Study – Water Quality Modelling Report, Portsmouth Water

⁶⁷ http://www.solentems.org.uk/natural_environment_group/SRMP/SDMP/

⁶⁸ Planning Solutions Consulting Limited (2019). Havant Thicket Winter Storage Reservoir: Visitor number and recreational and amenity facilities review.

Non-statutory designated sites

Potential impacts of the reservoir site including reservoir and access roads

- 9.241. Construction at the reservoir site would affect seven SINC, selected predominantly for supporting woodland, by resulting in the loss of 14.55 ha of SINC within the reservoir footprint, as summarised:
- Middle Clearing SINC – 2.18 ha (100% of SINC area);
 - Part of Thicket Bottom SINC – 4.20 ha (53.77% of SINC area);
 - Part of Thicket Bottom Woods and Lake SINC – 4.16 ha (Round Wood and part of The Avenue, 26.66% of SINC area);
 - Part of Havant Thicket SINC – 3.54 ha (3.67% of SINC area);
 - Part of Havant Thicket (South-West Corner) SINC – 0.28 ha (3.29% of SINC area);
 - Part of Idsworth Common SINC – 0.17 ha (1.21% of SINC area); and,
 - Part of Bell's Copse SINC – 0.02 ha (0.06% of SINC area).
- 9.242. The SINC directly affected by habitat loss are shown in Figure 9.3 Loss of SINC, ancient woodland and priority habitat in ES Volume 3.
- 9.243. Impacts on Middle Clearing SINC, Thicket Bottom SINC and Thicket Bottom Woods and Lake SINC involve the permanent loss of woodland habitat and would sever the woodland connectivity across the reservoir site and the local SINC network between Havant Thicket to the north of the reservoir and Thicket Bottom to the south.
- 9.244. Impacts on Havant Thicket SINC, Havant Thicket (South-West Corner) SINC, Idsworth Common SINC and Bells Copse SINC would arise from construction of the northern access road. The route has been designed to follow an existing forestry track for the majority of its length; loss of trees and woodland habitat has been reduced as far as reasonably practicable in preliminary design. Potential impacts would largely be restricted to construction activities (e.g. soil compaction, changes to air quality from construction traffic and dust) leading to habitat degradation.
- 9.245. Construction of the reservoir would also result in the loss of 2.92 ha of woodland in Havant Thicket SINC. However, this area is included in the northern part of the Reservoir that would support wetland rather than open water. It is intended that the transitional zone within the normal water level fluctuations of the wetland would allow the retention of approximately 1 ha of existing woodland, which would be transformed into wet woodland. Manipulation of soil levels may allow additional wet woodland to be created, and this would be confirmed at detailed design. This would not constitute retention of the existing ancient woodland. The 1 ha to become wet woodland is counted as being retained in the SINC. However, this is a precautionary approach and all of the 2.92 ha would still support habitat of nature conservation value.
- 9.246. Havant Thicket SINC is also selected for supporting Bechstein's bat, hazel dormouse, and silver-washed fritillary and purple emperor butterflies. Potential impacts on these species are discussed in the bats, hazel dormice and invertebrates sections below.
- 9.247. The assessment in Chapter 7 Air Quality in ES Volume 2 only identified one SINC, Havant Thicket SINC, where NO_x concentrations would be above the critical level of 30 µg/m³⁶⁹ in 2023. High levels at this SINC were thought to be due to its proximity to the A3(M) and would have exceeded the critical level even without construction traffic associated with the Scheme. The change in NO_x concentrations was only 0.1 µg/m³. Three survey points, located on the northern access road within Havant Thicket SINC recorded nitrogen deposition rates in 2023 with the Scheme between 20 and 21 kg/N/yr and had the greatest change in percentage of critical load of nitrogen deposition as a result of the Scheme. The maximum change was 1.6%. APIS⁷⁰ identifies the critical load for coniferous woodland as 5-15 kg/N/yr and broadleaved deciduous woodland as 10-20 kg/N/yr. Overall there is a reduction in nitrogen deposition rates from the 2019 baseline (resulting from air quality improvements not associated with the Scheme) with or without the Scheme. The localised effects of the Scheme would be temporary during the construction phase and therefore no significant indirect impacts on SINC from air quality changes are anticipated.

⁶⁹ As outlined in Table 2.1 Critical Levels in Institute of Air Quality Management (May 2020). A guide to the assessment of air quality impacts on designated nature conservation sites.

⁷⁰ UK Air Pollution Information System (APIS) that provides a searchable database and information on pollutants and their impacts on habitats and species. <http://www.apis.ac.uk/>

- 9.248. The SINC's have mainly been designated for the habitats they support which would not be affected by noise disturbance but potential noise impacts on bats and birds that may be present within these SINC's are discussed in the relevant species sections below.
- 9.249. Localised changes in hydrology are considered below in relation to watercourses within the SINC's.
- 9.250. The reservoir footprint is currently used for informal recreation, such as dog walking. During the construction phase, these visitors would be displaced to other sites. The majority of users are considered likely to continue to use surrounding retained SINC's, particularly those within Staunton Country Park and Havant Thicket woodland.
- 9.251. On completion of construction, it is estimated that there would be a net increase of 225,000 visitors per annum⁷¹ to the reservoir site. This has the potential to affect the associated SINC's through increased recreational disturbance, anti-social behaviour and erosion of desire lines away from designated tracks and footpaths, which could result in habitat degradation within the SINC's.

Potential impacts of the Pipeline

- 9.252. Works would take place within three SINC's for the pipeline. Open trench construction within the pipeline corridor would affect two SINC's, selected predominantly for supporting semi-improved grassland, as a result of the temporary loss of 1.21 ha of SINC grassland habitat within the working width of the trench, as summarised:
- Part of Thicket Lawn SINC – 0.71 ha (6.72% of SINC area); and,
 - Part of High Lawn SINC – 0.5 ha (4.26% of SINC area).
- 9.253. This temporary loss would be for the duration of construction, with affected habitat reinstated following completion.
- 9.254. There would be localised work on a culvert and the pipeline corridor would also impinge on Great Copse SINC.

Ancient woodland

Potential impacts of the reservoir site including reservoir and access roads

- 9.255. The seven SINC's listed above that would be affected by construction at the reservoir site, support woodland listed on the Ancient Woodland Inventory. The ancient woodland sites directly affected by habitat loss are shown in Figure 9.3 Loss of SINC, ancient woodland and priority habitat in ES Volume 3. Construction at the reservoir site, including the northern access road would result in loss of a maximum of 13.67 ha of ancient woodland within the reservoir footprint, as summarised:
- ASNW at Middle Clearing SINC – 2.18 ha;
 - ASNW at Round Wood (part of Thicket Bottom Woods and Lake SINC) – 1.40 ha;
 - ASNW at The Avenue (part of Thicket Bottom SINC and Thicket Bottom Woods and Lake SINC) – 6.17 ha;
 - PAWS at Forest of Bere ancient woodland (where wetland encroaches into Havant Thicket SINC) – 2.86 ha
 - PAWS at Forest of Bere ancient woodland (along the northern access road; Havant Thicket SINC, Havant Thicket (South-West Corner) SINC and Bells Copse SINC) – 0.89 ha; and,
 - ASNW along the northern access road (Idsworth Common SINC) 0.17 ha.
- 9.256. Impacts on ASNW at Middle Clearing SINC, Thicket Bottom SINC and Thicket Bottom Woods and Lake SINC would comprise the permanent loss of woodland habitat and the severance of woodland connectivity across the reservoir site and the network of ancient woodland between Havant Thicket to the north of the reservoir and Thicket Bottom to the south.
- 9.257. Impacts on PAWS at Havant Thicket SINC, Havant Thicket (South-West Corner) SINC and ASNW at Idsworth Common SINC, would arise from construction of the northern access road. The route has been designed to follow an existing made forestry track for the majority of its length (0.22 ha of made track) and loss of trees and woodland habitat would be reduced as far as reasonably

⁷¹ Planning Solutions Consulting Limited (2019). Havant Thicket Winter Storage Reservoir: Visitor number and recreational and amenity facilities review.

practicable. Potential impacts would largely be restricted to construction activities (e.g. soil compaction, changes to air quality from construction traffic and dust) leading to habitat degradation.

- 9.258. Construction of the reservoir would also result in the loss of PAWS in Havant Thicket SINC. These areas would be included in the area that will support wetland habitat. Detailed design will refine the wetland design to minimise woodland loss as far as practicable. Following completion, it is intended that the transitional zone within the normal water level fluctuations of Compartments 2 and 3 would allow the retention of approximately 1 ha of the ancient woodland, which would develop into wet woodland. Manipulation of soil levels may allow additional wet woodland to be created, and this would be confirmed at detailed design. However, where manipulation of soil levels is undertaken this would not constitute retention of the existing ancient woodland.
- 9.259. Based on Natural England advice during consultation in 2020, the work over the existing longstanding track and alteration to wet woodland do not constitute ancient woodland loss in this instance, so the figures were reviewed. Taking this into account, the loss of ancient woodland would be reduced by 0.22 ha due to the use of the existing access track and by approximately 1 ha due to the alteration to wet woodland within the wetland, so with these amendments the overall loss is predicted to be 12.45 ha.
- 9.260. As described above in the locally and non-statutory designated sites section, there could be potential impacts on ancient woodland from an increase in recreational use following completion of construction.
- 9.261. During the construction phase, ancient woodland within the reservoir site that would not be affected by direct habitat loss, including ASNW at Cabbagefield Row SINC, could be affected by incursions from construction activities which could result in the degradation of ancient woodland. Similarly, ancient woodland sites partially within or adjacent to site could be degraded during construction.
- 9.262. Air quality in relation to woodland habitats is discussed in detail above in relation to Havant Thicket SINC, which includes ancient woodland. The temporary localised construction phase changes in air quality are not considered likely to result in significant indirect impacts on ancient woodlands.
- 9.263. Localised changes in hydrology are considered below in relation to watercourses within the woodlands.

Potential impacts of the Pipeline

- 9.264. Construction of the pipeline corridor is not predicted to result in direct impacts on ancient woodland. However, there would be work to a culvert in close proximity Great Copse ASNW, so there is potential for indirect impacts.

Veteran and notable trees

Potential impacts of the reservoir site including reservoir and access roads

- 9.265. Seventeen veteran trees have been identified that would be permanently lost as a result of the Scheme. The layout and design of the Scheme has avoided loss of other veteran trees.

Potential impacts of the Pipeline

- 9.266. The scheme design has been designed to avoid as many veteran trees as possible, with alterations including the re-alignment of the pipeline corridor.
- 9.267. The veteran trees that lie within or adjacent to the construction working areas would be retained during construction through appropriate mitigation measures and would need to be defined within the Arboricultural Method Statement following good practice in tree protection, set out in the REAC in the OEMP in Appendix A2.1 in ES Volume 4.

Priority habitats

Potential impacts of the reservoir site including reservoir and access roads

- 9.268. Lowland mixed deciduous woodland, wet woodland, purple moor-grass and rush pasture, and lowland dry acid grassland priority habitats have been recorded within the reservoir site. The potential impacts on these habitats in the absence of mitigation are outlined below.

Lowland mixed deciduous woodland

- 9.269. Field surveys have confirmed the presence of lowland mixed deciduous woodland priority habitat in The Avenue (this has also been identified as wood-pasture and parkland from the desk study), Havant Thicket SINC and Cabbagefield Row SINC.
- 9.270. Construction at the reservoir site would result in the permanent loss of 6.31 ha of lowland mixed deciduous woodland in The Avenue (slightly larger than area of ancient woodland loss due to small area to north of Upper Lake not being ancient woodland) and the loss / modification of 0.62 ha in Havant Thicket SINC to the reservoir development. Cabbagefield Row would not be affected by habitat loss.
- 9.271. Lowland mixed deciduous woodland present within site but not affected by habitat loss, could be affected by incursions from construction activities potentially resulting in habitat degradation.
- 9.272. Air quality in relation to woodland habitats is discussed in detail above in relation to Havant Thicket SINC, which includes lowland mixed deciduous woodland. The temporary localised construction phase changes in air quality are not considered likely to result in significant indirect impacts on lowland mixed deciduous woodlands.

Wet woodland

- 9.273. Field surveys have confirmed the presence of wet woodland priority habitat in Havant Thicket SINC. The woodland, dominated by downy birch, has developed from natural succession of remnant heathland on naturally wet soils.
- 9.274. Creation of the reservoir would affect 0.19 ha of wet woodland. However, following completion, it is intended that the transitional zone within the normal water level fluctuations of Compartments 2 and 3 would allow the development of approximately 1 ha of wet woodland.
- 9.275. Wet woodland present within site but not affected by habitat loss could be affected by incursions from construction activities potentially resulting in habitat degradation.
- 9.276. Air quality in relation to woodland habitats is discussed in detail above in relation to Havant Thicket SINC, which includes wet woodland. The temporary localised construction phase changes in air quality are not considered likely to result in significant indirect impacts on wet woodlands.

Purple moor-grass and rush pasture

- 9.277. Field surveys have confirmed the presence of purple moor-grass and rush pasture priority habitat in small areas along the margins of the streams and in hollows with impeded drainage within the reservoir footprint.
- 9.278. Construction at the reservoir site would result in the permanent loss of 1.21 ha of purple moor-grass and rush pasture.
- 9.279. Purple moor-grass and rush pasture present within site but not affected by habitat loss could be affected by accidental incursions from construction activities potentially resulting in habitat degradation. The temporary localised construction phase changes in air quality are not considered likely to result in significant indirect impacts on purple moor-grass and rush pasture.

Lowland dry acid grassland

- 9.280. Field surveys have confirmed the presence of lowland dry acid grassland within the reservoir site. This habitat would not be affected by habitat loss but could be affected by accidental incursions from construction activities potentially resulting in habitat degradation. The temporary localised construction phase changes in air quality are not considered likely to result in significant indirect impacts on lowland dry acid grassland.

Potential impacts of the Pipeline

Wood-pasture and parkland and deciduous woodland

- 9.281. The desk study has identified the presence of wood-pasture and parkland and deciduous woodland in Thicket Lawn SINC and High Lawn SINC, and deciduous woodland within Great Copse SINC within the pipeline corridor.
- 9.282. Open trench construction within the pipeline corridor would result in the temporary loss of 1.21 ha of wood-pasture and parkland within the working width of the trench. It is understood that detailed design and good site practice will ensure all mature trees are protected during pipeline works.

- 9.283. This temporary loss would be for the duration of construction and affected habitat would be reinstated following completion.

Summary of habitat losses and habitat created

- 9.284. A summary of the permanent habitat losses of priority habitat and non-priority habitat, within the reservoir footprint is provided in **Table 9-7** below. Habitat losses within the pipeline corridor would be temporary, and affected habitat would be reinstated following completion of construction works and is therefore not included in this table.

Table 9-8 - Summary of habitat losses within the reservoir footprint

Habitat type	Comments	Area Lost (ha)
Ancient Semi-Natural Woodland	IRREPLACEABLE HABITAT ASNW at Middle Clearing – 2.18 ha; ASNW at Round Wood (part of Thicket Bottom Woods and Lake SINC) – 1.40 ha; ASNW at The Avenue (part of Thicket Bottom SINC and Thicket Bottom Woods and Lake SINC) – 6.17 ha; ASNW along the northern access road (Idsworth Common SINC) 0.17 ha Includes some Priority Habitat – Lowland mixed deciduous and wet woodland and other non-priority woodland	9.92
Plantation on Ancient Woodland Sites	IRREPLACEABLE HABITAT Forest of Bere ancient woodland (where wetland encroaches into Havant Thicket SINC) – 2.86 ha – 1 ha changed to wet woodland Forest of Bere ancient woodland (along the northern access road; Havant Thicket SINC, Havant Thicket (South-West Corner) SINC and Bells Copse SINC) – 0.89 ha – 0.22 ha existing track	2.53
Purple moor-grass and rush pastures	Priority Habitat	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 ⁷²	Non-Priority Habitat	0.39
Made-up track with grass verges	Non-Priority Habitat	1.02

⁷² Further information on Upper Lake provided in Aquatic habitats and species section below.

Table 9-9 - 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	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

9.285. The Scheme would also result in construction of features such as the visitor centre and access roads (hence habitat loss does not equal habitat created).

9.286. 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
- 15.42 ha grassland
- 1.29 ha species poor rush pasture

Priority plant species

Potential impacts of the reservoir site including reservoir and access roads

9.287. The noteworthy/notable species which have been recorded within the reservoir footprint, and would therefore be affected by habitat loss, are assemblages associated with the following habitat types:

- Lowland mixed deciduous woodland, e.g. sanicle (NT)⁷³; wood-sorrel (NT); wild strawberry (NT)
- Purple moor-grass and rush pasture, e.g. lesser spearwort (VU); ragged-robin (NT); marsh pennywort (NT); marsh St John's-wort (NT); and,
- Other neutral grassland, e.g. lesser spearwort (VU); ragged-robin (NT); heath speedwell (NT).

9.288. In addition to the loss of local populations of notable plant species through site clearance, populations within the reservoir site not directly affected by habitat loss could be affected by habitat degradation, through accidental incursions from construction activities. For mitigation, notable plants are considered and reported as part of the habitat supporting them within this chapter.

9.289. The temporary localised construction phase changes in air quality are not considered likely to result in significant indirect impacts on priority plant species.

Potential impacts of the Pipeline

9.290. No noteworthy/notable species are anticipated to be affected by the pipeline.

Aquatic habitats and species

9.291. There are several elements of the Scheme which have the potential to impact aquatic habitats and species during construction and operation. These are:

- the reservoir and embankment footprint;
- culvert works;

⁷³ Red list status (Stoh et al. 2014); EN = Endangered, VU = Vulnerable, NT = Near Threatened

- pipeline crossings;
 - construction site compound footprint and associated construction works;
 - reservoir site water management;
 - discharge regime, compensation flow and discharge quality; and
 - discharges to watercourses associated with routine reservoir drawdown.
- 9.292. Further details on construction and operational activities which have the potential to affect the water environment are provided in Chapter 15 Water in ES Volume 2. Potential impacts to aquatic habitats and species resulting from Scheme elements are covered here.
- 9.293. No impact pathways to aquatic ecological receptors have been identified in relation to the construction and operation of the access roads, given that there are no watercourse crossings for either the northern or southern access roads.
- 9.294. Potential impacts of the reservoir are described, followed by those relating specifically to the pipeline. Subheadings are provided for the different aquatic receptors, and then dividing construction from operation phase impacts for clarity.

Potential impacts of the reservoir site

Watercourse habitats - Intermittent headwaters of Riders Lane Stream

Construction

- 9.295. The construction of the reservoir would result in a direct loss of 3.7 km of intermittent headwater channel under the footprint of the reservoir (see Figure 9.2 Aquatic habitats in ES Volume 3 for location of watercourses). These losses across five streams equate to 42% of the linear length of headwaters within the Hermitage Stream catchment area.
- 9.296. The loss of these streams would initially be associated with the requirement to intercept flows draining into the reservoir footprint during construction. This would alter the structure and function of these aquatic habitats via the removal of incoming flows. Further impacts to these watercourses would continue through subsequent construction phases, including borrow pit excavation, embankment construction and reservoir filling, until these streams are fully lost under the footprint of the reservoir.
- 9.297. The Scheme design also includes the requirement for existing culverts over two of the intermittent headwaters of Riders Lane Stream (HS1 and HS2) to be replaced or extended.
- 9.298. These watercourses have been identified as important features within the county due to the rarity of the habitat typology (i.e. ephemeral watercourse habitat), as well as the presence of notable aquatic invertebrate species which are considered likely to be poorly distributed and rare within the county context. It is unlikely that the intermittent headwaters of Riders Lane Stream provide optimal habitat for fish, due to frequent channel drying, except for potentially low numbers of minor species, that are resilient to environmental disturbance and can quickly recolonise, such as stickleback.

Operation

- 9.299. The presence of the reservoir would act to create a permanent barrier between the upper extents of three intermittent headwaters of Riders Lane Stream (HS1, HS2 and HS3) within Havant Thicket woodland, and the downstream catchment affecting the current function of the watercourse system through a loss of connectivity and changes to the natural sediment regimes and aquatic species movements.

Watercourse habitats - Riders Lane Stream

Construction

- 9.300. The Scheme would result in the removal of flow from 0.1 km of functional watercourse immediately downstream of the reservoir, as a result of the requirement to manage surface water flows draining into the reservoir footprint during construction. This effect would continue into operation given that it is situated upstream of the proposed compensation flow discharge.

- 9.301. Mitigation to reduce risks to aquatic habitats and species is described in the design, mitigation and enhancement measures section of this chapter and within the REAC in Appendix A2.1 OEMP in ES Volume 4.

Operation

- 9.302. To alleviate the potential effects of changes to the natural hydrological regime of the watercourses downstream of the reservoir, a compensation flow would be developed for Riders Lane Stream. The discharge regime of the compensation flow into Riders Lane Stream would be developed during detailed design and would be subject to agreement with the Environment Agency.
- 9.303. Conceptually, this could be:
- 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 (provision of wetting and drying cycles); or
 - a hybrid regime based on the two options above.
- 9.304. The compensation flow could alter extent and duration of aquatic habitat availability and the composition of aquatic invertebrate, fish and macrophyte communities. However, this is not considered likely to result in a negative impact given that the flow would be developed with reference to ecological flow targets which are set for WFD reportable rivers, based on reference conditions. Ecological flow targets are effectively the flows required to support the attainment of 'Good' ecological status within a water body.
- 9.305. Water quality modelling undertaken by Atkins has shown there is no risk of a deterioration in the Water Framework Directive chemical status, with mass balance reductions in phosphorus (1%), ammonia (49%) and Biochemical Oxygen Demand (15%). The model predicts increases in some non-WFD determinants for which more information is provided in Chapter 15 Water in ES Volume 2.
- 9.306. These changes are considered likely to result in some alteration to the distribution and composition of aquatic invertebrates and macrophytes within the downstream receiving watercourses. However, the quantification of any change would be difficult to determine. It is anticipated that changes in calcium, alkalinity and conductivity may result in an improvement in primary and secondary productivity in the watercourses.
- 9.307. Overall, the magnitude of the change of modelled water quality, is not anticipated to negatively affect ecological functioning of watercourses. This is in context of an existing ecological community indicative of (natural) wetting and drying and current catchment pressures resulting from an urban environment.
- 9.308. Non-emergency routine drawdowns would be required during operation for inspection and maintenance of the emergency drawdown infrastructure. These are assumed to be 10% of the emergency drawdown flow and be required twice a year.
- 9.309. The routine drawdowns equate to an input of 0.70m³/s on the Riders Lane Stream. No gauged flows for Riders Lane Stream are available to inform this impact assessment. Q5 downstream at the Hermitage Stream gauging station is 0.883 m³/s. The routine drawdown flows are therefore likely to result in high flows equivalent to those exceeded less than 10% of the time within Riders Lane Stream. However, these flows may be within the 'normal' flow thresholds for the watercourse given that QMED is 8.95 m³/s for the Hermitage Stream and flood modelling indicates that QMED for Riders Lane Stream is approximately 3.0 m³/s.
- 9.310. Nonetheless, uncertainty over the existing flows within Riders Lane Stream and the expected increase in the frequency of high flow events as a result of routine drawdown, it is considered likely that there could be a temporary negative effect on aquatic species during these events. That said high flows are also an important mechanism for the maintenance of habitat diversity and quality.
- 9.311. Precise scheduling parameters of these routine drawdowns are to be developed during detailed design following Environment Agency guidance. Careful planning will ensure tests are undertaken at optimal times to minimise potential negative effects e.g. the system would not be tested if the additional discharge could result in flooding, or if the river is unusually low.

Watercourse habitats - Hermitage Stream

Construction

- 9.312. No construction phase impacts on the Hermitage Stream are predicted as a result of the reservoir construction.

Operation

- 9.313. To alleviate the potential effects of changes to the natural hydrological regime downstream of the reservoir resulting from the loss of incoming flow, a compensation flow will be developed for Riders Lane Stream which flows into Hermitage Stream. The compensation flow could alter extent and duration of aquatic habitat availability and the composition of aquatic invertebrate, fish and macrophyte community composition). However, this is not considered likely to result in a negative impact on the Hermitage Stream given that the flow will be developed with reference to ecological flow targets. Any changes to flow and chemistry on the Hermitage Stream resulting from the compensation flow are likely to be less pronounced than in the Riders Lane Stream due to the greater dilution potential given the flow inputs from its own upstream reaches.
- 9.314. Non-emergency routine drawdowns would be required during operation for inspection and maintenance of the emergency drawdown infrastructure. Routine drawdowns are assumed to be 10% of the emergency drawdown flow and be required twice a year. This equates to 0.38m³/s directly discharging to the Hermitage Stream via the Emergency Discharge Valve.
- 9.315. Mean flow downstream at the Hermitage Stream gauging station is 0.24 m³/s. The routine drawdown flows discharging to the Hermitage Stream (0.38m³/s) would be greater than average flows. However, these flows are likely to be within the 'normal' flow thresholds for the watercourse given that QMED is 8.95.
- 9.316. Nonetheless, there is potential for temporary effects on aquatic species within Hermitage Stream during these events, but there is recognition that high flows are also an important mechanism for the maintenance of habitat diversity and quality.

Pond habitats - Upper Lake

Construction

- 9.317. The construction of the reservoir would result in the permanent direct loss of Upper Lake a feature of County importance due to its connectivity with the central intermittent headwater stream (HS2) which provides a relatively rare type of ephemeral habitat, as well as the fact it supports notable species which are rare within the county.
- 9.318. A second pond within Havant Thicket woodland would become connected to the new wetland.

Operation

- 9.319. No operational impacts are anticipated.

Summary of potential impacts on aquatic habitats and species in relation to the Reservoir

- 9.320. In the absence of mitigation there is potential for significant impacts to aquatic habitats and species in relation to permanent watercourse and pond habitat loss and changes to flow and chemistry in the watercourses downstream of the reservoir (Riders Lane Stream and Hermitage Stream).

Potential impacts of the Pipeline

Watercourse habitats - Riders Lane Stream

Construction

- 9.321. A construction compound would be situated adjacent to Riders Lane Stream at NGR SU 71742 08731 within an existing area of amenity grassland. No direct losses of watercourse habitat have been identified in relation to its placement and the tree lined riparian corridor is unaffected.
- 9.322. There would be temporary loss and/or disturbance to the watercourse banks and riparian zone associated with the construction of three culvert upgrades on Riders Lane Stream. These culvert upgrades are required to increase culvert capacity under Middle Park Way (NGR SU 71761 08669),

Dunsbury Way (NGR SU 71302 08168) and Purbrook Way (NGR SU 71179 07781) to facilitate emergency reservoir drawdown should it be required. The design includes the retention of existing culverts with the construction of additional new culverts adjacent to these. All new culverts would be approximately the same length as those that currently exist. Details on culvert sizes is provided in Chapter 15 Water in ES Volume 2.

- 9.323. The three culvert upgrades have the potential to result in localised effects on Riders Lane Stream during construction. These effects include the potential for localised temporary disturbance to aquatic habitats and species associated with construction noise/vibration, physical harm resulting from in channel works and minor temporary and permanent losses of riparian habitat.
- 9.324. Since the existing culverts would be retained and would remain in situ during construction there are no permanent impacts anticipated on fish passage and habitat availability for fish or aquatic invertebrates.
- 9.325. One pipeline crossing is required on Riders Lane Stream. A reasonable 'worst case' scenario has been assessed in which it has been assumed that the pipeline crossing of Riders Lane Stream would be constructed using an open cut trench approach, whereby the stream flow is diverted, a trench is dug into the bed of the watercourse, the pipe laid and then the bed reinstated. This method is more invasive than a trenchless drilling method which is also being considered within the design and construction feasibility process.
- 9.326. Assuming open cut construction methods are used, the pipeline crossing would result in a temporary loss of riparian and in channel habitat, as a result of the requirements to use coffer dams and to over pump the working area. The works would require a 20 m in-channel working width. This could temporarily affect local resource availability for fish, aquatic invertebrates and macrophytes during the construction works only.
- 9.327. The construction of the pipeline crossing would act as a temporary barrier to fish movement. However, pipeline construction is due to be undertaken in stages with small segments being constructed over short durations. Therefore, assuming best practice construction management (as outlined in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4), the temporary effects associated with any in channel barriers resulting from pipeline crossing construction are unlikely to affect aquatic species in the long term. Mitigation to reduce risks to aquatic habitats and species is described in the design, mitigation and enhancement measures section of this chapter and within the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4.

Operation

- 9.328. No operational impacts are predicted as a result of the pipeline.

Watercourse habitats - Unnamed tributary of Riders Lane Stream (The Lake Stream)

Construction

- 9.329. One pipeline crossing is required on an unnamed tributary of Riders Lane Stream (The Lake Stream).
- 9.330. Assuming an open cut construction methodology (as stated for the Riders Lane Stream), the pipeline crossing would result in a temporary loss of riparian habitat and availability of in channel habitat, as a result of the requirements to use coffer dams and to over pump the working area. The works would require a 20 m in channel working width. This could affect local resource availability for fish, aquatic invertebrates and macrophytes during the construction works only.
- 9.331. The construction of the pipeline crossing would act as a temporary barrier to fish movement. However, pipeline construction would be undertaken in stages with small segments being constructed over short durations. Therefore, assuming best practice construction management (as outlined in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4), the temporary effects associated with any in channel barriers resulting from pipeline crossing construction are unlikely to affect aquatic species in the long term.

Operation

- 9.332. No operational impacts have been identified as a result of the pipeline.

Watercourse habitats - Hermitage Stream

- 9.333. One pipeline crossing is required on Hermitage Stream.
- 9.334. Assuming open cut construction methodology (as stated for the Riders Lane Stream), the pipeline crossing would result in a temporary loss of riparian habitat and availability of in channel habitat, as a result of the requirements to use coffer dams and to over pump the working area. The works would require a 20 m in channel working width. This could affect local resource availability for fish, aquatic invertebrates and macrophytes during the construction works only.
- 9.335. The construction of the pipeline crossing would act as a temporary barrier to fish movement. However, pipeline construction is to be undertaken in stages with small segments being constructed over short durations. Therefore, assuming best practice construction management (as outline in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4), the temporary effects associated with any in channel barriers resulting from pipeline crossing construction is unlikely to affect aquatic species in the long term.

Operation

- 9.336. No operational impacts have been identified as a result of the pipeline.

Summary of potential impacts on aquatic habitats and species in relation to the Pipeline

- 9.337. Potential impacts have been identified, but assuming best practice construction management no potential long term effects are predicted.

Bats

Potential impacts of the reservoir site including reservoir and access roads

- 9.338. The proposals would result in the loss of approximately 14 ha of woodland and scrub / tree line habitat, which provide suitable foraging habitat for a variety of bat species. The loss of The Avenue would result in the loss of a commuting corridor and habitat link between Staunton Country Park with Havant Thicket woodland which provides important connectivity in the context of the wider landscape. Over 120 ha of grassland, which would also contribute to foraging opportunities for bats, would also be lost. Once constructed, the reservoir and associated wetland and surrounding created habitats would provide suitable foraging habitat for bats.
- 9.339. In the absence of mitigation, there would be potential to affect commuting, foraging and roosting bats indirectly, such as through disturbance due to new temporary and permanent lighting and due to noise during construction.

Potential impacts of the Pipeline

- 9.340. The pipeline corridor mainly impacts on habitats of low value for bats, such as hardstanding and amenity grassland, although there would be some small scale temporary loss of scrub and localised impacts to watercourses associated with the pipeline crossing and culvert works. These would result in temporary loss of foraging and commuting habitat for bats. Lighting during construction could also cause temporary disturbance.

Hazel dormice

Potential impacts of the reservoir site including reservoir and access roads

- 9.341. Hazel dormouse was recorded locally across site in association with woody and scrub habitats, such as The Avenue. Onsite habitat is mostly well connected via treelines and it is therefore likely that hazel dormouse utilises the majority of available woodland and scrub habitat within and around the site. In the absence of mitigation, proposals would result in the loss of approximately 14 ha of hazel dormouse habitat. This area includes woodland and scrub / tree line habitat including broadleaved woodland (including plantation) associated with The Avenue, Middle Clearing and Round Wood and coniferous woodland at the Corsican Pine Plantation.
- 9.342. At a site level, in the absence of mitigation the dormouse population would be negatively affected through the fragmentation and loss of dormouse habitat. The key loss of connectivity relates to the broadleaved woodland linkage between Staunton Country Park and Havant Thicket woodland

provided by The Avenue. There would be long-term loss of suitable hazel dormouse habitat and fragmentation of retained habitat.

9.343. There is potential for an increase in informal human access to retained habitats and a subsequent risk of disturbance to hazel dormice due to the likely increase in visitors to site and surrounding areas due to the recreational opportunities of a reservoir site.

9.344. In the absence of mitigation and compensation, hazel dormice within site may be killed and/or injured as a result of the development.

Potential impacts of the Pipeline

9.345. The ECOSA surveys of the pipeline corridor (see Appendix A9.13 Pipeline Preliminary Ecological Appraisal in ES Volume 4) identified five sections of tree line and hedgerow, all located in the northern part of the pipeline corridor which provide suitable habitat for hazel dormouse. Without mitigation these would be temporarily severed resulting in a loss of habitat connectivity and there could be risks of killing or injury of individual dormice.

Otters

Potential impacts of the reservoir site including reservoir and access roads

9.346. Otters are currently considered to be absent from the reservoir site although there is potential for them to make occasional use of the habitats. Suitable habitat (wooded stream corridors and woodland linked to watercourses) within the reservoir footprint would be lost during the construction phase. There is potential for otters to colonise site prior to the start of construction which could result in the loss of holts and resting places. Potential commuting routes to the headwater streams in Havant Thicket woodland would be severed during the construction phase.

9.347. The distribution and population of otters in England is continuing to expand. Once constructed the reservoir and associated wetland would provide suitable foraging habitat for otters and secluded areas around the reservoir and within the adjacent woodlands could provide potential holt and resting places. Therefore, it is considered likely otters would colonise the reservoir site post construction.

Potential impacts of the Pipeline

9.348. Otters are currently considered likely to be absent from the sections of the Hermitage and Riders Lane streams directly affected by the pipeline construction, although there is potential for them to make occasional use of the stream corridors. In channel works, such as for the culvert upgrades and pipeline crossing on Riders Lane Stream, could result in temporary disturbance of usual commuting routes. This could force otters to use roads or bridges that might mean they are more likely to be killed or injured on the road. Changes in water quality during the construction phase could reduce the availability and quality of food sources.

Water voles

Potential impacts of the reservoir site including reservoir and access roads

9.349. Water vole is likely to be absent from the reservoir site and, therefore, no negative impact on this species as a result of the reservoir construction is anticipated. Once constructed, the wetland would provide suitable habitat for water vole and there is potential for enhancements to be made for water vole, post construction, if they colonised naturally or by an introduction programme.

Potential impacts of the Pipeline

9.350. The majority of the pipeline route would be set back at least 5 m from stream bank and survey work indicates water voles are currently likely to be absent from the sections that could be directly affected by in channel works, such as the culvert upgrades and pipeline crossing on Riders Lane Stream. If present at the time of the works, the in channel works could result in direct impacts on water vole burrows. Where the spillways are installed there may be long-term loss of potential bankside habitat for water vole.

Badgers

Potential impacts of the reservoir site including reservoir and access roads

- 9.351. Based on the badger surveys in 2018 and 2020 there would be no loss or disturbance of active badger setts as a result of the development. If badger setts become active on site in advance of construction works commencing there is potential for badgers to be disturbed through noise, vibration or physical harm whilst occupying their setts.
- 9.352. In the absence of mitigation, proposals would result in the loss of approximately 140 ha of habitat that has the potential to be used by foraging or commuting badgers. Given the limited evidence of the species recorded within site it is likely that only a small number of individuals would be affected. Woodland within site with suitability for sett construction would also be lost.
- 9.353. Additional recreational pressure within Havant Thicket woodland may, in the absence of mitigation, cause additional disturbance to badgers present locally.
- 9.354. The development could result in an increase in night-time traffic on site, which, if unmitigated, increases the potential for badgers to be involved in road traffic accidents. During the day badgers are unlikely to be active, vehicles would be moving slowly, and no setts have been recorded close to the northern access road. As a result they are unlikely to be affected by daytime traffic.
- 9.355. There is potential for badgers to be trapped within excavations during constructions works associated with the reservoir construction.

Potential impacts of the Pipeline

- 9.356. The construction works associated with the pipeline would result in a minor temporary loss of suitable foraging habitat. Whilst unlikely, it is possible that a badger sett may become active along the pipeline route prior to construction commencing. Badgers may also become trapped in excavations if left uncovered overnight.

Birds

Potential impacts of the reservoir site including reservoir and access roads

- 9.357. As discussed above in relation to internationally designated sites Chichester and Langstone Harbours SPA and Ramsar site are located approximately 3.85 km south of the reservoir site. The Information to Inform a Habitat Regulations Assessment report concluded that based on the irregular usage and low recorded numbers of qualifying bird species of the Chichester and Langstone Harbour SPA and Ramsar Site, birds are not reliant on the reservoir site as supporting habitat to ensure the integrity of these sites is maintained as part of the SPA and Ramsar Site's conservation objectives. Further information can be found in the Information to Inform the Habitats Regulation Assessment.
- 9.358. In the absence of mitigation, proposals would result in the loss of grassland, streams and ditches and woodland habitat within the footprint of the reservoir that would result in loss of breeding bird territories and of foraging and roosting habitat for wintering birds. The majority of wintering and breeding birds affected by the scheme are common and widespread.
- 9.359. The Scheme would likely result in the loss of a number of territories of notable species from the reservoir footprint. During the construction phase there is likely to be loss of 11 skylark territories, four meadow pipit territories, at least two of the eight song thrush territories, one of the four dunnoek territories and single territories of linnet, mallard, marsh tit, stock dove and tawny owl. Kestrel has been excluded given that the species was not confirmed as breeding on the site (and grassland margins with suitable feeding opportunities would remain post-development). Post-construction some recolonization of habitats around the periphery of the reservoir would be expected but the loss of large areas of grassland makes it likely that there would a permanent reduction in skylark territories.
- 9.360. The majority of impacts are associated with common and widespread species including blackbird, blackcap, blue tit, chiffchaff, chaffinch, coal tit, green woodpecker, goldcrest, goldfinch, great spotted woodpecker, great tit, long-tailed tit, nuthatch, robin, stonechat, treecreeper, woodpigeon, whitethroat and wren. These species are all likely to breed in habitats in the wider landscape.
- 9.361. There is potential for short-term noise disturbance to breeding birds within retained onsite and adjacent habitat. This is particularly relevant to firecrest, a Schedule 1 species protected from

disturbance when breeding which was recorded holding territories within Havant Thicket woodland and Staunton Country Park in close proximity to the proposed construction areas. There is also the potential for disturbance and loss of foraging habitat of nightjar that have been recorded in Havant Thicket woodland/Bells Copse.

- 9.362. If vegetation clearance is undertaken during the core breeding season (1 March to 31 August, subject to seasonal variation) then there is potential for damage or destruction of occupied nests.
- 9.363. The removal of The Avenue would potentially affect woodland species that use this feature to commute between Staunton Country Park and Havant Thicket woodland. The removal of woodland onsite would reduce cavities for nesting birds.
- 9.364. Post construction, and in the absence of mitigation, the increase in public access to site is likely to result in negative impacts on ground nesting birds and waterbirds through disturbance, especially in relation to dog walkers.
- 9.365. The proposal has the potential to provide landscape scale improvements to the bird assemblages across site and wider area. With appropriate design and management the proposal would also significantly diversify the bird populations across Staunton Country Park, the reservoir site and Havant Thicket woodland.

Potential impacts of the Pipeline

- 9.366. As with the reservoir site, works within the pipeline corridor could directly affect nesting individuals during vegetation clearance works if undertaken in the nesting bird season (1 March to 31 August, subject to seasonal variation) and indirectly through noise disturbance.

Reptiles

Potential impacts of the reservoir site including reservoir and access roads

- 9.367. In the absence of mitigation, proposals would see the loss from the reservoir site of approximately 140 ha of reptile habitat, including grassland, rush pasture, woodland edge and habitats along streams and ditches.
- 9.368. In the absence of mitigation and compensation, the reptiles located in the site may be killed/injured as a result of the development and there would be a long-term loss of suitable reptile habitat.

Potential impacts of the Pipeline

- 9.369. In the absence of mitigation, works to install the pipeline would result in the temporary loss of habitat with potential to support reptiles.

Great crested newts

Potential impacts of the reservoir site including reservoir and access roads

- 9.370. A low population of great crested newt is present within site. Environmental DNA testing returned a positive result for three ponds within the Havant Thicket woodland Ecological Enhancement Area to the north of the reservoir footprint and a single great crested newt was seen in one of these ponds in 2009. Great crested newt typically uses suitable terrestrial habitat up to 500 m from a breeding pond. However, there is a notable decrease in great crested newt abundance beyond a distance of 250 m from a breeding pond⁷⁴. The closest pond is approximately 122 m from the reservoir footprint, while the other two ponds are between 250 m and 500 m from the reservoir footprint. Therefore, in the absence of mitigation, proposals would result in the loss of a small amount of great crested newt terrestrial habitat within the reservoir footprint which lies within commuting distance from the nearest breeding waterbodies of this species.
- 9.371. No core terrestrial habitat (within 50 m of breeding ponds) would be lost as a result of the proposals. Based on a worst case scenario up to 2.63 ha of intermediate habitat (between 50 m and 250 m from breeding ponds) would be temporarily lost as a result of the development. This area comprises the north-east corner of the reservoir footprint, which would be affected by localised ground

⁷⁴ Natural England (2004). An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt (ENRR576). <http://publications.naturalengland.org.uk/publication/134002>.

manipulation to form compartment 0 of the wetland. Once established this area would be a habitat mosaic with high suitability for great crested newt (scrub, marshy grassland, wetland edge habitat).

- 9.372. Approximately 0.46 ha of suitable great crested newt intermediate terrestrial habitat (between 50 m and 250 m from breeding ponds) would be permanently lost as this area is located below the high-water mark of the reservoir. This equates to the loss of approximately 2% of the suitable habitat within 250 m of the Havant Thicket woodland breeding ponds. However, this area of permanent loss is located within the retained wetland on the northern edge of the reservoir footprint, an area with potential for great crested newt during their aquatic phase.
- 9.373. The retained 98% of suitable habitat within 250 m of breeding ponds comprises broadleaved woodland and coniferous woodland with high suitability for great crested newt. As a result, it is likely that individuals would remain in the retained woodland habitat during the terrestrial phase rather than moving into grazed grassland within the reservoir footprint, which is of lower value to the species.
- 9.374. In light of the low population and retained habitat of high suitability surrounding the ponds the potential impacts of the Scheme on great crested newt are limited.
- 9.375. One pond (Upper Lake, a shaded pond within woodland clearing in The Avenue) would be lost to the reservoir and the water from the wetland would encroach into Pond 16 (a medium sized, completely shaded waterbody with moderate water quality and no macrophyte cover) in Havant Thicket woodland. Neither of these ponds have been recorded as supporting great crested newts. Surveys of Upper Lake identified that it does provide habitat for more common amphibians, such as palmate newt, and therefore in the absence of mitigation more common amphibians may be killed/injured as a result of the development.

Potential impacts of the Pipeline

- 9.376. The pipeline corridor is considered unlikely to support great crested newts given the absence of suitable breeding waterbodies within 250 m and, therefore, no impacts of the pipeline construction on this species are anticipated.

Invertebrates

Potential impacts of the reservoir site including reservoir and access roads

- 9.377. In the absence of mitigation, proposals would result in the loss of approximately 140 ha of habitat. This area includes the following habitats and associated areas; neutral grassland, rush pasture, woodland edge and habitat along streams. These areas support a variety of notable invertebrate species, which, in the absence of mitigation/compensation measures would be negatively affected through the long-term loss of semi-natural habitat.
- 9.378. The removal of The Avenue would potentially impact woodland species which use this feature to commute between Staunton Country Park and Havant Thicket woodland. The removal of woodland onsite would create a net loss of cavities for invertebrates.
- 9.379. Sapling aspen are critical to the survival of the Rare (RDB 3) mason wasp *Symmorphus crassicornis* on site, as these provide a food source for the leaf beetle *Chrysomela populi* whose larvae are used to provision the wasp's nest. Whilst the wasp was recorded only from the grassland near the base of The Avenue, the leaf beetle was additionally recorded in the north-west of site around SU 70851045. This area would not be affected by the reservoir, and mature aspen in this area are likely to result in the continued presence of aspen saplings and consequently the continued presence of this mason wasp. As a result, it is considered unlikely that there would be a significant impact to this species by the Scheme.
- 9.380. There were no other range restricted, or rare species likely to only be supported by the area affected by construction works and, therefore, impacts on invertebrates is restricted to the loss of suitable habitat for a range of species.
- 9.381. With appropriate design and management the Scheme has the potential to provide landscape scale improvements to the invertebrate assemblage across site.

Potential impacts of the Pipeline

- 9.382. The temporary nature of the pipeline construction works means that impacts are not predicted.

Other species

Potential impacts of the reservoir site including reservoir and access roads

- 9.383. A number of other animal species have been recorded within site and surrounding habitats including fox, common toad, European hedgehog and yellow-necked mouse. The Scheme is likely to result in the loss of habitat which supports these species and habitat clearance and construction works have the potential for direct harm.
- 9.384. Fox earths have been recorded on the reservoir site. In the absence of mitigation, construction activities could result in harm to foxes within a fox earth which would be an offence under the Wild Mammals (Protection) Act 1996.
- 9.385. Whilst the desk study returned a record of a common seal within Langstone Harbour approximately 1.5 km downstream of site, no direct or indirect impacts on this species are anticipated. The Site does not contain suitable habitat for this species.
- 9.386. Deer are understood to be present within the habitats and while they would not be predicted to be affected, without management deer browsing could adversely affect the establishment of new woodlands being created as part of the mitigation and compensation strategy.

Potential impacts of the Pipeline

- 9.387. The temporary nature of the pipeline works means that impacts are not predicted, but measures to protect species such as foxes would be required for welfare reasons.

Invasive non-native species

The reservoir site including reservoir and access roads

- 9.388. Invasive species are not ecological receptors, but the risks relating to them require consideration in planning site works. Parrot's-feather has been recorded within ponds in Havant Thicket woodland. As a result there is the risk that it could be spread through construction works to the new reservoir and wetland area.

The Pipeline

- 9.389. Himalayan balsam has been recorded along the Hermitage Stream and, therefore, in the absence of mitigation it could be spread by construction machinery.

Design, mitigation and enhancement measures

General overview

- 9.390. Measures to avoid or mitigate impacts on nature conservation resources during the construction phase are set out in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4. The OEMP also includes compensation measures where impacts cannot be avoided or fully mitigated. This document includes measures to be put in place such as the provision of briefings and tool box talks for staff, timing of works, protecting animals from harm within the construction area, and precautionary methods of working (PMW). An Ecological Clerk of Works (ECOW) will be appointed by the contractor to monitor the construction works and provide advice.
- 9.391. The REAC as part of the OEMP in Appendix A2.1 in ES Volume 4 includes commitments to develop a detailed Biodiversity Mitigation and Compensation Strategy for the reservoir site and an Ecological Mitigation and Management Plan (EMMP) for the pipeline. Portsmouth Water have produced an outline Biodiversity Mitigation and Compensation Strategy, which accompanies the planning applications and provides an overview of the content that will be included in the detailed Biodiversity Mitigation and Compensation Strategy. The detailed Biodiversity Mitigation and Compensation Strategy will include details of onsite habitat enhancement and creation and additional offsite measures. It will also contain an outline of the long term ecological management plan that will be produced for the reservoir site at the end of the development works. The measures relating to the loss of bat roosts and dormouse habitat will be detailed in Natural England licence applications. The approach taken in the outline Biodiversity Mitigation and Compensation Strategy includes the following:

- Mitigate and compensate for ecological impacts associated with the reservoir through a variety of on- and offsite measures. Key impacts are related to the loss of woodland, including ancient woodland. Collaboration will be undertaken with Forestry England and Hampshire County Council who own surrounding land.
 - Provide support for others to create new high biodiversity value habitats offsite through provision of a Capital Grants scheme. Further information on the criteria for these grants is provided below.
 - Ensure appropriate mitigation and compensation is implemented for protected and priority species. EPSM licences will be obtained where required.
 - Allow significantly greater protection of nationally and internationally important chalk stream habitat by reducing water abstraction from the Rivers Test SSSI and Itchen SAC (see Chapter 3 Need for the Reservoir in ES Volume 2). While this is not reported as an impact of the Scheme in EIA terms, it is an underpinning reason for the creation of the reservoir.
- 9.392. The impacts of the pipeline are smaller scale and temporary, so a simpler EMMP document will be produced for the pipeline.
- 9.393. Biodiversity resources have been taken into account during the development of the design of the Scheme, so that potential impacts can be avoided or mitigated for through appropriate design. As far as is practicable, working within the engineering brief, the Scheme has been designed to minimise the extent of habitat loss, particularly of ancient woodland and veteran and notable trees, priority habitat and SINCs within site. Justification for the need for the Scheme, and alternatives considered in identifying the Havant Thicket site, are considered in Chapter 3 Need for the Reservoir and Chapter 4 Alternatives Considered in ES Volume 2 and site Alternatives Assessment⁷⁵. The design changes resulting from the environmentally led design are outlined in the Engineering and Design Report⁷⁶.
- 9.394. Pollution prevention measures will be put in place to avoid affecting water quality of watercourses or polluting adjacent retained habitats during the construction phase.
- 9.395. In order to ensure the appropriate creation and long-term management of new biodiversity resources provided as mitigation, compensation or enhancements, a post-construction Ecological Management Plan will be produced as a requirement of the CEMP, that will include details of management works, monitoring and maintenance measures required post-construction. The plan will be agreed with key stakeholders and will ensure that the reservoir site is operated and managed for the benefit of biodiversity and people. This requirement will be secured through the planning permission and be delivered through agreements with Portsmouth Water, Forestry England and Hampshire County Council who own part of the land within site and adjacent land.
- 9.396. The project design will take account of the need to minimise disturbance to some parts of the site in relation to recreational pressure. Measures to control visitor access will include:
- provision of well-marked trails graded to different abilities, with a short loop trail close to the visitor centre which will meet the needs of many visitors.
 - provision of well-marked circular trails for cycling, walking and horse riding which be a key attraction for visitors requiring a longer trail.
 - short trail will have all-weather surface to encourage users to stay on the path.
 - rides through or leading to more sensitive habitats will not be way marked and will not be surfaced which will make them less attractive to the majority of visitors who will not come equipped with boots. The site is located on clay and the existing rides quickly become saturated and boggy when it rains.
 - use of spaced play and signage to keep families on the main circular route.
 - provision of dog walking routes away from sensitive areas.
 - provision of gated side paths to the wetland off the main visitor route, such that someone has to make a conscious decision to go down a dead-end path to visit the wetland conservation area, with signs making it clear dog access is not permitted.

⁷⁵ Agilia Transformation Ltd & Portsmouth Water (2020). Havant Thicket Winter Storage reservoir site Alternatives Assessment.

⁷⁶ Atkins (2020). Havant Thicket Reservoir Project. Engineering and Design Report.

- carefully positioned hedgerows, dead hedges and dense vegetation (e.g. bramble banks) will all be employed at the site to ensure that dogs remain on the designated paths.
- where clearings are created within Havant Thicket woodland a belt of young trees / scrub will remain on the track edges to ensure that the newly opened areas are not visible from the main tracks. If open areas are not visible and instead the track edge habitat looks impenetrable it is less likely that visitors and dogs will attempt to access it.

- 9.397. Biodiversity Net Gain is an approach that leaves biodiversity in a better state than prior to development. As this Scheme will result in the unavoidable loss of ancient woodland and veteran trees, which are irreplaceable habitats, the scheme design has been developed to reduce their loss as far as practicable and a bespoke approach to compensation for these habitats will be designed in consultation with key stakeholders. Bespoke compensation will also be provided for any habitats of very high distinctiveness, with the aim of achieving a net gain in the area of that habitat. For all other habitats affected by the Scheme, losses will be minimised and opportunities for compensation on site will be taken as far as practicable, and the priorities for targeting offsite capital funding will take account of the habitat types to be lost.
- 9.398. 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.

Internationally and nationally designated sites

- 9.399. Mitigation relating to internationally designated sites for nature conservation is discussed in Appendix A9.15 Information to inform the Habitats Regulation Assessment in ES Volume 4. Key mitigation measures identified as required in this report include:
- Portsmouth Water will engage with Forestry England (owner of Havant Thicket) and share information on bat mitigation measures with the LPA and wider development applicants including the land East of Horndean applicants to assist in developing a strategic mitigation approach that maintains the conservation status of the Bechstein's bat population. In addition, Portsmouth Water has called for and is supporting the LPAs in developing the technical content of a Bechstein's Bat conservation policy for the area.
 - To minimise potential impacts on water quality from an increase in phosphorus associated with a large bird roost the wetland design includes an area to the north-west of the proposed reservoir, where birds are likely to mainly congregate, that will be separated from the main reservoir when summer water levels are low by a retaining structure.
- 9.400. Further details of mitigation measures relevant to the internationally and nationally designated sites are also provided in the sections on aquatic habitats and species and bats below. These measures would also mitigate for the associated nationally designated sites.

Non-statutory designated sites

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.401. During detailed design, the predicted loss of habitat within SINC's will not increase, and if it is possible to identify further practicable ways to reduce losses these will be taken. All areas of vegetation within SINC's will be protected from accidental incursion and indirect impacts through the measures in the CEMP.
- 9.402. There will be a loss of a maximum of 13.55 ha SINC habitat and 1 ha of Havant Thicket SINC would be modified into wet woodland along the wetland edge. Almost the entire SINC loss is ancient woodland, although a small area of woodland within The Avenue to the north of Upper Lake is SINC but not ancient woodland. Mitigation and compensation for the loss of ancient woodland is described below under ancient woodland and measures are set out in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications, and shown on Figures 9.4 Habitat retained/ created and 9.5 Woodland enhancement in ES Volume 3. Further detail on the proposed habitat creation and enhancement will be provided in the detailed Biodiversity Mitigation and Compensation Strategy.
- 9.403. Whilst there will be no loss of grassland or wetland habitat designated as SINC's within the reservoir site, it likely that the created wetland and areas of managed grassland around the perimeter of the reservoir site will, through positive ecological management, be suitable for SINC designation in the future, potentially along with the reservoir itself.

Mitigation & Compensation relating to the Pipeline

- 9.404. The temporary impacts on the SINC's along the pipeline route will be mitigated by avoidance of accidental incursions into areas outside of the construction zone through the use of protection fencing. Post construction, the grassland and woodland habitat affected by construction will be re-instated. The grassland within the High Lawn and Thicket Lawn SINC's will be restored through retention of soil in layers, which will be reinstated in layers and surfaced either with retained turfs or replanted with a locally sourced grassland mixture comprising species already recorded within the SINC's. The methods for re-instatement will be detailed in an Ecological Mitigation and Management Plan (EMMP) prepared for the pipeline route.

Ancient woodland

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.405. Loss of ancient woodland, as an irreplaceable habitat will be minimised as far as practicable, and subject to bespoke compensation.
- 9.406. During option selection and project design every effort has been made to avoid the loss of ancient woodland. The option selection approach is described in Chapter 4 Alternatives Considered in ES Volume 2. Within the Reservoir site, design refinements to reduce ancient woodland loss are described in the Design Access Statement⁷⁷. Mitigation measures applied during the design process include moving the visitor car park, which had been proposed within Bells Copse, routing the majority of the northern access road along an existing logging track, and amending the alignment of the access road along the western periphery to keep it outside of a 15m buffer along the woodland edge wherever possible. The design of the reservoir embankment includes a slope gradient that varies between 1:5 and 1:7, resulting in indentations where it crosses The Avenue and Round Wood, which has enabled increased retention of each woodland block.
- 9.407. During detailed design, the predicted loss of ancient woodland will not increase, and if it is possible to identify further ways to reduce loss they will be taken if practicable. All areas of vegetation within ancient woodland will be protected from accidental incursion and indirect impacts through the measures in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4.
- 9.408. The loss of 12.45 ha of ancient woodland will be compensated by a bespoke package of onsite and offsite measures. Onsite, the bespoke compensation includes 52.7 ha of woodland enhancement and 4.30 ha of woodland / wood pasture creation (totalling 57 ha). Woodland enhancement will occur within Havant Thicket SINC, and advanced planting for woodland and wood pasture creation

⁷⁷ Atkins (2020). Havant Thicket Reservoir Project. Design Access Statement.

has taken place as part of compensation on Gipsies Plain and Deerslaughter Plain. These areas are set out in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications, and shown on Figure 9.4 Habitat retained/ created and Figure 9.5 Woodland enhancement in ES Volume 3. Further detail on the proposed habitat creation and enhancement will be provided in the detailed Biodiversity Mitigation and Compensation Strategy.

- 9.409. The northern access road has been designed as single lane, to reduce the width of the route and therefore habitat loss. This means passing places are required. These have been kept to a minimum, and after the construction phase will be reduced in size. Retained ancient woodland topsoil will be used to restore the areas when these are removed, but while over time these will be recolonised by woodland plants, this temporary soil removal and replacement means this is counted as part of the compensation package and does not mean these areas are no longer reported as part of the ancient woodland loss.
- 9.410. During detailed design, consideration will be given to reuse of ancient woodland topsoil for wider vegetation creation, taking account of engineering limitations caused by the requirements of reservoir construction. The topsoil of The Avenue would be the priority for this re-use. The existing design includes retention of some existing ancient woodland at the northern edge of the reservoir, changing it into wet woodland. During detailed design, some topsoil from ancient woodland areas to be lost will be used to increase ground levels in other parts of the Corsican Pine Plantation that are to be lost under the reservoir footprint, allowing additional wet woodland to establish. This manipulation of soil levels may allow additional wet woodland to be created, and this will be confirmed at detailed design. However, this would not constitute retention of the existing ancient woodland.
- 9.411. During vegetation clearance, localised areas of ancient woodland indicator ground flora plants will be moved into retained areas of woodland as individual plants / clumps. These measures can result in limited retention of individual plants, but will be undertaken with the aim of contributing to local genetic diversity.
- 9.412. In addition to works onsite, there will be additional woodland and wood pasture creation offsite. The methodology is to be confirmed, but measures are anticipated to include native tree and shrub planting and natural regeneration using approaches such as rewilding or accelerated succession. In total, compensation measures will result in the creation and / or enhancement of 110 ha of woodland and wood pasture habitat.
- 9.413. Full details on the bespoke compensation approach for mitigating the unavoidable loss of ancient woodland will be provided in the detailed Biodiversity Mitigation and Compensation Strategy.

Mitigation & Compensation relating to the Pipeline

- 9.414. Impacts on ancient woodland have been avoided through design. Construction options that involved trenching adjacent to the ancient woodland or trenchless routing beneath the ancient woodland were rejected and an alternative route selected. Where works on a culvert would take place close to the boundary of Great Copse, measures will be put in place to avoid accidental incursion or harm to tree roots.

Veteran trees and notable trees

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.415. There are no feasible design options available to retain the seventeen veteran trees within The Avenue trees that would be lost as part of the reservoir construction.
- 9.416. The veteran trees that lie within or adjacent to the construction working areas will be retained during construction through appropriate mitigation measures.
- 9.417. Compensation for loss of veteran trees from The Avenue will include measures such as moving deadwood, creating veteran tree characteristics on existing younger trees⁷⁸ and ring barking trees non-native trees, such as Turkey oak, to create standing dead wood.

⁷⁸ Natural England (2000). Veteran: Trees: A guide to good management (IN13). Chapter 8 The next generation of veteran trees. <http://publications.naturalengland.org.uk/publication/75035>

Mitigation & Compensation relating to the Pipeline

- 9.418. Impacts on veteran trees will be avoided through design.

Priority habitats

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.419. Lowland mixed deciduous woodland and wet woodland that will be lost to construction within the reservoir footprint are habitat components of the ancient woodland. The ancient woodland compensation strategy will address the loss of priority woodland.
- 9.420. The loss of purple moor-grass and rush pasture will also be addressed through bespoke compensation through like-for-like habitat creation, at a ratio of at least 1:1 in area, within Havant Thicket woodland. The existing soil and hydrological conditions of Havant Thicket woodland is conducive to the creation of purple moor-grass and rush pasture. Previous forestry clearance has resulted in the development of heath and mire communities, particularly the NVC community M25 *Molinia caerulea-Potentilla erecta* mire, a vegetation community that conforms to purple moor-grass and rush pasture. The creation of glades (forest meadows) through selective clearance and future on-going management will expand this habitat, without reducing the overall area of woodland, as these glades will still form part of the woodland structure and habitat.

Mitigation & Compensation relating to the Pipeline

- 9.421. Impacts on wood pasture and parkland trees and deciduous woodland will be avoided through protection of trees within the High Lawn and Thicket Lawn SINCS; grassland within the SINCS will be restored as described above.

Vegetation

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.422. The loss of semi-improved grassland (including developing rush pasture that does not comprise the purple moor-grass and rush pasture priority habitat) will be addressed through creation of species-rich neutral grassland on the outer embankment and around the perimeter of the reservoir, creation of neutral (marshy) grassland within compartment 0 of the wetland, and enhancement of the neutral grassland species diversity within the Gipsies Plain and Deerslaughter Plain advanced planting areas. Acid grassland areas will also be created as part of the enhancements within Havant Thicket woodland. Native species will be used in all planting, apart from localised amenity planting in recreational areas.
- 9.423. Onsite hedgerows will be strengthened and enhanced around the boundary of the Reservoir site as illustrated in Figure 9.4 Habitat retained/ created in ES Volume 3.

Mitigation & Compensation relating to the Pipeline

- 9.424. The temporary impacts associated with installation of the pipeline through habitats including semi-improved grassland, woodland and scattered trees will be mitigated by avoidance of accidental incursions into areas outside of the construction zone through the use of protection fencing. Post construction, the grassland and woodland habitat affected by construction will be re-instated. The methods for re-instatement will be detailed in an Ecological Mitigation and Management Plan (EMMP) for the pipeline corridor.

Aquatic habitats and species

- 9.425. It should be noted that the overarching purpose of the project is to provide significantly greater protection of nationally and internationally important chalk stream habitat by reducing water abstraction from the Rivers Test and Itchen. Whilst this does not mitigate for any of the negative ecological impacts on the aquatic habitats within the study area, it is an important positive impact of the Scheme.

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.426. Construction management approaches, including pollution prevention measures and fish rescue requirements are set out in the REAC as part of the OEMP in Appendix 2.1 in ES Volume 4.

- 9.427. Where works are undertaken in association with streams a pre-construction checks will be undertaken and Himalayan balsam plants 'pulled' from within 5 m of the construction zone. A detailed mitigation strategy to prevent further spread of this species will be included within the CEMP.
- 9.428. Best practice construction pollution prevention guidance⁷⁹ and Construction Industry Research and Information Association (CIRIA) guidance will be implemented during the Scheme. This includes Guidance for Pollution Prevention (GPP5) 'for works and maintenance in or near water' and 'control of water pollution from construction sites' (CIRIA 532).
- 9.429. In addition to general construction management, there are a series of bespoke mitigation measures to compensate for the Scheme's impacts on aquatic receptors. These are included in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications. An overview of the measures aimed at mitigating for and offsetting the effects of the Scheme on aquatic habitats and species are stated below.
- 9.430. There are limited practical mitigation options available to offset the predicted permanent loss of 3.7 km of intermittent headwaters of Riders Lane Stream and the further 0.1 km functional loss of Riders Lane Stream associated with permanent loss of incoming flows to this reach.
- 9.431. The creation of a new 250 m channel through which the compensation flow from the reservoir will be discharged, will be designed to provide compensatory open channel habitat within the Scheme and will include the provision of a meandering profile.
- 9.432. Upstream of the reservoir, localised woodland stream enhancements on intermittent headwaters of Riders Lane Stream will mitigate in part the permanent loss of watercourse extents, through improving existing habitat condition. Additionally, translocation of gravels and associated aquatic invertebrates from the intermittent headwaters of Riders Lane Stream within the reservoir site to locations upstream on the retained headwaters will aim to improve the distribution of notable taxa within the local area. However, the success of these translocations cannot be guaranteed given the specific aquatic invertebrate community's association with groundwater connectivity. The hydraulic continuity between the receptor sites (the retained intermittent headwaters of Riders Lane Stream (upper reaches of HS1, HS2 and HS3)) and groundwater is not confirmed.
- 9.433. These measures on their own are not considered likely to adequately offset the permanent loss of headwater stream within the reservoir footprint.
- 9.434. Further offsite measures are to be developed in agreement with the Environment Agency, which could include works, such as restoration of a section of Hermitage Stream. These measures will be informed by outputs from the MoRPh surveys and the application of the beta version of Defra's Biodiversity Metric 2.0.
- 9.435. To alleviate the potential effects of changes to the natural hydrological regime downstream of the reservoir, a compensation flow will be developed for Riders Lane Stream in consultation with the Environment Agency. The compensation flow regime (timing and quantity) will take into account the ecological requirements of both the Riders Lane Stream and Hermitage Stream.
- 9.436. To mitigate for potential effects on aquatic species (principally fish and aquatic invertebrates) associated with the routine reservoir drawdown events, the Scheme will create additional backwater habitats in Riders Lane Stream which will act as refugia outside of the main flow.
- 9.437. The creation of a retained wetland within the reservoir (minimum area ~10ha, divided into four compartments) and an area of wet grassland habitat to the east of the retained wetland (~1.3ha) are key components of the Scheme's mitigation and compensation strategy. Together they will provide a diverse array of wetland habitats that will support a wide range of wetland species. These intrinsically important habitats will be integrated into the wider site ecology and landscape setting.
- 9.438. In summary, the wetland areas will include the following habitat typologies:
- open water;
 - shallow water with emergent wetland vegetation;
 - reed and sedge beds;
 - seasonally inundated bird nesting islands;

⁷⁹ <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

- wet woodland;
- ephemeral shallows; and
- raised areas.

- 9.439. In combination with translocation of locally uncommon plants (including marsh St John's wort, creeping forget-me-not and floating club rush) to ponds within Havant Thicket woodland, this wetland habitat is considered to provide adequate compensation for the loss of Upper Lake ephemeral pond. Biosecurity risks associated with the potential translocation of invasive non-native species to receptor sites will be effectively managed through adherence to a Site biosecurity protocol, the requirement for which is outlined in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4.
- 9.440. Further pond enhancement work will be undertaken within Havant Thicket woodland (including Pond 16 which will form the northern extent of Compartment 3 within the retained wetland). Ponds within Havant Thicket woodland are currently heavily shaded with limited aquatic vegetation, enhancements will include removal of conifers to increase light and improve marginal character and suitability of the area as a receptor site for the aforementioned uncommon wetland plant species.
- 9.441. Whilst it is recognised that there are significant impacts at the county scale associated with the loss of intermittent headwater habitats and associated species, which have limited practical options for mitigation, the reservoir wetland is likely to provide significant betterment in aquatic habitat provision (both ephemeral and permanent), which ultimately is likely to support a greater range of aquatic species than the resources available within site currently.

Mitigation & Compensation relating to the Pipeline

- 9.442. Construction management approaches, including pollution prevention measures and fish rescue requirements are set out in the REAC as part of the OEMP in Appendix A2.1 in ES Volume 4.
- 9.443. Where works are undertaken in association with streams a pre-construction checks will be undertaken and Himalayan balsam plants 'pulled' from within five metres of the construction zone. A detailed mitigation strategy to prevent further spread of this species will be included within the CEMP.
- 9.444. Best practice construction pollution prevention guidance⁸⁰ and Construction Industry Research and Information Association (CIRIA) guidance will be implemented during the Scheme. This includes Guidance for Pollution Prevention (GPP5) 'for works and maintenance in or near water' and 'control of water pollution from construction sites' (CIRIA 532).
- 9.445. During construction of the pipeline crossings on Riders Lane Stream, an unnamed tributary of Riders Lane Stream (The Lake Stream) and Hermitage Stream, temporary dams will be required upstream and downstream in order to dewater the working area. Water will be over pumped to avoid the works acting as a temporary impoundment. Appropriately screened pumping equipment will be deployed to reduce the risk of fish entrainment and a plan developed to remove fish from any sections of channel requiring dewatering under Environment Agency FR2 consents. Fine sediment control measures e.g. silt fences, will be installed during construction.
- 9.446. In conjunction with best practice construction methods, further watercourse enhancements at the three pipeline crossings on an unnamed tributary of Riders Lane Stream (The Lake Stream), Riders Lane Stream and Hermitage Stream, will mitigate for any temporary loss of habitat availability associated with the pipeline construction and act to locally enhance these areas following disturbance from construction.
- 9.447. Reinstatement of riparian zones (e.g. bank profiles and/or vegetation cover) following any temporary disturbance to banks associated with construction of pipeline crossings and culvert upgrades will also be undertaken.
- 9.448. Culvert upgrades will be designed in such a way as to maintain, as far as practically possible, hydrological and ecological connectivity within the system, noting that the primary flow route on these watercourses will remain through the existing culvert arrangement.

⁸⁰ <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

Bats

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

Protection of bats during tree felling and compensation for loss of roosting opportunities

- 9.449. Given the presence of roosting bats within the reservoir footprint, it will be necessary to obtain a EPSM licence for felling trees supporting roosts. It is intended that a single EPSM bat licence will be obtained from Natural England to cover the four woodland blocks. The bat licence will cover the loss of roost sites, and disturbance and potential capture of individual bats. The licence method statement will include measures to protect individual bats from harm and to compensate for the loss of the roosts.
- 9.450. Extensive survey work has been undertaken over many years and the compensation will be provided based on the combined data for roosts found across all years rather than just those found in the 2018 surveys. However, further targeted update surveys will be undertaken to inform the final licence application as a precaution.
- 9.451. The method statement for the licence will recognise the fact that bats can move frequently between tree roosts, so at the time of felling some roosts could be in different trees from those originally recorded. While works will be timed to minimise the number of bats captured, as a precaution it is intended that the licence would cover works affecting up to 50 brown long-eared bat, 20 Bechstein's bat, 10 Natterer's bat, 10 bats of other Myotis species, 20 common pipistrelles and 10 soprano pipistrelles. Subject to Natural England's approval, the licence would also cover up to five individuals of other Vespertilionidae bat species not previously recorded roosting at site if found in low status (i.e. not maternity or hibernation) roosts.
- 9.452. Compensation will be provided for loss of roosting opportunities at features where roosts have been recorded in the past. This approach takes account of the variation in use of trees by roosting bats between years, and is in keeping with the proposed licensing approach of treating the woodland blocks as roosting resources rather than licencing based on a single snapshot of bat activity.
- 9.453. The licence method statement will include a requirement for a final climbing and/or emergence survey of all trees identified as having suitable bat roost features with moderate or high potential prior to woodland clearance. Features where bats can definitely be confirmed as absent will be blocked to prevent colonisation prior to felling. Those where bats may be present will have an exclusion device fitted to the features to ensure bats have left prior to felling.
- 9.454. Felling of trees with bat roost suitability will be timed to occur when bats are less likely to be present, and will also consider the mitigation requirements of other protected species, especially hazel dormice and breeding birds. The clearance works will be timed to occur mainly in September and October. Woodland clearance will be phased over the course of one to two years.
- 9.455. Known and potential roosting features will be subject to a final inspection by a bat licensed ecologist and then sectionally felled. Where practicable, known roost features will then be moved to a tree in nearby retained woodland and strapped to a limb to retain the natural roost feature. If bats are present within the feature when felling occurs (or their presence is uncertain), these limbs will be carefully removed and lowered to the ground and left overnight in a safe location onsite, leaving the roost feature facing upwards, to allow any bats present to leave of their own accord, before the limb is strapped to a retained tree.
- 9.456. In an attempt to encourage a stable maternity colony of Bechstein's bat to roost close to but not within the reservoir footprint, a small number of bat boxes (three Schwegler 1FW and eight Schwegler 2FNs) known to be suitable for this species were erected in May 2018 within woodland that will be retained in the north and south of Reservoir site.
- 9.457. In advance of clearance works, additional bat boxes with suitability for a variety of species including brown long-eared bat, Bechstein's bat and Natterer's bat will be erected within approximately 3 km of site in Staunton Country Park, Havant Thicket woodland and potentially other sites, subject to landowner agreement. Bat boxes will include a combination of 75 Schwegler 1FS, 2F, 1FF and 2FN (or similar), to provide a variety of roost types. In addition, five 1FW boxes (or similar) will be erected; these boxes are suitable for both hibernation and maternity roosts. The boxes will be erected in locations where sufficient foraging habitat is present in their vicinity.
- 9.458. In addition to the Schwegler-type boxes, a series of additional boxes will also be erected. These may be either woodcrete or wooden construction, such as the Kent bat box design. While these do

not have the longevity of woodcrete boxes, they will add additional temporary roosting opportunities. At least one bat box for each tree with high or moderate bat potential will be provided.

- 9.459. Due to its age structure, Havant Thicket woodland has limited natural roost features suitable for maternity roosts; in addition, the habitat enhancement measures described below will increase the woodland's value for foraging. Providing bat boxes will increase the woodland's carrying capacity for roosting bats present in local woodland areas within the range of the Bechstein's bat and brown long-eared bat maternity colonies recorded on or in the vicinity of site.
- 9.460. Compensation for loss of veteran trees from The Avenue will include measures such as creating veteran tree characteristics on existing younger trees⁸¹ and ring barking non-native trees, such as Turkey oak, to create standing dead wood. Whilst these measures are not proposed specifically as compensation for loss of bat roosts, it is likely that they could result in the formation of additional potential bat roost features more quickly than natural processes.

Protection of retained habitat during construction

- 9.461. During the construction phases of the development, the retained woody vegetation onsite and along the boundaries of the working areas 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. The buffer zones to protect ancient woodlands and retained trees will also protect trees with bat potential from accidental damage. Measures to limit and control noise during construction will take account of ecological receptors.

Mitigation for indirect impacts through lighting

- 9.462. Mitigation will be provided to reduce the effects of lighting during construction and operation. As part of the Construction Environmental Management Plan (CEMP), any temporary lighting required during construction will be designed to minimise light spill.
- 9.463. Permanent lighting will comprise hooded luminaires directed away from vegetation, particularly the boundary hedgerows and treelines, to avoid any light spill onto retained vegetation. Lighting will follow good practice current at the time of detailed design. This is likely to include, for example, use of LED bulbs at the warmer end of the spectrum. 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 and with no lighting on the access roads apart from at the junction with Swanmore Road. The lux level will be as low as possible to meet their purpose safely and effectively. Guidance on task-related lighting levels and mitigation options as described within the current Bat Conservation Trust guidance (Bat Conservation Trust & Institute of Lighting Professionals, 2018⁸²) will be followed.

Compensation for disruption to commuting and foraging opportunities

- 9.464. In order to provide compensation for the loss of the commuting corridor provided by The Avenue, a new area of native woodland and wood pasture was planted in early 2019 between Havant Thicket and Staunton Country Park in the east of the Reservoir site. This area, at Gipsies Plain, links existing habitat to create a new link between Havant Thicket woodland to the north and Staunton Country Park to the south. The planting includes 3 m standards as well as smaller shrub understory species, to ensure the new woodland is functional as a commuting corridor immediately, with the area effectively resembling a wide 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. These areas are shown in Figure 9.4 Habitat retained/ created in ES Volume 3. The advance planting was designed to provide compensation for the loss of the commuting corridor provided by The Avenue and will be especially beneficial to woodland species such as Bechstein's bat, brown long-eared bat, whiskered bat and Brandt's bat, as well as other species such as hazel dormice and birds. The woodland corridor is within an area that was used by Bechstein's bat during the 2018 tracking surveys. This enhanced eastern corridor provides an alternative to the existing commuting route that would be lost due to the removal of The Avenue.

⁸¹ Natural England (2000). Veteran: Trees: A guide to good management (IN13). Chapter 8 The next generation of veteran trees. <http://publications.naturalengland.org.uk/publication/75035>

⁸² Bat Conservation Trust & Institute of Lighting Professionals (2018). Bats and artificial lighting in the UK Guidance Note 08/18. ILP

- 9.465. New woodland planting has also been undertaken as advance works in early 2020 in Deerslaugter Plain in the southwest of the Reservoir site. An existing woodland fringe has been widened and native species blocks of woodland planted within the grassland to provide a suitable mosaic of habitats for commuting and foraging, in an area where there was previously currently very little bat activity. In the longer-term (10-40+ years), both the advance planting areas will be suitable for foraging Bechstein's bat and they will quickly become suitable foraging habitat for a variety of other more common bat species. The onsite planting areas at Gipsies Plain and Deerslaughter Plain provide a total of 4.3 ha of compensation habitat for the loss of woodland foraging habitat.
- 9.466. Previous surveys in Havant Thicket woodland have recorded limited bat activity (see Appendix A9.4 Bat survey report in ES Volume 4) and the area is considered to be low quality bat foraging habitat with the potential to be enhanced. A programme of interventions in Havant Thicket woodland will improve the foraging value of this area in the north of the Reservoir site, which lies within the Core Sustenance Zones (CSZ) of the nearest Bechstein's bat and brown long-eared bat maternity colonies (see Appendix A9.4 Bat survey report in ES Volume 4) for further information on CSZ). The interventions will form part of the wider ecological management strategy for Havant Thicket woodland, which will restore broadleaved 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 though creating a more diverse and enhanced foraging habitat. These measures are discussed in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications and will be set out in full in the detailed Biodiversity Mitigation and Compensation Strategy. The interventions will provide over 40 ha of substantially enhanced habitat for woodland bats, particularly benefitting brown long-eared bat and Bechstein's bat, compensating for the onsite woodland loss (approximately 14 ha in small woodland blocks).
- 9.467. Previous work has recorded Bechstein's bat gathering over pond features in Havant Thicket woodland and Staunton Country Park. Pond and streams areas within Havant Thicket woodland are generally very shaded and will be enhanced to let in more light and create enhanced foraging opportunities for bats. Two new ephemeral ponds have also been created in the new woodland corridor to the east of the Reservoir site.
- 9.468. Enhancements will include creation of a retained wetland and wet grassland area with variable water depths on the northern edge of the reservoir site, and will include a number of islands and wetland areas, including reedbeds and grassland-scrub mosaics. These areas will be suitable for bat species that forage over open habitats, such as noctule, Leisler's bat and serotine, and those that have a preference for riparian habitats such as Daubenton's bat and soprano pipistrelle. Alcahloe bat, which also has a preference for riparian habitats, is present in the wider landscape, so may also benefit from the wetland proposals.
- 9.469. The Site will be subject to a long-term site management plan.

Mitigation & Compensation relating to the Pipeline

- 9.470. It is understood no potential bat roost trees will be lost as a result of the pipeline construction. Construction lighting will be avoided if possible. If temporary construction lighting is required it will follow best practice to minimise light spill.

Hazel dormice

Mitigation & Compensation relating to the Reservoir site including reservoir and access roads

- 9.471. Given the potential impacts on hazel dormouse present on site, it will be necessary to obtain a EPSM licence for the works.
- 9.472. Loss of habitat with potential to support hazel dormouse will be minimised as far as possible. During the construction phases of the development, the retained woody vegetation on site and along the boundaries of the construction area 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.
- 9.473. Enhancements to increase the carrying capacity of these woodlands will be undertaken in advance of construction. The detailed measures will be set out in the EPSM licence method statement and

the detailed Biodiversity Mitigation and Compensation Strategy. In summary these enhancements will include:

- Habitat restoration works in Havant Thicket woodland that will provide enhanced habitat for hazel dormice through felling and clearance of pine plantations and planting with new native broadleaved trees; clearance of rides through birch dominated woodland to provide improved habitat for hazel dormice through increased woodland species diversity (including planting hazel) and creation of graded edges along existing ride network providing enhanced dormouse habitat;
- Existing defunct and gappy hedgerows will be bolstered with planting to make them suitable for hazel dormouse and then managed appropriately.
- 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.
- Enhancements will include the management of Bells Copse woodland to the west of site. This woodland comprises oak with hazel coppice with high suitability for hazel dormouse. As part of the management of the overall Site, this area will be subject to rotational hazel coppicing to diversify the age structure and retain the woodland's suitability for hazel dormouse.
- Approximately 200 hazel dormouse boxes will be installed within Havant Thicket woodland and in woodland to the south of site. Nest boxes can increase density of hazel dormouse as suitable nesting sites can often be a limiting factor to population growth. The introduction of nest boxes in Havant Thicket woodland is considered to be particularly beneficial given the scarcity of suitable nesting features in this location.

9.474. In addition to enhancement of existing habitat, new advanced planting has been undertaken at Gipsies Plain and Deerslaughter Plain. In addition to providing replacement habitat, the planting at Gipsies Plain will provide improved connectivity, compensating for the loss of connectivity from the removal of The Avenue and tree lines within the reservoir footprint. Dormouse boxes will also be installed within the woodland strip to provide an initial increase in site's suitability for nesting. Overall, the combined area of habitat either created or enhanced to improve dormouse carrying capacity is substantially larger than the area of suitable habitat to be removed.

9.475. The clearance of the woodlands at the reservoir site will be covered under a hazel dormouse EPSM licence. The method statement will set out the compensatory measures, which are summarised above. In addition, it will set out the timing and method of vegetation removal. This will be timed and undertaken to minimise risks to individual dormice and to enable their movement to retained alternative habitat. Ground vegetation in woodlands and tree stumps will not be cleared in months when dormice could be hibernating. Similarly, clearance in the breeding season will be minimised. Movement of dormice will be enabled by phased clearance of the woodland, which will displace some animals, combined with capture and movement of individual dormice by the licence named ecologist and their accredited agents. Dormice capture and release will follow current best practice, and animals will be released in suitable retained habitat.

9.476. During the operational phase 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.

Mitigation & Compensation relating to the Pipeline

9.477. The pipeline corridor has been designed to avoid impacts on Great Copse which was identified as having potential to support hazel dormice, apart from one localised area of works on a culvert. Where the pipeline route will cross the tree lines in Staunton Country Park, trees will be protected and any temporary loss of suitable hazel dormouse habitat will be compensated through the provision of replacement habitat. Tree and shrub removal in this areas will be reduced as far as practicable. Timings for these works will be guided by the build programme, however, small-scale clearance in relation to hazel dormouse will be undertaken in the autumn period (September to October). Given the small scale and temporary nature of the clearance of suitable hazel dormouse habitat in Staunton Country Park the works may be undertaken under a Precautionary Method of Working or as part of the EPSM licence to cover works on the reservoir site.

Otters

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.478. Otters are currently considered likely to be absent from the reservoir site although there is potential for them to make occasional use of the habitats present. Pre-construction surveys will be undertaken to determine if otters have colonised the area since the last survey, including checks of watercourses and areas of scrub and woodland linked to watercourses. If otters are confirmed as present and it is not possible to avoid harming otters or damaging or blocking access to their habitats an EPSM licence would be required.
- 9.479. The construction of the reservoir and wetland would provide enhanced habitat for otters.
- 9.480. A Conservation, Access and Recreation Strategy will be prepared to ensure specific areas remain secluded and inaccessible to people and dogs to minimise impacts on species such as otters.

Mitigation & Compensation relating to the Pipeline

- 9.481. Otters are also currently considered likely to be absent from the pipeline corridor although there is potential for them to make occasional use of the habitats present. Pre-construction surveys will be undertaken to determine if otters have colonised since the last survey. If otters are confirmed as present and it is not possible to avoid harming otters or damaging or blocking access to their habitats, an EPSM licence would be required.
- 9.482. Enhancements to the Hermitage Stream (see information in aquatic habitats and species section above) have the potential to benefit this species through habitat enhancements and potential to enhance connectivity for this species through the culvert changes.

Water voles

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.483. Water vole are likely to be absent from the reservoir site and, therefore, mitigation for water vole in this area is not required.
- 9.484. The reservoir proposals will include a retained wetland area with islands and riparian habitat along the northern shore which will provide suitable habitat for water vole should they colonise or be introduced to site in the future. Enhancements to the Hermitage Stream also has the potential to benefit this species. These enhancements are discussed further in the aquatic habitats and species section above.
- 9.485. A Conservation, Access and Recreation Strategy will be prepared to ensure specific areas remain secluded and inaccessible to people and dogs to minimise impacts on species such as water vole.
- 9.486. Evidence of mink was recorded during water vole surveys in 2005-2006 and, therefore, mink monitoring and control measures may be required as part of site's management plan if water voles establish on site.

Mitigation & Compensation relating to the Pipeline

- 9.487. To avoid temporary impacts where the pipeline crosses the Hermitage Stream and Riders Lane Stream, trenchless drilling is recommended, but this will be a matter for detailed design so assessment is based on an assumption that trenching will occur. Mitigation for the loss of bankside habitat where the pipeline crosses the Hermitage Stream and Riders Lane is presented in the aquatic habitats and species section above, which includes design that allows these areas to colonise with native vegetation with suitability for foraging water vole.
- 9.488. Another water vole survey will be undertaken by a suitably qualified ecologist in advance of construction works commencing near potentially affected watercourses including the Hermitage Stream and Riders Lane Stream crossing points.

Badgers

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.489. In advance of reservoir construction and enhancement works in Havant Thicket woodland, a detailed badger survey of these areas will be undertaken to update previous surveys. Where any

new evidence of badger setts is confirmed within or in close proximity (50 m) to the construction works the Construction and Environmental Management Plan will be reviewed and updated, to ensure no disturbance or destruction of setts occurs without the necessary licencing and appropriate compensation.

- 9.490. As part of the development, habitat around the perimeter of the reservoir will be managed as grassland with suitability for foraging badger. This will also include a large expanse of meadow grassland on the downslope of the reservoir embankment. The new mosaics of woodland and wood pasture planted as advance works will provide compensatory woodland habitat for foraging badgers.
- 9.491. Habitat enhancement within Havant Thicket woodland will provide suitable and improved habitat for badger. Details of the works in Havant Thicket woodland are shown in Figure 9.5 Woodland enhancement in ES Volume 3 and summarised in the outline Biodiversity Mitigation and Compensation Strategy. Woodland meadows and management of dense birch thickets will diversify these habitats, increasing the habitat available in this area for foraging badger. This work will offset the impacts associated with the habitat lost to construction of the reservoir. Within the compensation works proposed in Havant Thicket, woodland trees and shrubs will be retained around the edge of woodland blocks subject to management. This work is designed to discourage public access and will also mitigate for potential increased disturbance to badger associated with likely increased visitor pressure in this area. The reservoir site will be subject to a long-term site management plan.
- 9.492. To mitigate the potential impact of additional night-time traffic, a gate will be installed at the site entrance; this will prevent unauthorised vehicle access at night. During the winter months the visitor centre's opening hours are likely to extend into periods of darkness, and the centre could occasionally be used in the evenings.
- 9.493. Steep sided excavations will be either filled or covered at night, or a battered edge ramp inserted, to allow badgers to escape of their own accord if they were to enter the excavation. This requirement will be incorporated into the site Construction Environmental Management Plan (CEMP) by the appointed contractor.

Mitigation & Compensation relating to the Pipeline

- 9.494. As with the reservoir site, a pre-construction badger survey of the pipeline corridor will be undertaken. If badger setts that could be affected by the Scheme are found to be present then further ecological advice will be provided. As discussed for the reservoir site, measures will be put in place to ensure badgers do not become trapped in steep sided excavations.

Birds

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.495. Where possible, tree felling and vegetation clearance will be minimised and undertaken outside the core bird nesting season (1 March to 31 August, subject to seasonal variation) to avoid damage to or destruction of occupied nests or harm to breeding birds. If this cannot be achieved, works within the core bird nesting season will require an inspection of vegetation to be cleared for breeding birds and their occupied nests by a suitably qualified ecologist no more than 24 hours prior to any works being undertaken. If any nesting birds are identified during the survey they will be left in situ for their entire nesting period and alternative approaches to the work proposed. This may include leaving an exclusion zone around the nests to avoid disturbance.
- 9.496. Furthermore, grazing density will be increased in advance of the start of the construction phase to maintain as short a sward as possible, this will significantly reduce site's suitability for ground nesting birds.
- 9.497. Retained woodland on the periphery of site with potential for breeding birds, including firecrest and nightjar, will be protected from accidental incursions using protective fencing. A buffer zone will also be provided adjacent to retained woodland, and this will also contribute to minimising disturbance. Measures to limit and control noise during construction will take account of ecological receptors.
- 9.498. Compensation for loss of habitats within the reservoir footprint will comprise two main elements: enhancement and development of a mosaic of habitats within Havant Thicket woodland/Bells Copse and compensatory habitats development around the periphery of the reservoir footprint, including the advance planting undertaken at Gipsies Plain and Deerslaughter Plain. The planting

undertaken at Gipsies Plain will also provide a commuting corridor for birds moving between Staunton County Park and Havant Thicket woodland. Habitat restoration works at Havant Thicket woodland will provide suitable habitat for a range of bird species. Details of the works in Havant Thicket woodland are shown in Figure 9.5 Woodland enhancement in ES Volume 3 and summarised in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications.

- 9.499. As part of the development of the reservoir, grassland habitat around the perimeter of the reservoir footprint 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 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 site will entirely off-set the loss of skylark territories, therefore grassland creation and enhancement and measures to benefit grassland birds will be among the targets of Portsmouth Water's Capital Grants scheme. This grant scheme is summarised in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications.
- 9.500. There will also be a scrub and grassland interface created along the northern edge of the reservoir which will provide habitat for notable species affected by the Scheme including linnet, bullfinch, song thrush and dunnock. The creation of compensation habitats within site 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.
- 9.501. 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 Staunton Country Park.
- 9.502. A retained wetland area with variable water depths will be created on the northern edge of the reservoir site and will include a number of islands and wetland areas which will be suitable for breeding lapwing and a variety of wetland species. The reservoir, especially the northern wetland, will provide excellent habitat for waterfowl and gulls. There is potential to encourage a number of species of conservation concern to breed and winter at site. Experience from other wetland schemes, such as Blashford Lakes⁸³ has shown that the benefits to wetland species provided as a result of the reservoir could be significant. One example of a species that could recolonise is lapwing, which has been lost from site. In addition, many other breeding species could be encouraged including common tern, little egret, oystercatchers, black-headed gull, Mediterranean gull, water rail, little ringed plover, redshank, kingfisher, sand martin, Cetti's warbler, reed bunting and reed warbler.
- 9.503. In the long-term it is possible that the reservoir will become important for wintering, passage and breeding birds, potentially including birds displaced from Langstone and Chichester Harbours SPA following disturbance/high tide events. There are numerous examples of man-made reservoirs that have since been designated as SPAs/Ramsar sites and SSSIs for their ornithological interest, including:
- Arlington Reservoir, West Sussex SSSI and LNR – *'Arlington Reservoir is an important ornithological site. In recent years the numbers of wintering wigeon have exceeded 1% of the total UK population. In addition, over 170 species of birds on passage have been recorded and the number of wintering birds regularly exceeds 10,000 individuals.'* (Natural England SSSI Citation Text);
 - Abberton Reservoir, Essex SPA, Ramsar Site, SSSI – *'...one of the most important reservoirs in Britain for wildfowl. About thirty thousand birds visit the reservoir annually including internationally important members of one species and nationally important members of twelve others.'* (Natural England SSSI Citation Text);
 - Weir Wood Reservoir, East Sussex SSSI – *'...is one of the largest areas of open water in Sussex and supports a rich community of breeding birds. The diversity and numbers of wintering and passage birds are also of note.'* (Natural England SSSI Citation Text).

⁸³ Hampshire and Isle of Wight Wildlife Trust, 2017. Blashford Lakes Annual Report 2016-2017, s.l.: Hampshire and Isle of Wight Wildlife Trust.

- 9.504. Given these examples and the habitat creation proposals for site, it is anticipated that the populations of wintering waterbirds identified in the baseline surveys will increase significantly at site once the reservoir is complete.
- 9.505. Barn owl and kestrel boxes will be erected within secluded areas within the retained grassland on the eastern and western boundaries of site. In addition, the detailed design of the reservoir will include consideration of creating:
- artificial nesting platforms in order to attract breeding osprey. Such strategies have been successful elsewhere in the UK and a local reintroduction scheme is currently underway⁸⁴.
 - sand martin banks/kingfisher bank
 - swift/house martin towers
 - standing deadwood for nesting herons, egrets and/or osprey
- 9.506. The Site will be subject to a long-term site management plan. Post construction measures will be implemented to control and manage dog access. This will include no dog access to sensitive areas (e.g. the new wetland). Hedgerows, dead hedges and dense vegetation will all be employed at site to ensure dogs remain on designated paths. Further information will be included in the Conservation, Access and Recreation Strategy and in the detailed Biodiversity Mitigation and Compensation Strategy.
- Mitigation & Compensation relating to the Pipeline*
- 9.507. As with the reservoir site, tree felling and vegetation clearance in relation to the pipeline corridor will take account of the bird breeding season (see above for further details).

Reptiles

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.508. Measure will be taken to ensure that reptiles are not harmed and that animals are not present within the development area during construction works. During the initial development of the reservoir the footprint of works will result in the loss of the majority of the suitable reptile habitat within the reservoir footprint. Reptile habitat will be retained in buffer strips around the periphery of the reservoir footprint to help ensure habitat connectivity around the reservoir development is retained. Advanced tree planting in the Gipsies Plain and Deerslaughter Plain areas did not involve removal of the existing grassland habitat and, therefore, these areas of young planted woodland will remain as suitable reptile habitat until the canopy closes in 10-15 years. These areas will be protected from accidental incursions during construction works, through the use of Heras fencing (or similar).
- 9.509. Prior to works commencing on the reservoir footprint the grassland habitat will be grazed more heavily to reduce the height of the sward and make it less suitable for reptiles. Management of a section of birch dominated woodland and associated stream corridor immediately to the north of the reservoir footprint in Havant Thicket woodland will be undertaken in advance of the main works to provide enhanced habitat for reptiles to disperse into as the reservoir footprint becomes less suitable for reptiles through grazing. Commercial forestry operations by Forestry England in Bells Copse and Havant Thicket woodland took place in winter 2019/20 and whilst these measures were not undertaken as mitigation for this Scheme they will provide additional suitable habitat for displaced reptiles.
- 9.510. A PMW will be written for clearance of suitable reptile habitat. Given the high numbers of reptiles within parts of the reservoir footprint it is expected that this will include a reptile translocation in combination with displacing animals into enhanced adjacent habitat. Compartmentalised reptile fencing would be the most efficient way to achieve clearance of the reservoir footprint within a defined time frame. However, given the very high likelihood of vandalism of fencing associated with public access to the area, fencing is not considered to be a sensible solution; an assessment which has been acknowledged by Natural England. Therefore, grazing will be combined with the installation of a high density of reptile refugia followed by up to 90 days of trapping to translocate reptiles to the receptor sites within Havant Thicket woodland. Where very low numbers of reptiles are recorded during trapping a reduction in trapping effort will be considered by the ecologist

⁸⁴ Birds of Poole Harbour, 2018. Poole Harbour Osprey Translocation Project To Start This Summer. [Online] Available at: <https://www.birdsofpooleharbour.co.uk/poole-harbour-osprey-translocation-project-start-summer> [Accessed November 2018].

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 and removal of potential reptile hibernacula outside the hibernating period.

- 9.511. All translocation works will be undertaken in the reptile active season which runs from April to October. Given the size of site and the scale of the Scheme it may be necessary to undertake translocation works in phases over more than one year. 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.
- 9.512. A number of receptor sites will be developed within Havant Thicket woodland where surveys in 2018 confirmed no or extremely small existing reptile populations. Some of these sites are temporary, for use as receptor sites during construction. Others are permanent, and, along with the periphery and embankments of the reservoir, will provide suitable long-term replacement habitat for reptiles. Measures comprise:
- felling and clearance of pine plantations to provide temporary reptile habitat whilst new native broadleaved tree planting establishes;
 - clearance of rides⁸⁵ through birch dominated woodland to provide temporary reptile habitat whilst new broadleaved woodland establishes;
 - creation of forest meadows through clearance of young birch trees in previously clear-felled areas to create permanent open space;
 - opening up along the stream corridors and around ponds to allow more light to enter and enhance habitat permanently for reptiles;
 - creation of graded edges along existing ride network providing enhanced reptile habitat;
 - installation of hibernacula and log piles to provide shelter and hibernating sites for reptiles.
- 9.513. Full details of the management proposals of the proposed receptor areas will be set out in the detailed Biodiversity Mitigation and Compensation Strategy.
- 9.514. In the long term the advance planting on Gipsies Plain and Deerslaughter Plain will provide excellent woodland edge habitat for reptiles. Two new ephemeral ponds were dug within Gipsies Plain in early 2019 and reptile hibernacula will be installed adjacent to them. It is anticipated that the wetland habitat created along northern edge of the reservoir will provide suitable habitat for reptiles, particularly grass snake and adder.
- 9.515. A proportion of the reptile compensation works outlined above will be undertaken in advance of site clearance works to enable high carrying capacity 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. The receptor sites in Havant Thicket woodland are considered to provide adequate carrying capacity to receive reptiles from the reservoir footprint.
- 9.516. As part of the development of the reservoir, habitat around the perimeter of the reservoir will be managed for reptiles. This will include management regimes to provide varied grassland sward heights, the installation of hibernacula and creation of log piles. The species-rich grassland on the south-facing bank of the reservoir will also provide suitable reptile habitat. There will also be enhancements around site perimeter and most notably a new woodland / scrub and wetland / grassland interface created along the northern edge of the reservoir, which will provide habitat for reptiles and allow translocated individuals to recolonise site from Havant Thicket woodland once construction is complete.
- 9.517. It is recognised that some of the enhanced habitat within Havant Thicket woodland will be suitable for reptiles in the short to medium term, but would become less suitable with time (~10 years). However, by that point habitat such as the grassland on the south facing embankment on the reservoir site will develop as suitable reptile habitat. This time period will also allow re-colonisation of the area by all four common species of reptile.

⁸⁵ A forestry term for clearing strips of trees

Mitigation & Compensation relating to the Pipeline

- 9.518. Where work is required in areas of habitat suitable for reptiles, a Precautionary Method of Working will be followed.

Great crested newts

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.519. It is not anticipated that an EPSM licence will be required in relation to great crested newts. The PMW for site clearance will take the low risk of encountering individual great crested newts into account. This will protect individual great crested newts from risks of accidental killing or injury. As a further precaution, an eDNA survey will be undertaken of the Upper Lake in The Avenue in spring 2021. If this indicates that the lake has been colonised then a licence would be obtained, based on measures to protect individual animals and the compensation for habitat loss that is already provided within the Scheme design.
- 9.520. Enhancements of the pond groups where great crested newt has been recorded will be undertaken. These enhancements will include opening up the surrounding tree canopy to allow more light to reach the ponds, which will encourage emergent vegetation. Hibernacula will also be created within Havant Thicket woodland to provide enhanced terrestrial habitat for the species. This work will be undertaken in the autumn when amphibians are not breeding or hibernating, and when the water levels in the pond are likely to be low.
- 9.521. Two ephemeral ponds were dug in early 2019 in the advance planting area within Gipsies Plain. These ponds were noted to be more than half full of water within 2 weeks of construction. The margins of the new wetland on the northern edge of the reservoir, and wildflower meadows on the embankments will provide enhanced terrestrial and aquatic habitat for great crested newt, and potentially increase the suitability of the landscape for this species.
- 9.522. Whilst not subject to specific protection, the population of more common amphibians, especially palmate newt, in the Upper Lake will be translocated away from the development footprint using a capture and translocation exercise. The removal of common amphibians from the pond will be achieved by removing a short section of the dam at the southern end of the pond to drain the waterbody prior to construction, leaving just a stream channel through the low point. Amphibians will naturally concentrate in the remaining wet area allowing them to be carefully netted and removed. A thorough search of the drained pond area will be undertaken and all the amphibians located and captured will be placed in other ponds located within, or in the site vicinity of site. This work will be undertaken during the spring breeding season to enable the greatest number of animals to be rescued.

Mitigation & Compensation relating to the Pipeline

- 9.523. No specific mitigation for great crested newts is anticipated to be required in relation to the pipeline construction.

Invertebrates

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

- 9.524. Compensation for loss of onsite 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. Measures that will compensate for loss of invertebrate habitat include:
- Habitat restoration works in Havant Thicket woodland that will provide suitable habitat for a range of scarce and notable species.
 - Grassland habitat around the perimeter of the reservoir that will be subject to management regimes which will provide varied grassland sward heights with suitability for numerous species.
 - Hedgerow and woodland bolstering within the Gipsies Plain and Deerslaughter Plain advance planting areas and around the perimeter of the reservoir footprint will also improve habitat and connectivity for invertebrates.
 - Aspen will be included in detailed planting design.

- Creation of standing and ground level dead wood habitat, including measures such as creation of log piles and creating veteran tree characteristics on younger trees to provide increased habitat opportunities.

9.525. Full details of the mitigation and compensation measures for invertebrates will be set out in the detailed Biodiversity Mitigation and Compensation Strategy.

Mitigation & Compensation relating to the Pipeline

9.526. No specific mitigation for invertebrates is anticipated to be required in relation to the pipeline route..

Other species

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

9.527. The mitigation measures identified in the sections above will also ensure that impacts to other species that use habitats within the Scheme boundary are avoided or minimised. The habitat creation and enhancements proposed will also benefit these species.

9.528. Temporary fencing will be installed around the construction area, and any open excavations will be fenced or have ramps, to prevent harm to animals using the area.

Mitigation & Compensation relating to the Pipeline

9.529. The mitigation measures identified in the sections above will also ensure that impacts to other species that use habitats within the Scheme boundary are avoided or minimised. The habitat creation and enhancements proposed will also benefit these species.

9.530. Temporary fencing will be installed around the construction area, and any open excavations will be fenced or have ramps, to prevent harm to animals using the area.

Invasive non-native species

Mitigation & Compensation relating to the reservoir site including reservoir and access roads

9.531. Invasive species are not valued ecological receptors, but are considered in order to protect existing habitats and native wildlife. A method statement for the management and removal of invasive non-native plant species will be produced and incorporated into the CEMP by the appointed contractor.

9.532. Non-native species found (excluding pine trees which are a crop or considered beneficial, e.g. as potential raptor nest sites) will be selectively removed, as appropriate, in conjunction with other woodland enhancement as the programme of work is progressed. Examples of species to be removed could include laurel and rhododendron.

9.533. The invasive non-native aquatic parrot's-feather has been identified in a pond in Havant Thicket woodland. Strict measures, such as equipment washing, will be implemented to ensure this plant is not accidentally spread during habitat enhancement works in the vicinity of this pond. Potential measures to eradicate the plant will be investigated and discussed with the landowner Forestry England.

Mitigation & Compensation relating to the Pipeline

9.534. Invasive species are not valued ecological receptors but are considered in order to protect existing habitats and native wildlife. A method statement for the management and removal of invasive non-native plant species will be produced and incorporated into the CEMP by the appointed contractor. This will include the requirement for pre-construction checks for Himalayan balsam where works are undertaken in association with streams and any plants found 'pulled' from within 5 m of the construction zone.

Assessment of effects

- 9.535. Taking all mitigation and compensation measures into account the effects on biodiversity resources have been determined as part of this assessment. These are summarised for the construction and operational phases in Table 9-10 - Assessment of effects of the reservoir site and Table 9-11 - Assessment of Effects of the pipeline corridor below.

Table 9-10 - Assessment of effects of the reservoir site

Resource	Value	Residual effect	Significance
Internationally designated sites (Singleton and Cocking Tunnels SAC, Briddlesford Copses SAC, Ebernoe Common SAC, Chichester and Langstone Harbours Ramsar site, The Solent Maritime SAC, The Solent and Isle of Wight Lagoon SAC and Solent and Dorset Coast SPA)	International	No direct effect on any internationally designated site. During the construction phase indirect effects through pollution incidents and changes to water flows will be avoided through mitigation. During the operational phase there may be some beneficial effects resulting from reduced nutrient inputs, creation of alternative recreational facility for visitors that may otherwise have visited the internationally designated sites and the created wetland and open water habitat could provide additional habitat for qualifying bird species.	Construction Phase: Neutral and not Significant Operational Phases: Possible Positive Effects Significant at a Local Level
Nationally designated sites (Langstone Harbour and Chichester Harbour SSSIs)	National	No direct effect on any nationally designated site. During the construction phase indirect effects through pollution incidents and changes to water levels will be avoided through mitigation. During the operational phase there may be some beneficial effects resulting from reduced nutrient inputs, creation of alternative recreational facility for visitors that may otherwise have visited the internationally designated sites and the created wetland and open water habitat could provide additional habitat for qualifying bird species.	Construction Phase: Neutral and not Significant Operational Phases: Possible Positive Effects Significant at a Local Level
SINCs/LWS (61 within 2km of the site of which seven at least partially within the reservoir site)	County	Direct impact on 14.55 ha of woodland SINC of which 1 ha of Havant Thicket SINC would be modified into wet woodland along the wetland edge. It is anticipated that the modified woodland would be retained as SINC resulting in permanent loss of approximately 13.55 ha of SINC habitat.	Construction Phase: Negative Effect Significant at a County level for SINCs within the reservoir footprint that are subject to

Resource	Value	Residual effect	Significance
		A significant habitat enhancement package will be undertaken within retained SINC habitat (particularly Havant Thicket and Bells Copse SINC) within the reservoir site. It is likely that the created wetland and areas of managed grassland around the perimeter of the reservoir site will, through positive ecological management, be suitable for SINC designation in the future, potentially along with the reservoir itself. On-site woodland creation is expected to reach the quality of SINC woodland habitat in the long term. Indirect impacts on SINC adjacent to the reservoir footprint during the construction and operational phases through potential pollution incidents, changes to local hydrology and recreational pressure will be avoided through mitigation measures set out in the CEMP.	permanent habitat loss. In the long-term, Positive Effects Significant at a County Level are predicted, after habitat enhancement. In addition, it is predicted that new habitats will establish into habitats of SINC quality. Operational Phase: Neutral and not significant
Ancient woodlands and veteran trees. Includes The Avenue, Corsican Pine Plantation, Round Wood, Middle Clearing, Havant Thicket woodland and Bells Copse.	Regional	Significant adverse effect on the conservation status due to loss of a maximum of 12.45 ha of ancient woodland. This will include loss of 17 veteran trees within the ancient woodland. This impact constitutes loss of irreplaceable habitat. A suitable compensation package will be provided through onsite and offsite woodland enhancement and creation (cumulatively totalling 110 ha), but the loss of irreplaceable habitat would remain so this adverse effect is reported.	Construction Phase: Negative Effect Significant at a Regional Level resulting from permanent loss of ancient woodland and veteran trees. In the long-term, Positive Effect Significant at a County Level as retained ancient woodland enhanced. Operational Phase: Neutral and not significant

Resource	Value	Residual effect	Significance
Local Nature Reserves (Hazelton Common, Dell Piece West)	Local	A significant effect is not predicted on conservation status during either construction or operational phases due to the closest being over 800 m from the site.	N/A
Priority Habitat – Lowland mixed deciduous woodland Including an assemblage of England Red List plants, e.g. sanicle (NT); wood-sorrel (NT); wild strawberry (NT).	County	Permanent loss of 6.93 ha of lowland deciduous woodland in The Avenue and 0.25 ha in Havant Thicket woodland. A suitable compensation package would be provided through onsite and offsite woodland enhancement and creation. Some woodland creation has been undertaken as advance works and some enhancements of lowland mixed deciduous woodland and as these establish the adverse effects will, at least partially, be off-set.	Construction Phase: Negative Effect Significant at a County Level. In the long-term, Positive Effect Significant at a County Level as enhanced and new woodlands establish. Operational Phase: Neutral and not significant
Priority Habitat – Wet woodland	County	Creation of the reservoir will affect 0.19 ha of wet woodland. However, following completion, it is intended that the transitional zone within the normal water level fluctuations of Compartments 2 and 3 will allow the development of at least approximately 1 ha of wet woodland. No residual operational effects are predicted.	Construction Phase: Positive Effect Significant at a County Level Operational Phase: Neutral and not significant
Priority Habitat – Purple moor-grass and rush pastures Including an assemblage of England Red List plants, e.g. lesser spearwort (VU); ragged-robin (NT); marsh pennywort (NT); marsh St John's-wort (NT).	County	Construction of the reservoir will result in the permanent loss of 1.21 ha of purple moor-grass and rush pasture which will be addressed through bespoke compensation by like-for-like habitat creation, at least 1:1 in area, in Havant Thicket woodland. Enhancement of retained grasslands within the Reservoir is planned to create some additional areas of this habitat, but taking a precautionary approach this is not reported as a significant benefit. No residual operational effects are predicted.	Construction/Operational Phase: Neutral and not Significant

Resource	Value	Residual effect	Significance
Priority Habitat – Lowland dry acid grassland Including an assemblage of England Red List plants, e.g. heather (NT); tormentil (NT); heath speedwell (NT).	County	This habitat will not be affected by habitat loss. Mitigation will be implemented to avoid accidental incursions from construction activities. Acid grassland areas will also be created as part of the enhancements within Havant Thicket woodland. No residual operational effects are predicted.	Construction/ Operational Phase: Neutral and not Significant
Other neutral grassland Assemblage of England Red List plants, e.g. lesser spearwort (VU); ragged-robin (NT); heath speedwell (NT).	County	The loss of semi-improved grassland (including developing rush pasture that does not comprise the purple moor-grass and rush pasture priority habitat) will be addressed through creation of species-rich neutral grassland on the outer embankment and around the perimeter of the reservoir, creation of neutral (marshy) grassland within compartment 0 of the wetland, enhancement of retained species-poor rush pasture and enhancement of the neutral grassland species diversity within the advanced planting areas. There will be a net loss of grassland habitat, so grassland creation and enhancement will be a priority in the Capital Grants scheme. No residual operational effects are predicted.	Construction Phase: Negative Effect Significant at a County Level. Positive Effect Significant at a Local Level as new habitats establish. Operational Phase: Neutral and not significant
Wetland and open water (reservoir)	County	The newly created wetland on the northern edge of the reservoir is anticipated to establish into habitat of at least County value due to the habitats and associated wetland species, particularly birds. The open water within the reservoir will provide habitat for fish, aquatic invertebrates and provide foraging habitat for some bird species. No residual operational effects are predicted.	Construction Phase: Positive Effect Significant on at least the County Level Operational Phase: Neutral and not significant
Upper Lake (a pond)	County	Neutral residual effect on the conservation status of pond habitats and associated species within the County. Adequate compensation for the loss of Upper Lake is provided through the creation of the wetland, creation of two ephemeral ponds in Gipsies Plain, enhancement of ponds within Havant	Construction/ Operational Phases: Neutral and not significant

Resource	Value	Residual effect	Significance
		Thicket woodland and translocation of uncommon wetland plant species. No residual operational effects are predicted.	
Intermittent headwaters of Riders Lane Stream	County	Direct loss of 3.7 km of watercourse will result in permanent negative residual effect due to loss of unique intermittent headwater habitat and associated species and the limited practical options to mitigate for the loss of this habitat typology. This loss could affect the conservation status of a limited number of notable aquatic invertebrate species through a reduction in their distribution at a county level. No residual operational effects are predicted.	Construction Phase: Negative Effect Significant at a County Level resulting from permanent loss of intermittent stream habitat. Operational Phase: Neutral and not significant
Riders Lane Stream	Local	Permanent loss of 0.1 km of functional watercourse immediately downstream of the reservoir is adequately compensated for through implementation of best practice pollution prevention and construction measures, creation of a new 250 m compensation flow channel and localised watercourse enhancements upstream of the reservoir so that these losses will not affect the conservation status of Riders Lane Stream habitat and associated species in the long-term. Residual effects associated with changes in flow could be positive or negative depending on exact parameters of compensation flow and routine drawdowns. Review of ecological flow requirement will be undertaken to set an appropriate compensation flow and there will be provision of backwater habitats to provide refugia during routine drawdown events. In light of this, effects are likely to be negligible within the context of the watercourse character and species assemblage.	Construction/Operational Phase: Neutral and not Significant
Hermitage Stream	Local	Residual effects associated with changes in flow could be positive or negative depending on exact parameters of compensation flow and routine drawdowns. Review of ecological flow requirements will be undertaken to set an appropriate compensation flow and there will be provision of backwater habitats to provide refugia	Construction/Operational Phases: Neutral and not significant

Resource	Value	Residual effect	Significance
		during routine drawdown events. In light of this, effects are likely to be negligible within the context of the watercourse character and species assemblage.	
Bats	National	Habitat loss and loss of known and potential roosts will be minimised and retained habitats protected. New habitats suitable for bats and roosting opportunities will be created and existing habitats enhanced to compensate for loss of bat habitat. Mitigation and compensation will be undertaken in accordance with an EPSM licence, and combined with habitat enhancement and creation this will ensure there are no residual effects on bats. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Hazel dormice	County	Habitat loss will be minimised and retained habitats protected. New habitats suitable for dormice will be created and existing habitats enhanced to compensate for loss of dormouse habitat. Mitigation and compensation will be undertaken in accordance with an EPSM licence which will ensure there are no residual effects on dormice. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Otters	site	Otters have not been recorded on the reservoir site although there is potential for them to make occasional use of the habitats present. Given the absence of any evidence of this species and the proposed mitigation, there is unlikely to be any residual effects on otters. Post construction the wetland and reservoir will provide enhanced habitat for otters if they colonise the site. While this is a benefit, it relies on colonisation so is not reported as a significant impact. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Water voles	Negligible	Water voles have not been recorded on the reservoir site so there is unlikely to be any residual effects on water voles. Post construction the wetland and reservoir banks will provide enhanced habitat for water voles if they colonise or are introduced to the site. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant

Resource	Value	Residual effect	Significance
Badgers	Negligible	No loss of badger setts and retained habitats enhanced to compensate for loss of suitable foraging habitat. Mitigation in the CEMP will ensure badgers are not harmed. No residual effects on badgers. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Birds	County value for breeding birds Local value for wintering birds	Habitat loss will minimised and retained habitats protected and enhanced. Mitigation in the CEMP will ensure that nesting birds are not harmed and that the Schedule 1 firecrest is not disturbed. New habitats created, particularly the wetland, will benefit bird species and therefore there is unlikely to be a significant effect on the conservation status of the majority of the bird species identified in the baseline surveys. It is unlikely that the compensation grassland within site will entirely off-set the loss of skylark territories, so grassland creation and enhancement will be a target of the Capital Grants scheme. These measures will ensure no adverse residual effects on birds. Some species, such as wetland birds, will benefit from the onsite habitat creation and enhancement, and colonisation can be predicted with confidence.	Construction Phase: Neutral and not significant Operational Phase: Potential for Positive Significant at least County Level
Reptiles	County	Loss of suitable reptile habitat at the reservoir site will be minimised and retained habitats protected and enhanced. A reptile translocation will be undertaken to suitable enhanced habitat in Havant Thicket woodland and site clearance undertaken in accordance with a PMW. New habitats created will once established provide suitable habitats for reptiles. These measures will ensure no adverse residual effects on reptiles. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Great crested newt	Local	Habitat loss will be minimised and any works undertaken within 500 m of ponds known to support great crested newts undertaken under a PMW or EPSM licence. Enhancements to new habitats created will be suitable for great crested newts once established. These measures will ensure no adverse residual effects on great crested newts.	Construction/ Operational Phases: Neutral and not significant

Resource	Value	Residual effect	Significance
Invertebrates	Local	Habitat loss will be minimised and retained habitats protected and enhanced. The changes in habitats will adversely affect some invertebrate assemblages whilst others will benefit from the onsite habitat creation and enhancement. Overall no significant adverse residual effects on invertebrates is anticipated.	Construction/ Operational Phases: Neutral and not significant
Other priority animals, such as hedgehogs and toads.	Site	Habitat loss will be minimised and retained habitats protected and enhanced. New habitats created will be beneficial to other priority species that utilise the site once established.	Construction/ Operational Phases: Neutral and not significant

Table 9-11 - Assessment of Effects of the pipeline corridor

Resource	Value ⁸⁶	Residual effect	Significance
Internationally designated sites (Singleton and Cocking Tunnels SAC, Briddlesford Copses SAC, Ebernoe Common SAC, Chichester and Langstone Harbours Ramsar site, The Solent Maritime SAC, The Solent and Isle of Wight Lagoon SAC and Solent and Dorset Coast SPA)	International	No direct effect. Indirect effects through pollution incidents (during construction and maintenance) and changes to water flows will be avoided through mitigation. The Scheme is not predicted to have a significant effect on conservation status during construction and operational phases. The pipeline will transfer water to and from the reservoir. Operational effects associated with water quality and flows are considered above in relation to the reservoir site.	Construction/ Operational Phases: Neutral and not Significant
Nationally designated sites (Langstone Harbour and Chichester Harbour SSSIs)	National	No direct effect. Indirect effects through pollution incidents (during construction and maintenance) and changes to water flows will be avoided through mitigation. The Scheme is not predicted to have a significant effect on conservation status during construction and operational phases. The pipeline will transfer water to and from the reservoir. Operational effects associated with water quality and flows are considered above in relation to the reservoir site.	Construction/ Operational Phases: Neutral and not Significant
SINCs/LWS (High Lawn, Thicket Lawn, Great Copse SINCs and 65 within 2km of the pipeline corridor)	County	The temporary impacts on with the SINCs along the pipeline route will be mitigated by avoidance of accidental incursions into areas outside of the construction zone through the use of protection fencing. The grassland habitat within High Lawn and Thicket Lawn SINCs and habitat in Great Copse SINC affected by construction of the pipeline and works on a culvert will be re-instated in accordance with details in an Ecological Mitigation and Management Plan (EMMP) for the pipeline route.	Construction Phase: Temporary Negative Effect Significant at a Local Level but Neutral and not significant following restoration Operational Phase: Neutral and not significant
Ancient woodlands and veteran trees. Great Copse	Regional	The pipeline corridor has been re-designed to avoid impacts on Great Copse ancient woodland. Trees will be protected during construction.	Construction/ Operational Phases:

⁸⁶ The value of some ecological receptors assessed in relation to the pipeline corridor are in some cases lower than for the Site as a whole (as assessed in Table 9-7 - Nature conservation value of resources). The pipeline corridor is largely within a more urban environment resulting it in being of lower nature conservation value for many of the receptors.

Resource	Value ⁸⁶	Residual effect	Significance
This ancient woodland includes deciduous woodland priority habitat		No residual operational effects are predicted.	Neutral and not Significant
Local Nature Reserves (Farlington Marshes)	Local	No significant effect is predicted on conservation status during either construction or operational phases due to the closest being 1.6 km from the pipeline corridor.	N/A
Priority Habitat – Wood pasture and parkland and deciduous woodland associated with Staunton Country Park and deciduous woodland associated with Great Copse SINC	County	The temporary impacts on with these habitats along the pipeline route (within High Lawn, Thicket Lawn and Great Copse SINC) will be mitigated by avoidance of accidental incursions into areas outside of the construction zone through the use of protection fencing. The grassland habitat within High Lawn and Thicket Lawn SINC affected by construction of the pipeline will be re-instated in accordance with details in an Ecological Mitigation and Management Plan (EMMP) for the pipeline route. Trees will be protected during construction.	Construction/ Operational Phases: Neutral and not Significant
Riders Lane Stream	Local	Temporary loss of approximately 20 m of in channel habitat during construction of a pipeline crossing and culvert upgrades. Adequate compensation is provided through implementation of best practice pollution prevention and construction measures, reinstatement of channel and riparian habitats following pipeline and culvert construction, creation of a new 250 m compensation flow channel and localised watercourse enhancements upstream of the reservoir so that these losses will not affect the conservation status of Riders Lane Stream habitat and associated species in the long-term.	Construction/ Operational Phase: Neutral and not Significant
Unnamed tributary of Riders Lane Stream (The Lake Stream)	County	Temporary loss of approximately 20 m of in channel habitat during construction of a pipeline crossing will be adequately mitigated for through implementation of best practice pollution prevention and construction measures, and reinstatement of channel and riparian habitats following pipeline construction, so that it will not affect the conservation status of the unnamed tributary of Riders Lane Stream (The Lake Stream) habitat and associated species in the long-term.	Construction/ Operational Phases: Neutral and not significant
Hermitage Stream	Local	Temporary loss of approximately 20 m of in channel habitat during construction of a pipeline crossing. Negative temporary	Construction/ Operational Phases:

Resource	Value ⁸⁶	Residual effect	Significance
		effects associated with construction will be adequately mitigated through implementation of best practice pollution prevention and construction measures, and reinstatement of channel and riparian habitats following pipeline construction, so that they will not affect the conservation status of Hermitage Stream habitat and associated species in the long-term.	Neutral and not significant
Bats	Site	Habitat loss and loss of known and potential roosts will be avoided and retained habitats protected. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Hazel dormice	Site	Habitat loss will be minimised and retained habitats protected. Mitigation and compensation will be undertaken in accordance with an EPSM licence which will ensure there are no residual effects on dormice. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Otters	Site	Otters have not been recorded on the pipeline corridor although there is potential for them to make occasional use of the habitats present. Given the absence of any evidence of this species, there are unlikely to be any residual effects on otters. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Water voles	Negligible	Water voles have not been recorded on the pipeline corridor so there is unlikely to be any residual effects on water voles. Post-construction the enhanced watercourse habitats could provide habitat for water voles if they colonise the watercourses. While this is a benefit, it relies on colonisation so is not reported as a significant impact. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Badgers	Negligible	No loss of badger setts. Mitigation in the CEMP will ensure badgers are not harmed. No residual effects on badgers. No residual operational effects are predicted.	Construction/ Operational Phases: N/A
Birds	Site	Habitat loss will be minimised and retained habitats protected. Following installation of the pipeline habitats will be reinstated.	Construction Phase/ Operational Phase :

Resource	Value ⁸⁶	Residual effect	Significance
		Mitigation in the CEMP will ensure that nesting birds are not harmed and that the Schedule 1 birds such as kingfisher are not disturbed. These measures will ensure no adverse residual effects on birds.	Neutral and not significant
Reptiles	Site	Temporary loss of suitable reptile habitat in the pipeline corridor will be minimised and retained habitats protected. Site clearance will be undertaken in accordance with a PMW and reinstated following pipeline installation. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant
Great crested newt	Negligible	The pipeline corridor is considered unlikely to support great crested newts given the absence of suitable breeding waterbodies within 250 m and therefore, no impacts of the pipeline construction on this species are anticipated.	Construction/ Operational Phases: Neutral and not significant
Invertebrates	Site	Habitat loss will be minimised and retained habitats protected. Following installation of the pipeline habitats will be reinstated. No significant adverse residual effects on invertebrates are anticipated.	Construction/ Operational Phases: Neutral and not significant
Other priority animals, such as hedgehogs and toads.	Site	Habitat loss will be minimised and retained habitats protected. Habitats lost will be reinstated. No significant adverse residual impacts are predicted. No residual operational effects are predicted.	Construction/ Operational Phases: Neutral and not significant

Monitoring

Monitoring relating to the reservoir site including reservoir and access roads

- 9.536. In order to ensure the appropriate establishment and long-term management of new biodiversity resources provided as mitigation, compensation or enhancements, the Biodiversity Mitigation and Compensation Strategy will include details of monitoring measures required post-construction.
- 9.537. Monitoring will include, but not necessarily be limited to: bat and dormouse monitoring required under licence, and habitat monitoring at the habitat creation and enhancement areas. This habitat monitoring will inform any requirement for adaptive management.
- 9.538. Water quality and flow monitoring requirements are detailed in Chapter 15 Water in ES Volume 2.

Monitoring relating to the Pipeline

- 9.539. The dormouse licence will include some vegetation works in the northern part of the pipeline corridor. These will be included in monitoring required under the licence. Monitoring will also be undertaken during the maintenance period of the restored grassland in Thicket Lawn SINC and High Lawn SINC, to inform any requirement for adaptive management.

Summary

Overall findings on biodiversity relating to the reservoir site including reservoir and access roads

- 9.540. The significant residual effects of the Scheme relate to the reservoir site, including the reservoir itself and the access roads and other related development. The Scheme will result in the loss of 12.45 ha of irreplaceable ancient woodland, including the loss of 17 veteran trees, resulting in an Adverse Effect significant at the Regional Level. Compensation for this residual impact will include a total of 110 ha of woodland / wood pasture habitat creation and enhancement, onsite and offsite. While suitable compensation will be undertaken, this still constitutes loss of irreplaceable habitat.
- 9.541. The Scheme will also result in the loss of 13.55ha within SINC, 7.18 ha priority lowland mixed deciduous woodland habitat, and 1.21 ha of purple moor-grass and rush pastures priority habitat. The Scheme includes suitable compensation for these losses.
- 9.542. The Scheme will result in the loss of 3.7 km of headwater streams. Associated compensation / enhancement measures include the creation of a 250 m compensation flow channel, localised woodland stream enhancements and gravel translocations. However, these measures on their own are not considered to adequately mitigate for the significant negative effect identified in relation to the permanent headwater habitat losses. As such, further offsite measures are to be developed in agreement with the Environment Agency, such as restoration of a section of the Hermitage Stream.
- 9.543. The reservoir will result in the creation of new habitats of ecological value, particularly the wetland along the northern edge of the reservoir. It is considered likely that habitats of at least County value will establish. A number of reservoirs have been recognised for their national or even international ornithological interest so greater value is possible.
- 9.544. The significant residual impacts include a loss of grassland, which is only partially compensated for through habitat creation onsite. Grassland creation and enhancement will therefore be one of the targets of the Capital Grants scheme, as described in the outline Biodiversity Mitigation and Compensation Strategy that accompanies the planning applications.

Overall findings on biodiversity relating to the Pipeline

- 9.545. Impacts on biodiversity resulting from the Pipeline are largely temporary in nature, occurring during the construction phase and will not result in significant adverse effects.
- 9.546. No significant effects during the operation phase are anticipated.



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