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Technical Note

Project:	Havant Thicket Reservoir		
Subject:	Article 4.7 Mitigation Work for Reach 4		
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Document history

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1.0	First Draft	PMU	SB	-	-	17/05/2022

Client signoff

Client	Portsmouth Water
Project	Havant Thicket Reservoir
Project No.	5202641
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1. Background

Portsmouth Water have successfully gained planning permission for the construction of Havant Thicket Reservoir.

As part of the Environmental Impact Assessment (EIA); the Water Framework Directive (WFD) compliance assessment¹ and Article 4.7 Report², a package of aquatic mitigation and compensation measures were agreed with the Environment Agency³. An overview of the 14 agreed reaches is provided in Figure 1-1 and briefly comprises of:

- Reaches 1 to 3 – habitat improvements to three Headwater Streams north of the reservoir
- Reach 4 – aquatic macrophyte and macroinvertebrate mitigation work, including translocation of species
- Reach 5 – construction of a new watercourse on Gipsies Plain
- Reach 7 – water quality improvements in The Lake Stream
- Reach 8 – construction of a new compensation flow channel and a new compensation flow regime
- Reach 16 – habitat improvements in the upper Park Lane Stream at the Waterlooville Golf Course
- Reach 23 – habitat improvements in the upper reaches of the Hermitage Stream in The Queen's Inclosure
- Reaches 26 to 30 – habitat improvements in the middle and lower Hermitage Stream

It has been agreed with the Environment Agency that the aquatic mitigation & compensation plan does not require delivery prior to reservoir construction as most reaches are not on the reservoir site and/or not directly linked to on-site construction activities. A programme for delivery of each of the reaches will need to be agreed between Portsmouth Water and the Environment Agency.

The exception to this is 'Reach 4' as its objective is to mitigate / compensate for some of the aquatic habitat and species loss at the Havant Thicket Reservoir site and thus requires delivery prior to construction works starting on-site. This Technical Note does not provide detail on other reaches, where Atkins have provided outline design drawings and further (detailed) design work is still needed.

This Technical Note provides further detail of the works proposed for Reach 4, split out into the aquatic macroinvertebrate, aquatic macrophyte mitigation and Invasive and Non-Native Species (INNS) work. It is noted that although there are clear overlaps and links between each of these three work streams, that these can be delivered by different contractors. For each, we provide the aims and objectives, delivery scope, monitoring requirements and timescales.

¹ Atkins (2020). Havant Thicket Reservoir Project. WFD Assessment. Appendix to Environmental Statement. Reference: HTR-ATK-ZZ-ZZ-RP-Z-0123

² Atkins (2021). Havant Thicket Outline Design. WFD – Article 4.7. Technical Note for Portsmouth Water. Reference: HTR-ATK-XX-XX-RP-Z-0067

³ Agreement reached 5 March 2021 following a workshop discussion on the mitigation and compensation package options.

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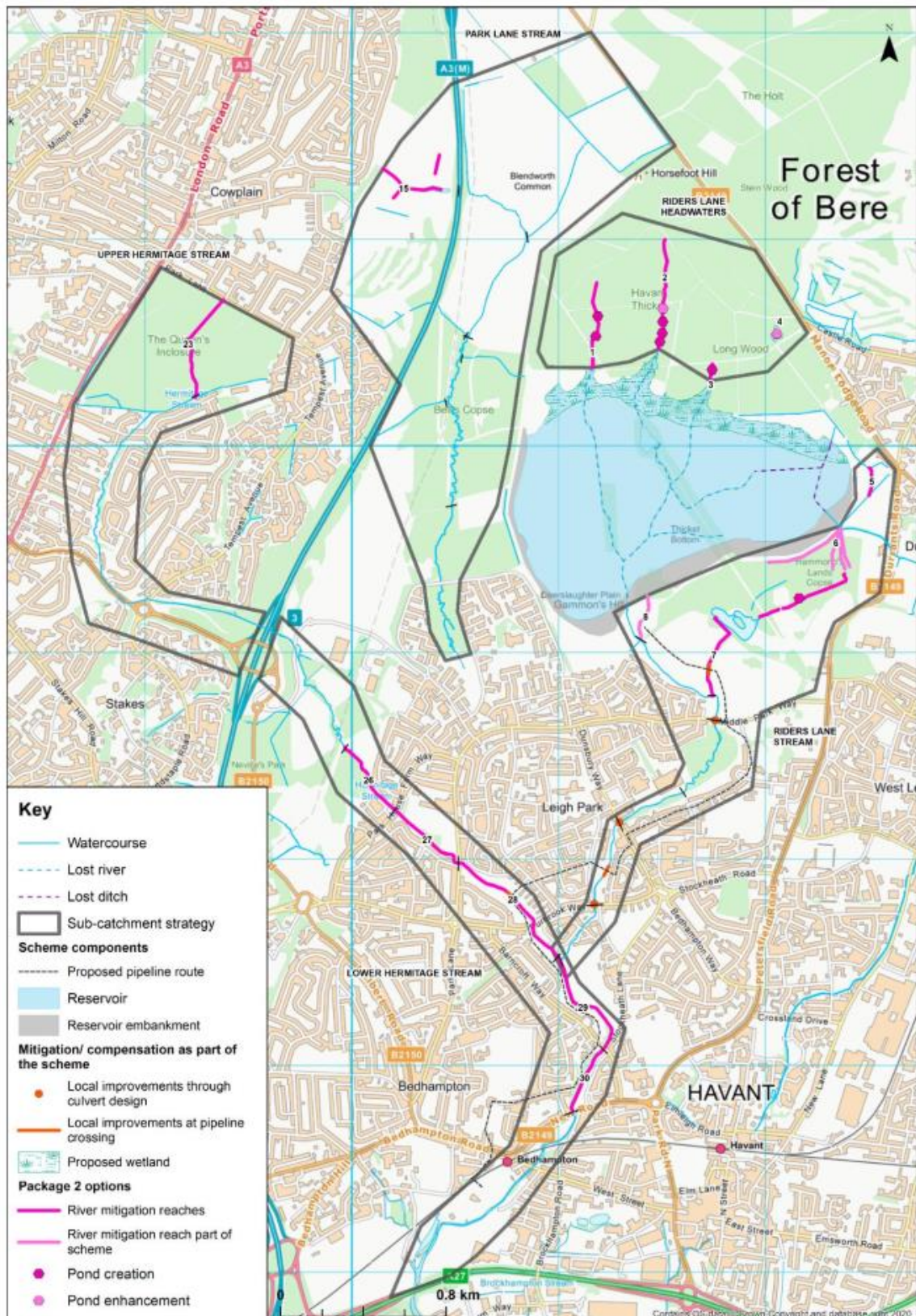


Figure 1-1 - Overview of WFD Article 4.7 mitigation and compensation measures agreed with the Environment Agency

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2. Aquatic macroinvertebrates

2.1. Aims and objectives

The main objective of this work is to translocate notable macroinvertebrate species recorded in Headwater Stream 1 and Headwater Stream 2, with a particular focus around a spring within Havant Thicket (approx. NGR SU 71191 09921), which will be lost as a result of the scheme. Water flows regularly below Upper Lake (marked as Pond 5 on Figure 3-1) and this spring whilst further upstream the streams dry up for about half of the year outside of winter and spring.

2.2. Background

Macroinvertebrate surveys undertaken as part of the scheme's Environmental Impact Assessment recorded assemblages containing nationally important species downstream of the spring and also the Upper Lake. Of particular note are the APEM Spring 2020 results⁴⁵ (as most of the streams were flowing at this point in time) and these recorded:

- On Headwater Stream 1, at APEM Sampling Site 2 (NGR SU7119709915 - downstream main spring) a community with 'high' conservation value, including a Nationally Scarce beetle (*Ochthebius pusillus*), a Nationally Scarce caddis fly (*Limnephilus bipunctatus*) and a relatively uncommon freshwater amphipod (*Niphargus aquilex*) which is associated with wells, interstitial gravels and groundwater upwelling.
- On Headwater Stream 2, at APEM Sampling Site 1 (NGR SU7146910446) a community with 'very high' conservation value including one Nationally Scarce beetle species: *Hydrovatus clypealis* and another uncommon beetle species: *Ilybius chalconatus*.
- On Headwater Stream 2, at APEM Sampling Site 3 (NGR SU7147609961) a community with 'very high' conservation value including two Nationally Notable beetle species: *Ochthebius marinus* and *Hydraena testacea*.
- On Headwater Stream 2, at APEM Sampling Site 5 (NGR SU71451 09632), a community with a 'very high' conservation value including a Near Threatened beetle species: *Hydrochus crenatus*.

Samples were also taken from Headwater Stream 3 as well as the downstream Riders Lane Stream and Hermitage Stream but communities at these sites were of much lower conservation value with no notable species recorded. Because neither the Riders Lane Stream nor the Hermitage Stream are directly affected through habitat loss, therefore species relocation was not considered necessary.

The APEM surveys highlighted that the principal interest of the Headwater Streams is in relation to notable beetle and caddis fly species. Most of the aquatic beetles recorded share a common life strategy trait in that they prefer temporary and semi-permanent watercourses with marginal vegetation. They adapt to this by burrowing into the sediment as water levels recede. It is hypothesized that the beetle community has established in the headwaters of Riders Lane Stream at Havant Thicket compared to the headwaters of Hermitage Stream or the headwaters of Park Lane Stream because they are undeveloped and there are no discharges that can affect water quality.

Work has been undertaken to find suitable receptor site(s) for species relocation. A key criterion for selecting the site(s) was to keep this local. Macroinvertebrate sampling undertaken as part of the EIA revealed that much of the Hermitage Stream catchment has water quality issues, meaning that mitigation assessments also considered nearby catchments, such as the Lavant and Ems.

Macroinvertebrate sampling was undertaken by APEM in autumn 2021 and spring 2022⁶ in a range of nearby watercourses to find suitable habitats and similar beetle communities i.e., also indicative of good water quality and temporary / semi-permanent waterbodies. An overview of the sites visited has been provided in Figure 2-2.

⁴ APEM Ltd (2020). Havant Thicket Reservoir. Freshwater Macroinvertebrate Analysis Report for Spring 2020 samples. APEM Report No. 4971.

⁵ Specialist advice, including specimen verification, was also provided by Dr Garth Foster, one of the UK's most eminent aquatic beetle specialists.

⁶ Only preliminary results were made available at time of writing this note.

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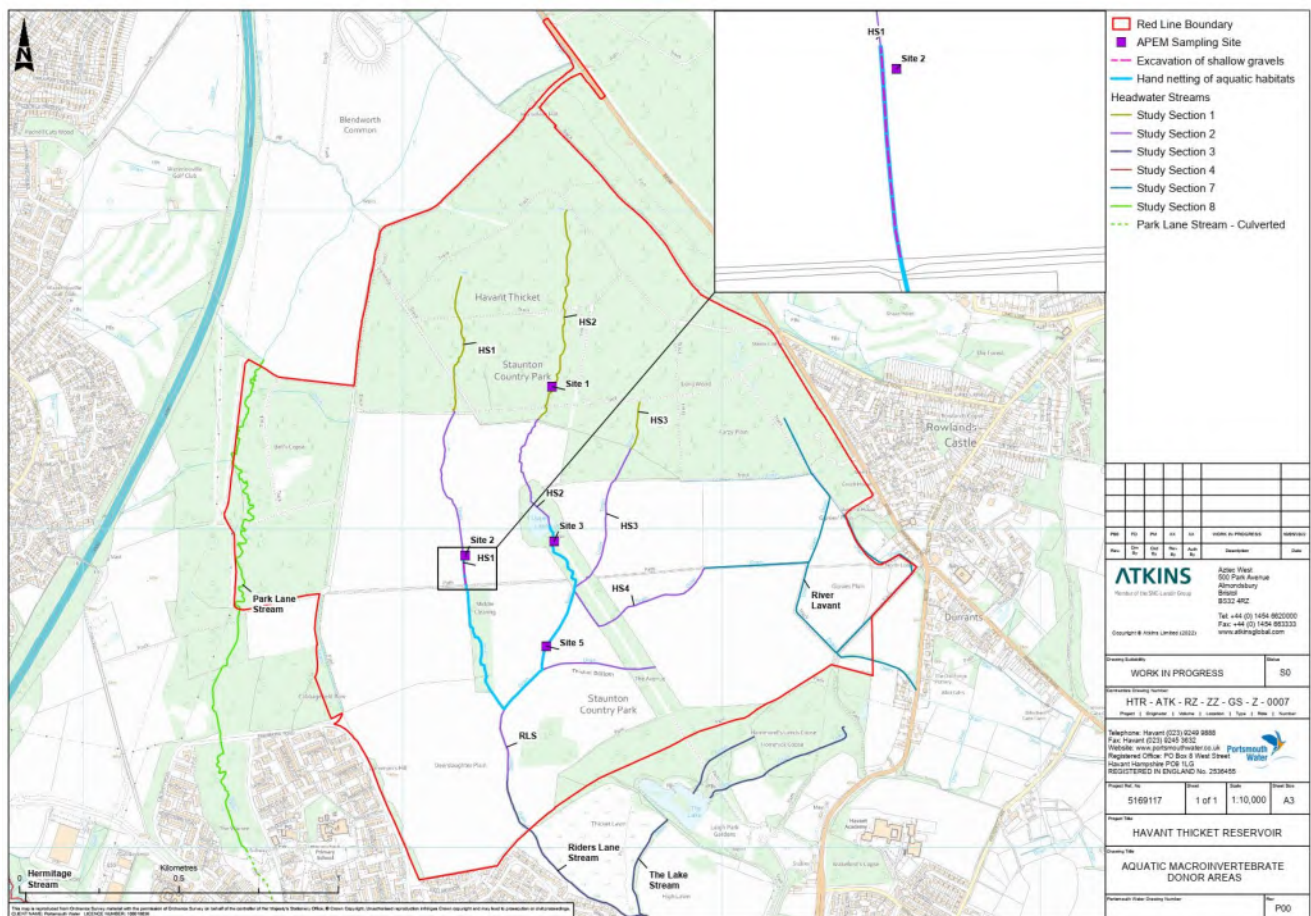


Figure 2-1 - Overview of aquatic macroinvertebrate donor sites

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2.3. Delivery scope

Capturing of macroinvertebrates is split into the following two activities:

- Hand netting of aquatic habitats Headwater Stream 1 & 2 by a suitably qualified aquatic macroinvertebrate specialist⁷. This would cover Headwater Stream 1 from its main spring at NGR SU 71191 09925 and its confluence with Headwater Stream 2 at NGR SU 71321 09436; and Headwater Stream 2 between Upper Lake (NGR SU 71488 10012) and the confluence with Headwater Stream 1 at NGR SU 71321 09436.
- Excavating of shallow gravels (up to approx. 20 cm depth) around the main spring(s) on Headwater Stream 1, between NGR SU 71191 09925 (Figure 2-3) and a tree stump just upstream of the Bridleway (Figure 2-4, SU 71198 09826).

The hand netting should precede the excavation work. Both activities will need to keep the aquatic macroinvertebrates 'wet' between the donor and receptor site. There should also not be too much gravel 'stacked' in each transporting container to avoid crushing of the beetles. They should also be shaded from sunlight during transport to prevent the water from warming up, which will result in a reduction in oxygen levels. It is considered likely that water quality will, nevertheless, reduce quite quickly once the macroinvertebrates are placed in their containers. Recovered specimens and materials should, therefore, be taken as quickly as possible to a suitable donor site. As such it is preferred that the work is spread over multiple trips, and thus it is likely that the translocation will need to be undertaken over multiple days.

In terms of the receptor sites, a review of suitable locations has been undertaken which is documented in Appendix A. There are two receptor reaches identified:

- An unnamed tributary of the River Ems in Southleigh Forest upstream of Emsworth Common Road (Receptor Site R8, see Figure 2-5). This reach contained notable beetle species which have the same life cycle strategy as those recorded in Headwater Streams 1 & 2. This reach already experiences some backing up from the downstream road and has a lower gradient than reach R9. As such, it is recommended that this reach receives the excavated shallow gravels, which can be transported from Woodberry Lane via the Public Bridleway. The gravels need to be spread evenly over the reach and must not be left in one location or deposited so they can result in further backing up of water as the stream is unlikely to have sufficient flow / 'energy' to move a gravel deposit / bar. Although the stream sides could be shaped to make a more natural river channel, additional handling and compaction must be avoided as this would result in crushing of the adult macroinvertebrates or their larvae.
- An unnamed tributary of the River Ems in Southleigh Forest downstream of the Emsworth Common Road (Receptor Site R9, see Figure 2-6). This reach has a slightly steeper gradient than reach R8. Access is not as easy as reach R8 and this reach is therefore not suitable for depositing the shallow gravels without. Pending landowner agreement, it is recommended that the hand netted macroinvertebrates are released into this reach.

It is not recommended that habitat enhancement works are required for the two Receptor Sites (R8 and R9). Habitats are suitable and so does water quality. Instead, on-going management for the streams should avoid any further interventions in this reach such as in-channel habitat work or dredging to prevent disturbance to the macroinvertebrate communities.

⁷ Given specific (beetle) habitats need to be targeted, the experience of the ecologist undertaking this work must extend beyond the standard 3-minute hand netting / kick sampling.

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Figure 2-3 - Photo of main spring, facing upstream, showing start of gravel extraction reach (Photo taken by Peter Mulder, May 2022)



Figure 2-4 - Photo of second spring, facing upstream, showing end of gravel extraction reach as indicated by tree stump (Photo taken by Peter Mulder, May 2022)

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Figure 2-5 - Photo of Receptor Site R8, facing downstream (Photo taken by Peter Mulder, May 2022)

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Figure 2-6 - Photo of Receptor Site R9, facing downstream (Photo taken by Peter Mulder, May 2022)

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2.4. Monitoring

Once the translocation has been completed, it is recommended that a programme of post-translocation environmental monitoring is undertaken for spring & autumn 2023, 2024 and 2025.

2.5. Timescales

The optimal timescales for the two activities (hand netting, excavation) are March to May inclusive. After May, as flows reduce in the tributaries, the beetles and their larvae will enter the gravels and live in these over the duration of the summer until the catchment re-wets in winter. Winter is generally a suboptimal season as although flows are better, colder winter temperatures will mean that macroinvertebrate activity is low and thus capture rates are also considered to be low for the hand netting work in particular.

If the yield of the hand netting is very low in May 2022, a repeat could be considered in 2023.

Any new crossings must be avoided within the Headwater Stream 1 and Headwater Stream 2 donor reaches. Comprehensive pollution control measures (including silt protection) must be put in place by any contractors working in the vicinity or upstream of the donor reaches until this work is completed.

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3. Aquatic macrophytes

3.1. Aims and objectives

The aquatic macrophyte mitigation work is focused on the macrophyte community in Upper Lake, which is a low-nutrient, low pH (i.e., acidic) ephemeral pond located in The Avenue at NGR SU 71436 10018 and is fed by Headwater Stream 2. It is marked as Pond 5 on Figure 3-1 overleaf. Ephemeral ponds like these are quite unusual. As Headwater Stream 2 dries up in summer, so does the flow into Upper Lake and water levels then decrease over time until refill starts in the winter.

3.2. Background

The macrophyte community in Upper Lake was surveyed in 2021 as part of the EIA and also more recently by Dr Richard Lansdown (a Kew Gardens associate, under contract through APEM Ltd⁸). The aquatic macrophyte species recorded were characteristic of standing water, with low nutrients and low pH. Three species of particular note included:

- Bog St. John's-wort (*Hypericum elodes*)
- Floating club-rush (*Isolepis fluitans*)
- Lesser skullcap (*Scutellaria minor*)

These three species are uncommon at a county level, but do not have any protection. They were mainly recorded at the inflow / northern side to Upper Lake. Upper Lake will disappear as part of the reservoir work and these three species are, therefore, considered target species to preserve.

The aim of this work package is to safeguard these populations for the future by improving the condition of the receptor ponds, followed by translocation and/or planting of seedlings. There is a significant risk to the delivery of this work package by the presence of parrot's feather (*Myriophyllum aquaticum*) at some of the ponds, which is considered in further detail in Section 4 below.

⁸ APEM Ltd (2021). Survey of Ponds at Havant Thicket. Report to Portsmouth Water, Reference P7215.

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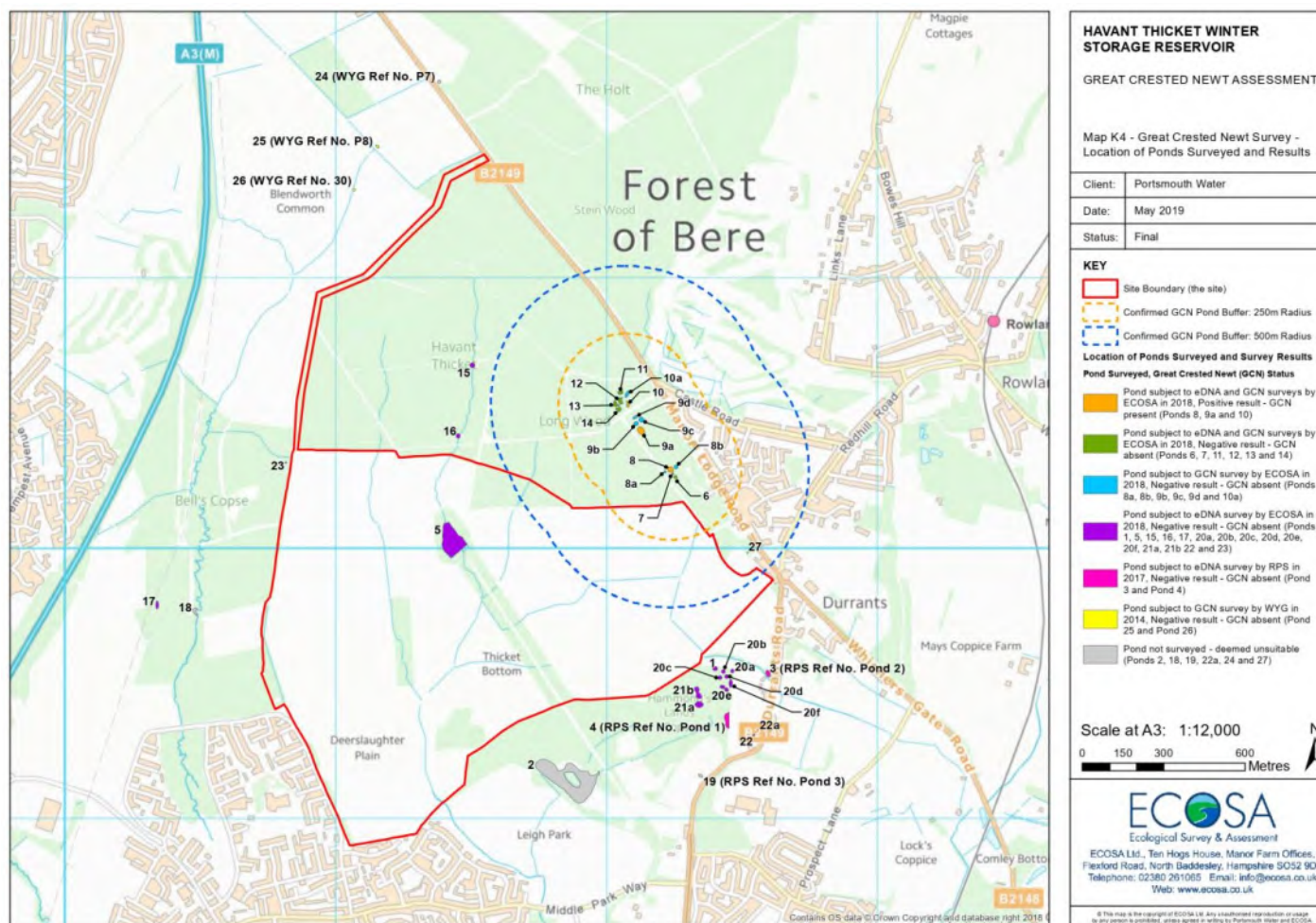


Figure 3-1 – Overview of Pond features around Havant Thicket Reservoir site. Reproduced from ECOSA ‘Map K4 GCN Survey Results. Colours relate to GCN presence/absence (as established through ECOSA surveys) and do NOT indicate any macrophyte results / suitability for translocation. Any advice on the supporting data and presence/absence of GCN needs to be sought from ECOSA.

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3.3. Delivery scope

3.3.1. Overview

APEM's 2021 surveys aimed to identify suitable receptor locations across Havant Thicket and covered the following ponds shown in Figure 3-1: Pond 5, 6, 7, 8b, 9a, 9b, 9c, 10a, 11, 12, 13, 14, 15 and 16. All three target species were recorded in Upper Lake, with only lesser skullcap recorded at one other pond i.e. Pond 9c.

It was concluded that the following ponds would be suitable as receptor locations for the translocation, but that these ponds do need to be improved to become more suitable for the three target plant species:

- Central ponds: Ponds no. 9a, 9b, 9c and 9d
- Northern ponds: Ponds 10, 10a, 11, 12, 13 and 14

Figure 3-2 shows the central and northern pond complexes in greater detail.

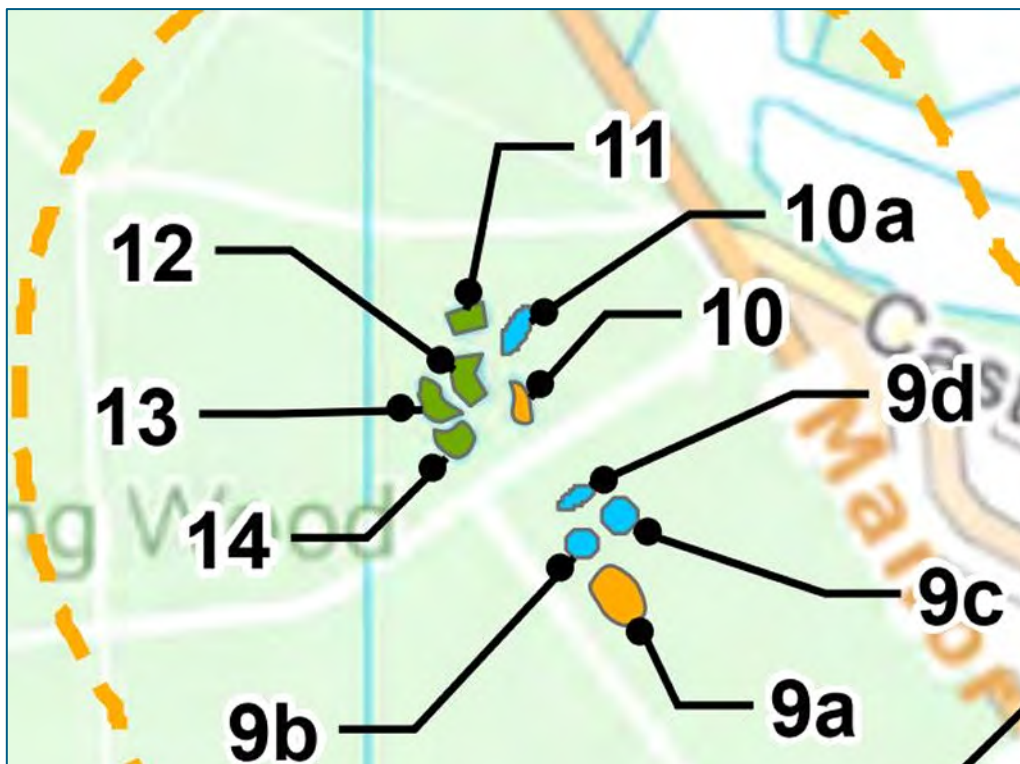


Figure 3-2 – Zoomed in version of Figure 3-1. See Figure 3-1 description for details and disclaimer.

It is considered possible that these ponds may have these target species present, but only very limited cover i.e., so low that it was not possible to detect plants as part of the surveys, and that environmental conditions (notably shallowing of the ponds and limited light) prevent these species from becoming more established – a phenomenon known as ‘ghost ponds’.

Improving the conditions of the ponds would be undertaken by removing all coniferous trees to a distance of 50 m from the two pond complexes. Removing trees must be undertaken without compacting the ground around ponds. Broadleaf trees can be left in-situ.

Forestry Commission (FC) have advised:

- Thinning around Ponds 9a-9d could be considered regeneration felling/thinning and can be delivered as part of the existing Forest Design Plan.
- Thinning around Ponds 10-14 could be considered a clear fell, but if natural regeneration or planting of broadleaf is incorporated into design then this would be acceptable. An amendment to the Forest Design Plan is required to accommodate this.

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- A small clump of Scottish Pines to the North West of ponds 10-14 is retained in context of their value for wider biodiversity.
- A significant component of the Pond 9 canopy is Norway Spruce which FC would support the removal of to help combat the spread of *Ips typographus*. (*Ips typographus* is destructive pest species primarily affecting Norway Spruce spread by the spruce bark beetle - cases have occurred in recent years in Kent and Sussex). There is also Norway Spruce around the Pond 10-14 complex.
- Natural regeneration will be allowed to avoid this being classed as a 'clear felling' of species.
- In future years, the remaining trees around the ponds could be managed in a short rotation to preserve the light levels. This needs to be incorporated in the updated Forest Design Plan.

The resultant area (2 ha) has been estimated by Jane Smith from Corylus Environmental by putting a point in the centre of each pond and then drawing a circle with a 50 m radius around each pond, removing any areas of overlap. This is shown in Figure 3-3 below, with the red shading indicating the 2 ha area. As the overall objective is to remove shading trees, the northernmost area (not shaded in red) does not require removal as it is not in the path of the sun.

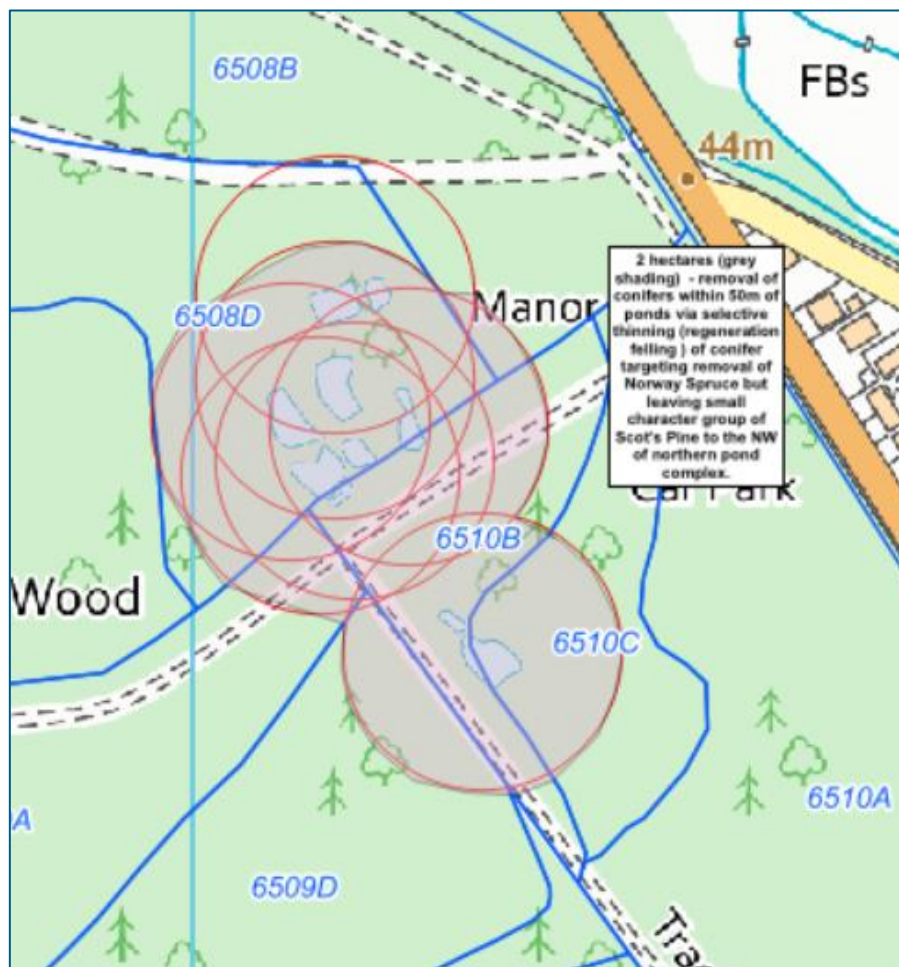


Figure 3-3 - Area estimate for selective thinning of conifer trees. Image provided by Corylus Environmental

3.3.2. Environmental considerations

We note Atkins are not contracted to undertake protected species surveys, mitigation work or providing any type of protected species advice. ECOSA hold all datasets, plans and agreements. As such, Atkins accept no liability in this regard and assistance on the presence of protected species like Great Crested Newts (GNC) and any others needs to be sought from ECOSA or another suitably qualified ecological consultancy.

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It is the contractor's responsibility to provide the necessary safeguards for nesting birds as well as species which have received protection under UK Law. As an example, GCN have been recorded by ECOSA in some of the ponds (see colour coding in Figure 3-1). The ponds also contain a number of very rare aquatic and riparian plant species. Uncommon mosses are also associated with the deadwood in the ponds, which is to be retained.

Forestry England (FE)'s ecologist has provided advice on good practice measures for forestry work which should be considered, including some wider protected species and habitat considerations. Their advice is attached in Appendix B.

3.3.3. Description of thinning works

- Prior to starting the thinning work, trees requiring removal need to be marked around the boundary of the area.
- All conifers, with exception of marked groups of character i.e., Scot's Pine need to be felled from the demarcated felling coup.
- All broadleaf, including deadwood, are to be retained.
- The proposed area of tree removal needs to be agreed with Portsmouth Water and its agents (including FE/FC) prior to the works processing.
- A buffer zone needs to be established around the ponds, using the UK Forestry Standard (UKFS) Guidelines. Most ponds are >2 m wide and thus the buffer should be between 2 and 20 m. Atkins recommend that the upper range, 20 m, is used.
- Within this buffer zone, ground should not be disturbed or driven over by machinery in accordance with the UKFS.
- Ground damage to be kept to a minimum elsewhere and any excessive ground damage reinstated at the Contractor's expense.
- Trees within the buffer zone, beyond the reach of the harvester boom would need to be hand felled using a chainsaw.
- If any fuels and oils are to be stored on-site, then this should be within bunded containers at least 20 m away from the ponds.
- A pollution kit must be kept on site at all sites. This should be readily accessible and contain absorbent sheets, pillows and a boom as a minimum. Staff must be trained in its use.
- We note the northern ponds in particular have very steep slopes leading to the ponds, particularly from the western and northern approaches to the ponds. Any spillages at the top of these slopes will flow down to the pond and so will any sediments. Where there are slopes, sediment protection measures must be put in place to prevent sediments from washing into the ponds.
- Felled timber is to be extracted and stacked in an agreed stacking area.
- Brash should be retained to construct dead hedging on sites around the pond complex by the Contractor. The principal objective of this dead hedging is to prevent access by members of the public and dogs to the ponds and thus would need to be around 75 cm to 100 cm high. As a minimum, the ponds need to have a dead hedge between the access track and the ponds to screen the ponds from dogs, extending this around the ponds as far as possible.
- The Contractor will need to arrange temporary closures / diversions of tracks and surrounding paths during felling operations, especially if a harvester is used.
- There are invasive species around some of the ponds (see below) and exceptional care should be taken to not transfer these across the site, which would constitute an environmental offence in accordance with the Wildlife & Countryside Act.
- Any environmental incidents, including spillages or damage to wildlife, must be reported to the landowner, Portsmouth Water and the appropriate authorities (Environment Agency, Natural England) by the Contractor.

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3.3.4. Macrophyte translocation

Where it is safe to do so, it is recommended that up to 50% of existing populations of the three target species are collected and spread across the receptor ponds, focusing on shallower areas. The remaining 50% will be left in Upper Lake. This would be by hand, using a low-disturbance method (trowels, spades and wheelbarrows) to take species across from Upper Lake to receptor ponds. A tracked vehicle can be used on forestry tracks to reduce manual handling, but any tracking around the ponds must be avoided to prevent rutting and soil compaction.

3.3.5. Growing of seedlings

The success of the thinning needs to be established through a survey in mid-May 2023. If all three of the target species have not appeared or established in the two pond complexes as a result of the pond clearance and translocation, it is proposed that plug plants of the three target species are grown by the Kew Gardens Millennium Seed Bank (MSB) team for planting at a suitable time. The UK Seed Hub staff have been contacted through Dr Richard Lansdown and have confirmed that they will be available for the planting activity and are also happy to undertake the planting with Portsmouth Water staff and other interested parties, such as local volunteers. The planting will be led by both Richard Lansdown and the MSB team with management of the surveys undertaken by Atkins and APEM.

3.4. Ongoing maintenance

The Ponds do suffer from leaf litter build up over time. Ponds should be inspected in future e.g. every 5 years to evaluate if leaf litter build up should be removed.

3.5. Monitoring

The central ponds (9a-9d) and northern ponds (10-14) complexes will need to be monitored in mid-May 2023 to assess whether any of the target species have grown as a result of increased light reaching the ponds.

Surveys should record species present as well as their abundance. The location of notable species (including the three target species and INNS) should be recorded so their extent can be mapped and form a record of how they populate the ponds over time.

Repeat surveys are recommended for 2024, 2025 and 2026.

3.6. Timescales

Translocation work needs to be undertaken mid- to late-summer (July to September) 2022. The success of felling and translocation works are to be evaluated in May 2023, at which point the MSB can be engaged. Once MSB are engaged, the seedlings will likely be ready in 2024 at which point they can be planted out in late spring / early summer (exact timing to be advised by MSB).

Comprehensive pollution control measures (including silt protection) must be put in place by any contractors working in the vicinity or upstream of Upper Lake until all works are completed.

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4. Invasive and Non-Native Species (INNS)

4.1. Aims and objectives

The presence of parrot's feather, an INNS, in Ponds 6 and 9a has the potential to compromise the objectives for the macrophyte enhancement work. The stand in Pond 6 was observed to be particularly large covering approximately 50% of the pond area. The stand in Pond 9a was relatively small but fragments were found along the pond edge suggesting the species is spreading across the pond.

The risk of financial and management burden will also be significant if parrot's feather colonises the reservoir and/or its wetland once constructed. As such, it is considered better to attempt to remove the plant where it occurs as well as prevent a re-introduction. It is noted that removal is an ambitious objective as this plant is very resilient and full removal will only be achieved under well-controlled conditions, notably the prevention of any new introductions and preventing access by members of the public and other vectors, notably dogs. For example, it can grow as a terrestrial plant if fragments are taken out of the pond or if a pond dries out. Only female plants have become established in the UK and it spreads by asexual means. Stems are brittle and the plant can propagate itself by growth of the small fragments of parent plants.

The proposed removal options are either infilling; manual removal and/or spraying. Noting some ponds have GCN present (notably 9a, 10), whilst the Environment Agency prefers infilling, the landowner prefers spraying. More than one spraying event will be needed to remove the species. In accordance with Centre for Ecology and Hydrology (CEH) Guidance⁹, mechanical control is only effective for removing large infestations of this plants if followed by chemical control. As such, Atkins advocate that if infilling is not possible that manual removal and spraying are used.

Manual removal is best timed in spring before biomass increases in summer. In accordance with CEH Guidance, there is an opportunity to spray in spring (using 2,4-D amine as active ingredient) or after this using glyphosate, including late in the season. Appropriate permissions will need to be sought from the Environment Agency, including disposal and spraying licences. Natural England should also be consulted on protected species matters (see Section 3.3.2 above).

During the last Atkins site visits in February and May 2022, parrot's feather was also observed in the soils around Pond 6 as a result of dogs entering and exiting the pond suggesting spread may be much wider. The species was growing terrestrially meaning that it can be spread easily by walkers. Pond 6 is used frequently by dogs but there is also evidence that dogs go in and out other ponds. In the absence of large amounts of wildfowl this may be how it originally colonised the site. As stated above, efforts to remove this species from ponds have only worked where ponds were not accessible by 'vectors' like dogs or livestock¹⁰. Whilst the brash from the aquatic macrophyte mitigation tree felling work can be used to fence off ponds from dogs, the timing of this is not until tree felling is undertaken late 2022. As such, temporary closure of paths may be needed around Pond 6 in particular. Dog walking seems a very popular activity in Havant Thicket and dedicated 'dog-dipping' ponds are proposed to be located at park entrances. It is accepted that these ponds will have greater disturbance and thus their objective is not to promote biodiversity but as a gesture of goodwill to local residents. One of the most obvious locations in the vicinity of the northern and central pond complexes is within the FE car parking area, so this can be monitored more easily.

At a project level, biosecurity measures are needed to prevent INNS arriving at the reservoir or risk them being spread across the site. Any further spread of high-risk INNS like parrot's feather will constitute an offence under the Wildlife & Countryside Act. It will also mean that the Infrastructure Act 2015 requirements for INNS are not met by the site owner / operator.

Biosecurity measures would, as a minimum, need to include signage at all entries to raise awareness and enforce check-clean-dry for walkers and dog owners. It may also need additional measures, such as boot scraping points or mats. Successful implementation of these measures would also prevent the introduction of other invasive plant species. That said, measures specific to parrot's feather or dogs are not available.

⁹ CEH (2004). Information Sheet *Myriophyllum aquaticum* Parrot's Feather. 2pp.

¹⁰ Chatters, C. (2020). The New Forest Non-Native Plants Project. Making a difference: examples of the effectiveness of work undertaken to control invasive non-native plants. Hampshire and Isle of Wight Wildlife Trust.

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Figure 4-1 - Parrot's feather in Pond 6 (photo taken by Peter Mulder, February 2022)



Figure 4-2 - Parrot's feather in Pond 6, close up of parrot's feather in area where dogs enter/leave pond (photo taken by Peter Mulder, February 2022)

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4.2. Delivery scope

The scope is as follows:

- Pond 6 and Pond 9a need to be fenced off immediately until the parrot's feather has been removed successfully to prevent any further spread and dogs entering and exiting the ponds. Pond 6 in particular should be closed to the public immediately.
- Mechanical control is proposed for Pond 6 and Pond 9a in the first instance. For Pond 9a, hand nets with long poles can be used to remove floating vegetation. No fragments can be left on the soil etc. as these will start new colonies. Remaining fragments then need to be treated with an Environment Agency approved herbicide as soon as possible.
- Parrot's feather in soils around Pond 6 need to be dug out selectively and herbicide applied to the areas where they have been dug up. Parrot's feather does not have deep roots so a shallow excavation (10-15 cm) by hand should be sufficient.
- All equipment used for the operations including boots, waders, nets, etc. need to be fully checked and cleaned and treated with herbicide before walking away from Pond 6 or Pond 9a. Small fragments can easily be carried underfoot. A biosecurity protocol needs to be set up ahead of the work starting and the area being treated fenced off from the public. The contractor could consider a 'clean' and 'dirty' area, with 'dirty' referring to the area closest to the pond where parrot's feather fragments are (likely to be) present. There should be no movement between 'clean' and 'dirty' areas without an inspection of all equipment, or a change of equipment.
- Any parrot's feather fragments need to be disposed off appropriately by the Contractor using appropriate environmental transfer and disposal permits (see [How to stop invasive non-native plants from spreading - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/campaigns/404797-invasive-aquatics-a4poster-art)).
- A new pond needs to be dug within the corner of the Forestry England Car Park – so dogs can still have somewhere to swim without spreading parrot's feather across the wildlife ponds, which will be shielded using the brash generated by the aquatic macrophyte mitigation work. This needs to be the same dimensions as Pond 6. It is observed that the green lawn within the Forestry England Car Park is one of the few open spaces in the area for dogs to run around, so it is recommended that the pond is located in a corner.
- Signage will need to be provided at the Forestry England Car Park and all main paths leading to the ponds to alert members of the public of the presence of invasive species (notably parrot's feather) and that dogs have been responsible for the spread of this plant. Reference should be made to the Defra check-clean-dry campaign [404797 InvasiveAquatics A4Poster art \(defra.gov.uk\)](https://www.defra.gov.uk/campaigns/404797-invasive-aquatics-a4poster-art).
- Portsmouth Water have further confirmed that the presence of parrot's feather at Havant Thicket has been incorporated within Portsmouth Water's Invasive and Non-Native Species Plan, which was delivered as part of the AMP7 Water Industry National Environment Plan (WINEP). We understand the plan was approved by the Environment Agency in March 2022.

4.3. Monitoring

This work package is ultimately monitoring-led.

Monitoring is required until the parrot's feather has been removed successfully. It is recommended that three rounds of surveys are undertaken each year, covering three pond complexes and up to 50 m around each pond to look for any terrestrial growing parrot's feather (see **Figure 3-1** for location of ponds):

- Ponds 6, 7, 8, 8a 8b
- Ponds 9a, 9b, 9c, 9d
- Ponds 10, 10a, 11, 12, 13, 14

If parrot's feather is recorded, manual removal must be undertaken immediately (as per the approach detailed in Section 4.2). The proposed timing of the monitoring rounds (subject to agreement with the Environment Agency and Natural England) is:

- Early summer (May-June) – monitoring + manual removal
- Summer (July-August) – monitoring + manual removal

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- Autumn (September-October) – monitoring + manual removal + herbicide spraying

Any INNS monitoring plan must be adaptive and the above has been provided as a guide. It is noted at this stage that the work undertaken by the Hampshire and Isle of Wight Wildlife Trust¹¹ in the New Forest highlighted the importance of having multiple eyes on the ground in terms of monitoring, e.g. using Project Managers, contractors and volunteers all looking out for parrot's feather to spot if any part of the population was taken inadvertently to other locations at the site, but also spot any terrestrially growing parrot's feather that can be transferred by walkers. In some cases where parrot's feather was very abundant, monitoring and manual removal was increased to a more frequent basis (weekly or monthly) to nip any further spread in the bud.

At this stage, it is recommended that three clear monitoring visits are needed until removal activities (manual removal, herbicide treatment) are stopped. It is advised that any decision making on stopping removal activities is based on a full year's monitoring. For example, if in 2023 no parrot's feather is found in June, August and October 2023, then the work can be stopped. If parrot's feather is not found in June 2023 but is recorded in August 2023, including any out of pond terrestrial growth, then the earliest the project should be stopped is October 2024.

Any 'dog-dipping' ponds e.g., in the FE car park should initially be monitored at the same time as Ponds 9a-9d; and Ponds 10-14; and also into the future as part of an ongoing routine asset monitoring programme for the reservoir undertaken by Portsmouth Water. As with many INNS, prevention is significantly easier and cost-effective compared to a more reactive removal and spray exercise.

In terms of wider parrot's feather monitoring, given the significant risk any (re)introduction of parrot's feather poses to the main reservoir, it is recommended that Portsmouth Water also consider commissioning a wider parrot's feather study in the East Hampshire and West Sussex area, essentially up to a (say 1-1.5 hr) radius where it is reasonable for someone to travel to Havant Thicket reservoir to go for a walk with their dog. The aim of this would be to determine which ponds in the vicinity of Havant Thicket Reservoir have parrot's feather present and could be a future donor area. There is a significant data gap in this area where online sources like the NBN Species Atlas suggests there is no parrot's feather in the nearby area, whilst personal observations by the author have confirmed populations are present in Queen's Inclosure (SU 69362 10631) and also Aldsworth Pond (SU 76280 08892). This does not need to be undertaken by a consultant perse, but can be research led or volunteer based.

4.4. Timescales

See Section 4.3, removal should start summer 2022 and is not considered complete until three consecutive visits have shown parrot's feather is no longer present.

¹¹ Chatters, C. (2020). The New Forest Non-Native Plants Project. Making a difference: examples of the effectiveness of work undertaken to control invasive non-native plants. Hampshire and Isle of Wight Wildlife Trust.

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Appendix A – Review of macroinvertebrate donor sites

Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
R1	Park Lane Stream	Park Lane Stream between its springs (shown on OS map as a pond, labelled 'Pond 25' on the ECOSA GCN map, NGR SU 71148 11484) and the confluence with an unnamed tributary taking water from Waterloo ville (NGR SU 70853 11013)	Proximity / same hydrological catchment Beetle community similar to Headwater Streams 1 & 2, including notable species such as <i>Hydraena palustris</i> which prefers temporary and semi-permanent watercourses (see Site R8 for more extensive description). Other beetle species recorded include: <i>Agabus melanarius</i> <i>Anacaena globulus</i> <i>Haliphus lineatocollis</i> <i>Hydroporus discretus</i> <i>Hydroporus nigrita</i> <i>Hydroporus tessellatus</i> <i>Helophorus obscurus</i> Although all of these are more common species, it highlights the fact that this is a high quality headwater site. A large number of cased caddis fly larvae (family: limnephilidae) were also recorded	Land has been earmarked for (extensive) housing development and is in independent 3rd party ownership, meaning that future safeguarding cannot be guaranteed. It is therefore not considered a suitable receptor site.	
R2	Park Lane Stream	Park Lane Stream between NGR SU 70853 11013 and SU 70493 09007	Proximity / same hydrological catchment Land ownership known. Reaches through Waterloo ville Golf Course, Forestry England likely to be receptive to	Site observations, habitats and aquatic communities all suggest that there are significant water quality pressures in this reach. These are, in the main, attributed to	-

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
			improvement works. Reaches through 3 rd party ownership not suitable.	the variable flow regime from underneath the Waterlooville and Cowplain estates as a result of surface water run-off entering Park Lane Stream at NGR SU 70123 11361, SU 69960 10680 and SU 70026 10020. It is unknown if there are additional inputs from the A3(M). The surface water run-off appears to contain organic pollutants which affects the macroinvertebrate communities. Upper reach (NGR SU 70580 11222 to SU 70549 10526) subject to same development pressure as Reach R1. Unless these issues are resolved, which is not possible within the project timescales, it is therefore not considered a suitable receptor site for macroinvertebrates with a preference for good water quality.	
R3	Hermitage Stream	The Queen's Inclosure (SU 69289 10726 to SU 69240 10240)	Proximity / same hydrological catchment Land ownership known (Forestry England)	Site observations, habitats and aquatic communities all suggest that there are significant water quality pressures in this reach. These are, in the main, attributed to the variable flow regime from underneath the Cowplain estate entering the Hermitage Stream at NGR SU 69289 10726. The surface water run-off also appears to	-

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
				contain organic pollutants which affects the macroinvertebrate communities. It is therefore not considered a suitable receptor site for macroinvertebrates that have a preference for good water quality.	
R4	River Lavant	Unnamed Tributary from Stein Wood (SU 72150 10946)	Relatively short drive (5-10 mins)	Most streams are managed by forestry for drainage and not good habitat. No access to the swallow holes and associated streams. Habitats not considered suitable without major interventions.	

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
R5	River Lavant	Around Rowlands Castle (SU 73608 10823)	Good substrate (clean gravels), relatively short drive (5-10 mins)	Lavant was dry above Rowlands Castle in autumn 2021. Site not considered suitable due to prominence of very low / no flow periods compared to a better flow regime in Headwater Streams 1 & 2.	

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
R6	River Lavant	North of Barton's Copse (SU 73406 09050)	Relatively short drive (5-10 mins). Vehicular access seems feasible. Portsmouth City Council ownership on river left.	Dry during sampling visits. Plant community suggests it is dry for most of the year. Therefore, not considered suitable as a receptor site.	

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
R7	River Ems	Pond and stream NE of South Leigh Forest (approx. NGR for spring is SU 74958 09486)	Appears to be a spring fed reach similar to Havant Thicket. Relatively short drive (10-15 mins)	Land ownership unknown. Downstream stream coming out of the pond dry and then flows into Brickkiln Ponds and Aldsworth Pond. Whilst technically a suitable reach, the overall benefit would be over a quite short reach with no opportunity for the macroinvertebrates to disperse downstream.	
R8	River Ems	Unnamed tributary of the River Ems in South Leigh Forest, upstream of the Emsworth Common Road between NGR SU 74775 08798 and SU 74759 08684	Land in Portsmouth Water ownership (Land parcel SH7279 ¹²). Relatively short drive (10-15 mins). Good access for small tracked vehicles via a Bridleway that can be accessed from Woodberry Lane. No discharges observed, suggesting no external pressures on water quality. APEM samples taken at this site in spring 2022 suggest the macroinvertebrate	Notice may need to be given to use the layby and Bridleway for the work. Overall, a suitable reach for both hand netted and shallow gravels, but it not recommended that both are placed here at the same time.	See Figure 2-5

¹² Deriver from: Atkins (2021). Havant Thicket Reservoir. Reservoir Land Owner Information. Drawing HTR-ATK-RZ-ZZ-GS-Z-0005. Dated 04/10/2021.

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
			community contains a relatively large community of common Nemouridae stonefly taxa. Although these are relatively common species, the overall habitat availability and diversity is good. Two <i>Hydraena palustris</i> individuals were also recorded. Prof. Garth Foster describes the ecology as follows: <i>"Habitat and ecology H. palustris prefers temporary and semi-permanent, stagnant water, and is confined to areas with well-developed marginal vegetation, especially litter-generating species such as reeds and sedges. It can occur in partial shade in fen carr. Painter (pers. comm.) has noted that it occurs in managed ditches at Wicken Fen with a distinct "drawdown zone" below the marginal vegetation but that it does not occur in the shallowly flooded litter of the surrounding fen. In the Netherlands, it appears to have one generation a year with a peak of adult abundance and breeding in the spring."</i> Key to the find of species the fact that its lifecycle strategy is similar to the species recorded in Headwater Streams 1 & 2.		
R9	River Ems	Unnamed tributary of the River Ems in South Leigh Forest,	Relatively short drive (10-15 mins). APEM samples taken within this reach in Spring 2022 recorded	No access for tracked vehicles meaning depositing gravels is not possible without significant traffic management measures on the	See Figure 2-6

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Site no.	Catchment	Receptor site	Advantage	Disadvantage	Photographs
		<u>downstream</u> of the Emsworth Common Road between NGR SU 74766 08682 and SU 75140 08258. Includes a potential spring-fed tributary starting at NGR SU 75202 08511 and ending SU 75140 08258.		Emsworth Common Road, which is considered undesirable from a Public Relations point of view. Hand netted macroinvertebrates can be introduced in this reach without the requirement for such traffic measures. Land owned by Havant Borough Council on a 999 year lease starting 1996¹³ Water quality likely to be as R8. However, there is a surface water outfall at the road crossing which will likely convey surface water run-off plus sediments, salts and other pollutants into this reach. Whilst the macroinvertebrate community does not suggest that this pressure is highly significant, attenuation of this road run-off could be considered in future. Overall a suitable reach, but for the hand netted macroinvertebrates only.	

¹³ <https://www.woodlandtrust.org.uk/visiting-woods/woods/hollybank-wood/>

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Appendix B – Advice from Forestry England Ecologist on environmental considerations for felling.

Summary of ecological considerations based on ForesterWeb data:

Ancient woodland – protect soils and any ground flora from excessive rutting and damage etc.

- Dormice known in area – risk lower in conifer around ponds so just ensure contractors aware of their potential.
- GCN – see below
- Butterfly site – given the location and conifer dominance, no concern but ensure routes taken for access are taken into consideration. Eg keep off verges etc. Main species on FW are white admiral and purple emperor so honeysuckle and willows are key plants to protect.
- Schedule 1 birds in general area. Inc. those more associated with conifer. Checks prior to works.
- Bats in general area. If conifers low risk of trees being suitable for roosts.
- Non-native invasives species – see below

The draft selective thin memo documents from Atkins covers most aspects, I would add the following points:

- Care to be taken if machinery is used to ensure forest soils aren't damaged. E.g. use of brash to lower risk of rutting/compaction; if signs of rutting occurs works to stop etc
- Parrot feather
 - Ensure best practice biosecurity measures are implemented.
 - Work round ponds with parrot feather last to reduce risk of spreading to uninfected ponds etc
- Newts
 - Suggest use the brash to create connectivity to the pond back to woodland habitat as well as what already proposing in terms of using it as a people/dog barrier. Such connections don't need to be huge, just sufficient to provide some cover as from memory I don't recall much understorey or ground flora. This will also help mitigation for any loss of refuge habitats as a result of the works.
 - If possible retain and avoid existing refuge such as logs etc
 - How and where is the timber being extracted? See below under good practice

As a brief risk assessment of potential for harm/disturbance/damage based on the FC GCN good practice guidance:

- **Distance to pond:** risk is high as it is within 50 m of breeding ponds; ie nearer the pond the greater the risk. **HIGH**
- **Intensity of operation:** risk is low if machinery use is minimised to few passes along a specified, low risk, route. Risk is higher if there is widespread machine movements and/or scarification of ground. **LOW** (I've assumed minimal passes will be used)
- **Nature of habitat:** Ponds not being directly affected means low risk. Terrestrial habitat risk lower as below conifer; from memory it is pretty dark and devoid of understory and ground flora with few/limited fallen deadwood, dense scrub (incl bramble), so fairly bare forest floor. If this is the case risk **LOW**
- **Timing of works:** newts can use terrestrial habitat all year. If there are limited refugia/resting sites (which there typically are in conifer woods), works when newts are hibernating present a lower risk. If works are carried out March-May the majority of adults will be in the ponds so it could be argued less of the population is at risk if the pond is not affected by the works BUT immature newts and juveniles and a proportion of adults will still be on land and moving around so will inherently be at risk!

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Additionally you could also consider the size of the population – a small population will lower the probability of encountering a newt compared to a high population. But loss of low numbers of newts in a low population, should they get harmed, will have a more significant effect on the future of the population. So risk level is really **neutral** for this!

The GCN survey report submitted with the PW application says there's a low population of GCN in three of our ponds, so 1-10 GCN. However, their 2018 presence/likely absence survey found no newts so I assume they're basing their low population assessment on the fact their eDNA came back positive and our record of a single GCN in 2009 (which doesn't appear to be on FW). Either way, we're not looking at significant or perhaps even viable GCN population!

You can take two views on the above:

1. Risk level is that of highest listed, so High
2. Risk level is a calculated/reviewed average, in which case I would say low-moderate.

If Atkins etc are doing the work for Portsmouth Water, even if it is our land, I would suggest it is their decision to determine risk level and whether they need a licence or not.

A brief review of works in relation to forestry good practice which if applied there should be no need for licence in forestry situations:

- Opening up the ponds will increase their value for newts, so in terms of the future of newts in the area. Opening up will also provide opportunity for better quality terrestrial habitat to establish and cut brash left in the form of people/dog barriers increases refuge habitat. In the "do nothing" approach, newt population is likely to remain and if anything it will decline as the ponds will further succumb to succession. It could be considered that the benefits outweighs the risk at population level.
- Again, from memory I would say that in close proximity to the pond, ie where works are proposed, there is limited suitable foraging and hibernating habitat and therefore newts are likely to be further afield except when dispersing to/from ponds for breeding. Therefore, I would suggest risks resulting from undertaking works nearer the pond compared to ponds with high quality habitat within the 50 m zone are lower.
- In relation to thinning/felling, the good practice suggests works near ponds should be phased over a number of years so only 25% of key habitat is affected each year. Given the general low suitability of habitat it could be argued there is flexibility in this 25% as it is not key habitat. Also retaining brash barriers etc will in part ensure retained habitat despite the works. In terms of habitat suitability I would look at it as, if after felling/thinning the ground habitat (ie below the canopy) is no different or better (ie pre-thin/fell no refuge and post thin/fell the brash provides refuge) then sticking strictly to 25% is less of an issue. Alternatively, is there an option to undertake the thinning over 2-3 years? Obviously this has time and economic efficiency implications.
- Extraction – good practice indicates preference for forwarders and NO skidders.
- Stacking – good practice indicates avoid key habitat and no stacking near ponds (no distance given but based on GCN movements, perhaps assume 100 m?) unless it is removed within a few weeks and certainly before October (ie when GCN start seeking out hibernation sites).

If the above is followed I would say we are adhering to good practice.

Based on all of the above if this was a purely forestry works OSA I wouldn't have any major concerns re GCN. But as I mentioned above I would let PW/Atkins/ECOSA make call given its all wound up with a development which means different subtle considerations!

Equally, from a generic ecology perspective, again if this were a forestry OSA, no concerns if best practice is followed and the proposed works will result in a positive ecological outcome.

Hope that helps but give me a shout if need any extra etc. Thanks,

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