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Project Name: **Kings Pond, Alton**
Date: **27th November 2025**
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Subject: **Initial Ecological Design Notes for Existing Two Options**

This document is an internal design document, constructed to give initial ecological advice to the design team.

The Kings Pond Site in Alton, forms part of the course of the River Wey. The site itself is experiencing several problems largely from siltation of the waterbody as the pond has been formed by a historical dam on the rivers existing course. As such the river cannot carry away silt and gravel as it would naturally do, depositing the material within the pond itself. The presence of the pond within the rivers course also creates other ecological problems, such as blocking fish movements up and down the river at the outflow, as well as attracting high levels of waterfowl which in turn creates high levels of nutrients into the water column from faeces. Additional higher nutrient levels are generated by the general public feeding the bird assemblage on site. It is understood this causes eutrophic conditions downstream from the site within the River Wey, which is a chalk stream, a very rare habitat worldwide, with around 85% of the worlds chalk streams found in England. In addition, the pond has a warming effect on the river. Chalk stream water is typically cool, having risen from groundwater aquifers. The pond holds water along the course of the river in a sizeable, relatively shallow pond, significantly warming the water that is discharged. It is understood that this changes the typical plant and invertebrate assemblages of the habitats downstream.

Figure 1. Approximate red line boundary of site

Initial investigation work by Alton Town Council and its team have identified two potential options aimed at improving the site ecologically but also maintaining the site as a much-loved amenity space for the public to enjoy. The Ecology Partnership have been commissioned to review the two potential options and provide initial guidance notes on "dos and don'ts" to considered in site design from an ecological point of view.

Option 1

Option 1 looks at the simplest option and aims to improve the waterbody by desilting the pond through dredging. This would aim to keep the pond in its current form but also include improvements to the weir to reduce blockages and fluctuations in water level as well as reinstatement and strengthening of the islands. Further ecological improvements can also be incorporated.

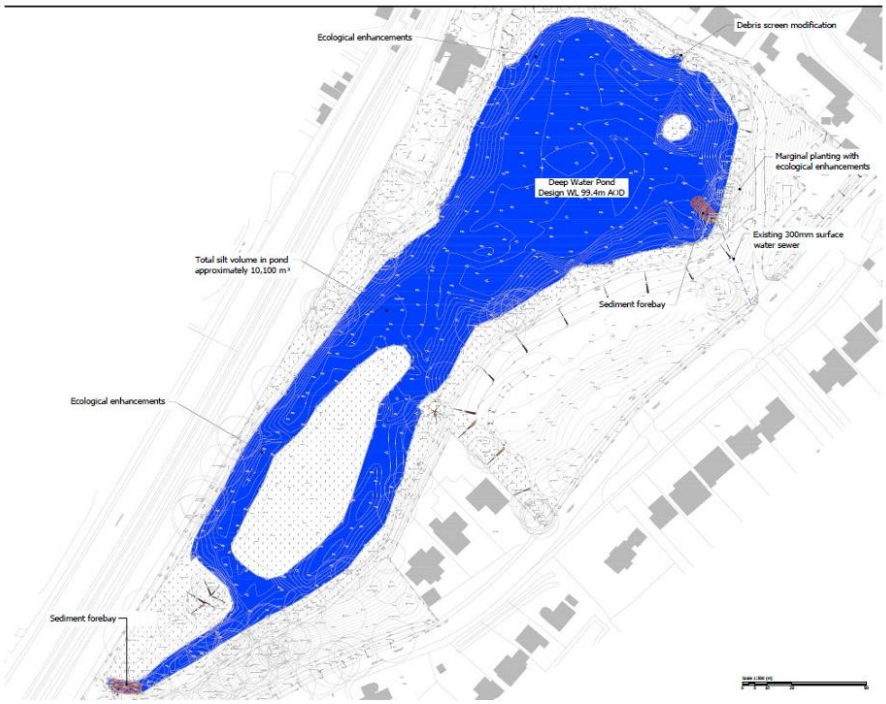

Figure 2: Initial design for option 1

Recommended points to consider:

- Dredging work would need to be designed to impact terrestrial habitats the least, retaining wooded margins and mature trees around the pond. Ideally minimal points for transferring silt out of the waterbody would be allowed, to minimise impacts to the ecological value of the site.
- Careful consideration of silt disposal. If this is to be onsite, then important habitats such as woodland should be avoided. Silt was previously deposited within the grassland adjacent to Ashdell Road to the east of the waterbody. This area is heavily grazed and impacted by waterfowl limiting its value and potential to support protected species. However, consideration should be given to ensuring that the habitat can be restored and even enhanced post works and to ensure that there would be no adverse impacts from polluted silt material. It is most favourable to take silt off site if viable. Islands on site should not be directly impacted during this works to minimise impacts upon wintering and breeding birds. The islands should also not be extended as to attract an increased waterfowl population which may bring larger nutrient enrichment and grazing impacts upon the wider site.
- It must be noted that the water level in the pond fluctuates. The seasonal variation in level due to changes in through flow is around 100/150mm. However, there are more frequent fluctuations due

to blockages at the outlet screen. These can be up to 450mm. The design and detailing of banks, revetments, areas of marginal wetland and drawdown zones must take these fluctuations into account.

- Regrading, the pond to provide a mixture of shallow edges and steeper vegetated banks and deeper open water. Some areas of shallow depth could be incorporated to encourage submerged macrophyte growth, although this is likely to be limited by the presence of waterfowl which would graze upon desirable submerged plants.
- It is understood that the previous dredge of the pond, was a wet dredging exercise, starting in October time. This is a good time to minimise impacts upon the pond and its wildlife.
- Design in reed beds to the site to provide additional habitat and natural filtration of harmful pollutants. Reed beds can provide habitat niches for amphibians, reptiles and birds. Installation of reed bed filtration structures around the proposed sediment forebays (if possible) may provide additional control of substances entering the waterbody. Reed filtration beds encourage the breakdown of harmful pollutants via microbes within the soil and plant roots. Any reed filtration bed may need maintenance which would need to be factored in.
- Additional native marginal planting in suitable zones of regraded waterbody and margins. Planting can be incorporated into metal cages to minimise impacts from waterfowl and allow establishment and resistance. Marginal planting will help stabilise the banks of the pond, helping prevent erosion and slippage. Marginal planting can also have additional filtration benefits like reedbeds. Aquatic plants also compete with algae for nutrients and may help control algal blooms.
- Willow spilling can be used to reinforce banks. This uses living willow rods to line the bank. The rods grow roots stabilising the bank naturally, whilst also trapping silt within the gaps providing a natural alternative to erosion.
- Ensure fish passage is possible through any proposed inflow sediment forebay.
- Installation of information boards educating the public on wildlife and to discourage feeding of wildfowl.
- Potential low-level fencing to restrict public to sections of the pond banks to allow for marginal habitat development. An alternative to fencing could be dead hedging for a more natural barrier.

- The pond attracts Canada Goose (*Branta candensis maxima*) the largest subspecies of Canada Goose which are resident the majority of the year. The species are invasive causing negative impacts to pond and the surrounding habitats particularly grassland. Control of this species could be

undertaken by using fencing around the pond. It is understood that this has been used successfully at Bourne Hall, which maybe a useful example project. This could be used to restrict geese to the water and prevent access to the wider site to limit grazing impacts.

- Installation of barley straw bales at the pond. With these anchored to the bottom of the pond, and float towards the surface, this can be an affective way to control algae, improving the health of the pond potentially combat the blocking of the outflow. This is more a management suggestion than a design suggestion.
- Removal of Japanese Knotweed, buddleia, and bamboo from the wider site to prevent any potential spread of non-native invasive plants during works and ensure that it does not take hold within the wider terrestrial environment going forward.
- This option would have the least impact upon protected species, chiefly wintering and nesting birds which would be more impacted by option 2. Consideration to suitable reptile habitat along the northern bank up to the railway line and also trees identified with bat potential should be made.
- Installation of brick / rubble hibernacula and log piles along the waterbody edges, to provide hibernation opportunities and refuge for amphibians, reptiles, small mammals and invertebrates.
- Installation of a variety of bird and bat boxes around the site to provide additional nesting and roosting space. These should be made from a long-lasting material such as woodcrete.
- Installation of artificial kingfisher perches.
- This option may not require biodiversity net gain requirements if it is exempt from a planning application or can be proven that impacts are temporary.

Option 2

Option 2 will provide areas of pond and also restore a separate section of river through the site to connect the existing river sections at either end of the site. This would have the most impact upon the site and change the site significantly from its current appearance. However, this would provide a sustainable solution to the siltation issue. Separating pond habitat and the majority of the wildfowl populations from the river course, would reduce the impact of nutrient levels and improve the condition of this stretch of River Wey, a section of chalk stream.

Figure 3: Initial design for option 2

Recommended points to consider:

- Try to establish the original course and channel planform of the river through site, possibly from historical maps or LIDAR if feasible etc. Figure 4 below provides a rough indication of the original channel course, from a historic map (OS Old Series 1798-1878: Sheet XII, published 1817) accessed online from the National Library of Scotland archive. If possible, more accurate maps of the exact river course should be sought out to inform design.

Figure 4. Approximate course of the River Wey through site, prior to the installation of the weir

- Design the restored stretch of river to have key chalk stream characteristics. This must have a gravel bottom to the stream. A natural gentle sloping gradient to the river through the site. Connect to flood plain once again, if possible, try to avoid over channelisation and try to determine what the original depth would be if possible. We do not want to create a channel that's too deep that will prevent plant growth and minimise biodiversity.
- Chalk streams typically have a low flow rate so over meandering a new section of river can slow flow rate further leading to deposition of fine sediments significantly changing the stretch over time. It is key to ensure a new length of river is not a silt trap, so design needs to be carefully considered to achieve best results. Research to establish the original course and planform will also aid this. Flow rate maybe also dictated by the level of the new outflow.
- If required enlist an expert who has experience restoring chalk stream rivers for advice to achieve best results.
- It is understood that a project that could be used as an example has taken place at Letcombe Regis, where a chalk stream was taken offline from the lake. The project is of a similar scale to Kings Pond

and maybe a useful example to use or explore and came about when a planning condition required the works, with the redevelopment of the site. It is understood that there is a Letcombe Brook Study Group who may have useful information, with management split between Richmond Retirement Village and Berks, Bucks and Oxon Wildlife Trust.

- The habitat on the existing islands should be kept to minimise impacts upon the habitats present, including woodland and mature trees. This will also protect the heronry that is present as well as little egret nesting habitat. The connectivity of the islands to other terrestrial habitats is likely be increased which will likely reduce ground nesting habitat for bird species. A smaller island could be developed within one of the ponds, to maintain safe ground nesting habitat on site, but also help to reduce the likely assemblage on site with view of reducing negative impacts from species such as Canada geese.
- Pond creation should have a variety of depths and niches, with shallow marginal habitat that is likely to contain low levels of water or even temporarily dry, shallow permanent areas where macrophytes may develop and deeper sections of open water.
- It is considered that inflows and outflows into the ponds from the river should be able to be manually operated. This is particularly important with the pond outflows to prevent nutrients entering the River Wey once again. Obviously engineering requirements need to be balanced.
- Installation of extensive reed filtration bed / pond around the surface water sewer inflow to manage pollutants and encourage natural microbial breakdown is recommended. There should not be a direct link of the sewer outflow to the river or a pond.
- This option provides a greater variety of habitat creation opportunities on site and should include wetland, open water and river, this needs to be maximised where possible to provide highest diversity on site.
- Wetland habitat on site should contain a mix of scrapes and seasonal ponds which will provide habitat for amphibians, reptile species such as grass snake and bird species.
- Additional native marginal planting in suitable zones of larger ponds. Planting can be incorporated into metal cages to minimise impacts from waterfowl and allow establishment and resistance. Marginal planting will help stabilise that banks of the pond, helping prevent erosion and slippage. Marginal planting can also have additional filtration benefits like reedbeds. Aquatic plants also compete with algae for nutrients and may help control algal blooms.

- Alternatively natural regeneration can be used for aquatic plants, this would be more favourable for the river, with seeds flowing down stream into the site. If a seed bank remains in the soil after silt removal etc this maybe effective for new ponds and wetlands too.
- Willow spilling can be used to reinforce banks in particular within the pond if needed. This uses living willow rods to line the bank. The rods grow roots stabilising the bank naturally, whilst also trapping silt within the gaps providing a natural alternative to erosion.
- Design should not impact existing terrestrial habitats and focus on the footprint of the existing pond.
- Installation of information boards educating the public on wildlife and to discourage feeding of wildfowl.
- Potential low-level fencing to restrict public to sections of the pond banks to allow for marginal habitat development. An alternative to fencing could be dead hedging for a more natural barrier.
- The pond attracts Canada geese (*Branta candensis maxima*) the largest subspecies of Canada geese which are resident the majority of the year. The species are invasive causing negative impacts to pond and the surrounding habitats particularly grassland. Control of this species could be undertaken by using fencing around the new ponds. It is understood that this has been used successfully at Bourne Hall, which maybe a useful example project. This could be used to restrict geese to the water and prevent access to the wider site to limit grazing impacts.
- Installation of barley straw bales at the pond. With these anchored to the bottom of the pond, and float towards the surface, this can be an effective way to control algae, improving the health of the pond potentially combat the blocking of the outflow. This is more a management suggestion than a design suggestion.
- Removal of Japanese Knotweed, buddleia, and bamboo from the wider site to prevent any potential spread of non-native invasive plants during works and ensure that it does not take hold within the wider terrestrial environment going forward.
- Installation of brick / rubble hibernacula and log piles along the waterbody edges, to provide hibernation opportunities and refuge for amphibians, reptiles, small mammals and invertebrates.
- Installation of a variety of bird and bat boxes around the site to provide additional nesting and roosting space. These should be made from a long-lasting material such as woodcrete.
- Installation of artificial kingfisher perches.
- It is considered likely that this option would trigger biodiversity net gain requirements as part of the planning process. Balance needs to be achieved on site with regards to this to ensure any

required 10% net gains are achieved. There might be exemptions from the 10% requirement if credits generated are available to be sold, guidance will be reviewed. Design revisions maybe required.

Potential supplementary aquatic planting species list. *Below is a list of potential suitable marginal and aquatic species which could be planted or encouraged to colonise the new areas of enhanced pond as per design one and the new areas created within design option 2. These species are recommended for the ecological value they provide to British aquatic ecosystems. Specific choices for the final design have not been made, as this must be reliant on understanding the specific habitats to be created. It is recommended that a new river channel created within option 2, is ideally left to colonise naturally. Some recommended species are more vigorous than others such as common reed, yellow flag-iris and white water lilly so the planting locations or inclusion within the scheme should be considered, with potential management implications.*

Banks:

- Brooklime (*Veronica beccabunga*)
- Greater bird's-foot trefoil (*Lotus pendunculatus*)
- Compact rush (*Juncus conglomeratus*)
- Hard rush (*Juncus inflexus*)
- Creeping cinquefoil (*Potentilla reptans*)
- Great willowherb (*Epilobium hirsutum*)
- Greater pond sedge (*Carex riparia*)
- Tussock sedge (*Carex paniculata*)
- Remote sedge (*Carex remota*)
- Hard rush (*Juncus inflexus*)
- Hemp agrimony (*Eupatorium cannabinum*)
- Marsh woundwort (*Stachys palustris*)
- Meadowsweet (*Filipendula ulmaria*)
- Purple loosestrife (*Lythrum salicaria*)
- Soft rush (*Juncus effusus*)
- Yellow flag iris (*Iris pseudacorus*)

Margins / Shallows:

- Brooklime (*Veronica beccabunga*)
- Common reed (*Phragmites australis*)
- Common water crowfoot (*Ranunculus aquatilis*)
- Floating sweet grass (*Glyceria fluitans*)
- Great yellowcress (*Rorripa amphibia*)
- Marsh marigold (*Caltha palustris*)
- Blue water speedwell (*Veronica anagallis-aquatica*)
- Water forget-me-not (*Myosotis scorpioides*)
- Water mint (*Mentha aquatica*)
- Water starwort (*Callitriche stagnalis*)
- Watercress (*Nasturtium officinale*)
- Yellow flag iris (*Iris pseudacorus*)

Deeper/open water (Ponds only):

- Broadleaved pondweed (*Potamogeton natans*)
- Stream water crowfoot (*Ranunculus fluitans*)
- Curled pondweed (*Potamogaton crispus*)
- Frogbit (*Hydrocharis morusu-ranae*)
- Opposite-leaved pondweed (*Groenlandia densa*)
- Rigid hornwort (*Ceratophyllum demersum*)
- Water starwort (*Callitriche stagnalis*)
- White water lily (*Nymphaea alba*)