

# **Broadwater Lake**

## **An Options Report for the Ecological and Visual Improvements to the Lake**



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### **Contents:**

- 1.0 Introduction**
  - 1.1 Site Location**
  - 1.2 Site Description & History**
  - 1.3 Existing Available Information**
    - 1.3.1 Silt Survey**
  
- 2.0 Scope of Report**
  
- 3.0 Improvement Options**
  - 3.1 Lake water level control**
  - 3.2 Debris removal include fallen trees**
  - 3.3 Bank side vegetation**
  - 3.4 Dredging**
  - 3.5 Sediment reuse and/or disposal**
  - 3.6 Services**
  - 3.7 Added Value items**
  - 3.8 Lake maintenance**
  
- 4.0 Budget Costs for Options**
  
- 5.0 Summary**

**Appendices 1, 2 and 3**

# Broadwater Lake

## An Options Report for the Ecological and Visual Improvements to the Lake

### 1.0 Introduction

Land and Water Services have been commissioned by the Broadwater Conservation Society to carry out a number of surveys on and around Broadwater Lake and to prepare a report on the options to improve the lake from an ecological and visual viewpoint. There is also a potential for the lake to be made available a local fishing club for managed fishing and to a local school for ecological field trips.

This document reports upon the findings of the surveys and sets out options and budgets for the various options discussed.

Site visits took place on 21<sup>st</sup> November 2020.

### 1.1 Site Location

Broadwater Lake lies to the northeast of Weybridge town centre and to the south of the Desborough Cut, a branch of the River Thames west of Walton-on-Thames.

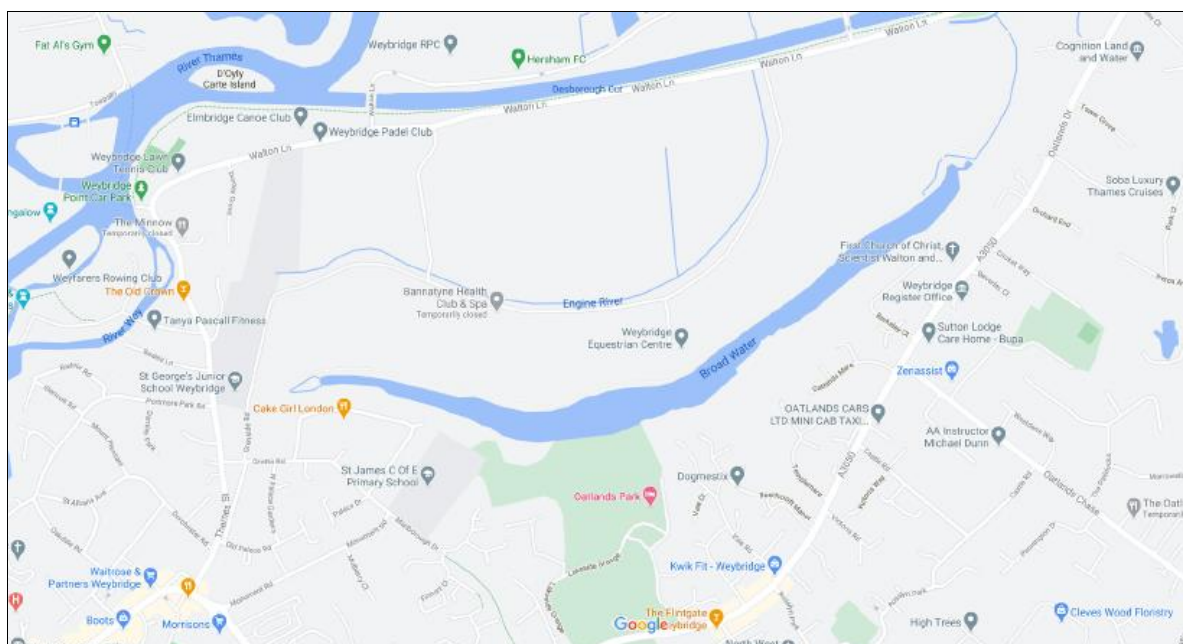


Figure 1: Location of Broadwater lake

### 1.2 Site Description & History

Broadwater Lake is a long narrow lake being approximately 1,130 meters long, 12 meters wide at its narrowest and 82 meters wide at its widest.

It is fed from surrounding surface water run-off and from an open ditch to the west which emanates from a culvert under the housing adjacent to Grenside Road. The water body is not classified as a “Main River” by the Environment Agency, so will fall under the responsibility of the Local Authority as an Ordinary Water Course for permitting and consents purposes.



The area to the north of the lake is low lying flat open fields owned by a Health Club and an Equestrian centre, although there is a strip of mature trees along the bank of the lake. There is also a recently established public footpath, known as Broadwater Walk, running through the trees along the northern bank.

The land to the south of the lake is largely privately owned and rises steeply to housing, a school and a hotel. The lake bank is tree lined in some sections, but open in others.

Also of note is the Conservation Area designated to the Templemere area which includes a section of the lake about 200m long in the central section and set within the Registered Park & Garden designation given to the rest of the lake.

Broadwater lake is believed to be a manmade lake constructed in the 1500s as part of the Oatlands Palace for Henry VIII. There are a number of historical buildings that have been constructed surrounding the lake, some now in ruins. Although the surrounding area of the lake has been maintained fairly well over the intervening years, because there is no significant flow of water through the lake, it has suffered from a continuous build-up of silt.

### **1.3 Existing Available Information**

#### **1.3.1 Silt Depth Survey**

A hydrographic and silt depth survey was carried out by Peer Design & Surveys in June 2019. The results of the survey produced four drawings of the top of silt levels and four drawings showing the bed levels (bottom of silt). Electronic versions of these drawings were provided to the Broadwater Conservation Society and are reproduced in the Appendices of this report in A3 size together with the accompanying notes.

The above information enabled a total volume of silt or sediment to be calculated which was given as 37,360 m<sup>3</sup>.

Please note that the heavily vegetated area at the western upstream end of the lake was not included in this survey.

#### **1.3.2 Silt Chemical Analysis Survey**

In order to inform the possible disposal or reuse options for the sediment should any portion of it be dredged, five sediment samples were taken at the locations shown on the plan below in August 2019. The depth of navigable water was too shallow to allow passage further west for obtaining further samples, but those recovered were all consistent with each other and in chemical analysis, so it was considered that representative samples of the lake were collected.

All samples were described as dark grey, very soft SILT with varying amount of vegetable matter and were sent to an accredited testing laboratory for analysis.

The results of the chemical analyses together with a short interpretive report are included in the appendices. The results indicated that the sediment could be classified as 'non-hazardous' under the Technical Guidance Note WM3: Waste Classification – Guidance on the classification of waste. The relevance of this classification will be discussed later in the report.

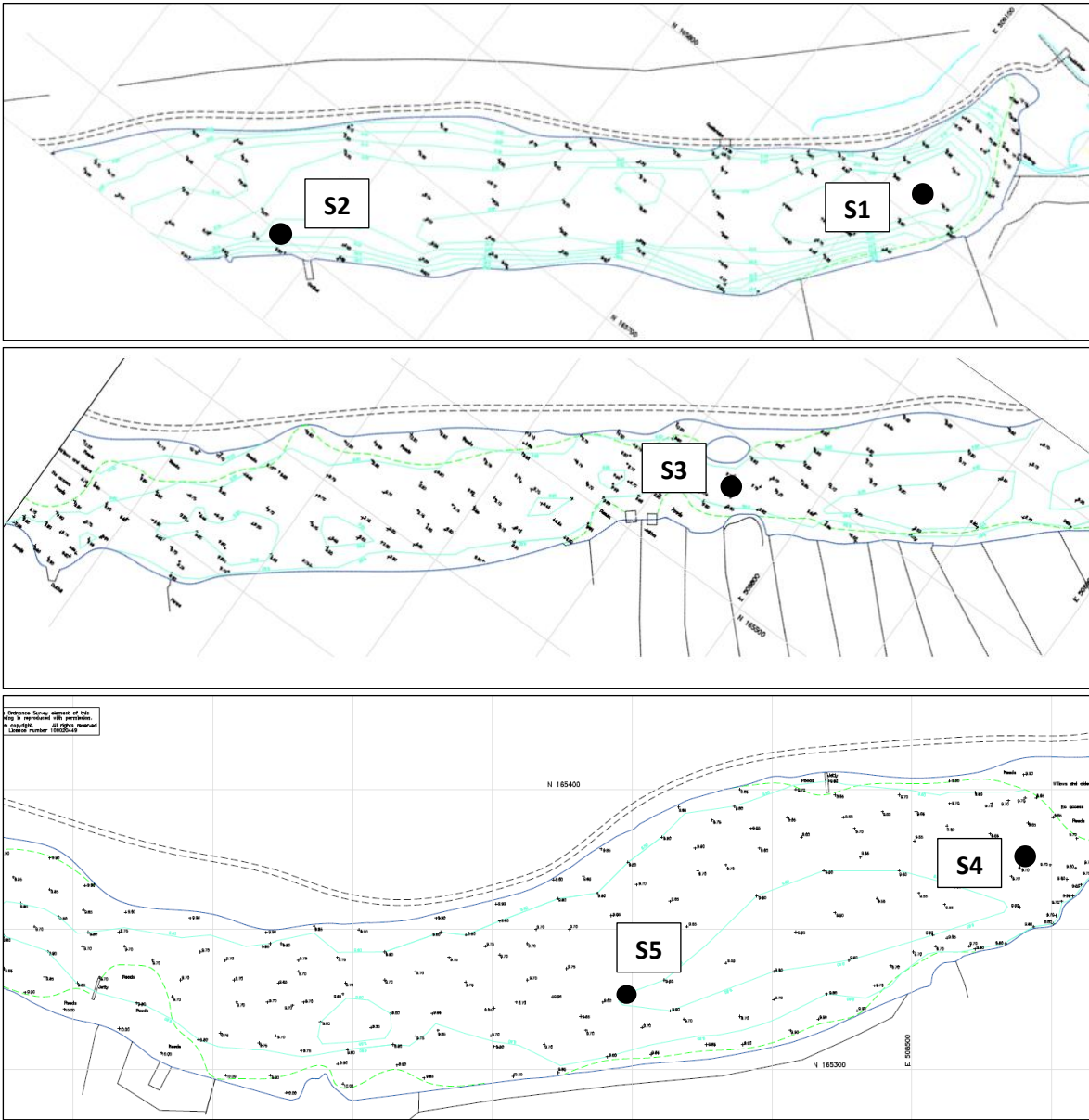


Figure 2: Location of Sediment Samples

**2.0 Scope of Works**

The scope of this report is to outline the various options that may be available to enhance the ecology and visual impact of Broadwater Lake, both from a resident’s and visiting public viewpoint.

The report may also be used to assist in the application for further funding to carry out the chosen options.

**3.0 Improvement Options**

**3.1 Legislating Considerations**

Broadwater Lake is not classified as a “Main River” and thus falls under the legislative control of the Local Authority as an “Ordinary Watercourse” for works within the footprint of the lake. Thus, the Local Authority will need to be contacted with regard to the dredging and fringe reclamations described below.

Dredged material is considered to be a waste and therefore the Environment Agency will need to consent or exempt the method of disposal or reuse. Section 3.6 below deals with this subject in more detail.

The map below shows the Flood Risk for the lake area and despite its relative proximity to the River Thames, the flood zones are largely restricted to the footprint of the lake, thus flooding is expected to discharge over the spillway and not break the banks of the lake.

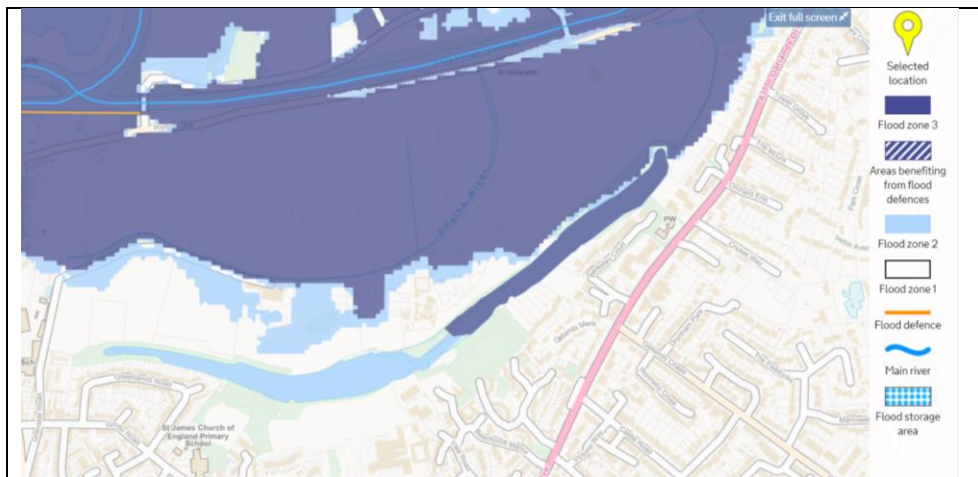


Fig 3: An extract from the EA Flood Map for Broadwater Lake

Section 1.2 mentions the Templemere Estate which was designated a Conservation Area in June 2017 and includes a section of the lake as indicated in the plan extract below left.



Fig 4: Templemere Conservation Area

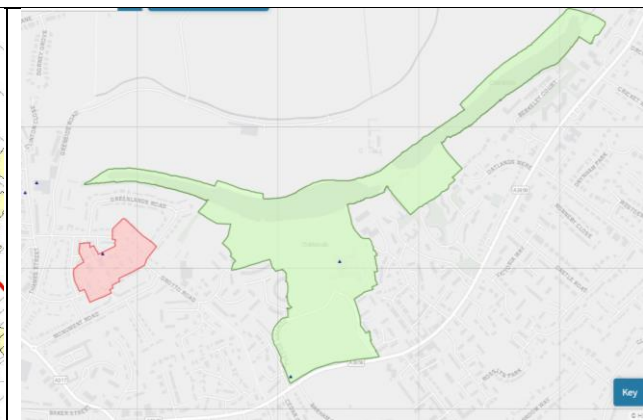


Fig 5: Registered Historic Park & Garden Area

The lake area and Templemere area has also been registered by Historic England as a Park and Garden of Historic Interest being the remnants of the Oaklands Estate dating from 1500.

### 3.2 Lake water level control

The level of the water in the lake is designed to be controlled by the spillway at the eastern end. However, there is an additional outlet under the footbridge approximately 80m west of the eastern end on the northern bank. The invert of this outlet is indicated to be lower than the spillway and indeed water was seen flowing out of this second outlet and under the footbridge whilst it was dry at the main eastern



spillway. Water from both of these spillways flows into the same ditch flowing northeast, into the Engine River, and then into the River Thames at the Walton Marina.



Fig 6: Dry Spillway at the eastern end of the lake



Fig 7: Debris and broken concrete on the spillway

The condition of the spillway is very poor with broken concrete and debris laying across the crest and it is therefore recommended that this is fully repaired with a crest height that reflects the required water level of the lake.

The level of the outlet under the footbridge will likely required to be raised to ensure that the eastern spillway is the governing structure for the lake water level.

There is a considerable build-up of silt in front of the spillway, which has also caused the lake water to divert to the footbridge outlet. This will need to be removed by dredging and is dealt with in more detail in the following sections.

### 3.3 Debris removal include fallen trees

At the time of the site inspection there was not a great quantity of rubbish or debris visible in the lake, but what there was, should be removed and disposed off site.

However, there were a large number of fallen trees along the northern shoreline and there is a delicate balance between their removal and leaving a number in place for ecological reasons including perches for birds.



Fig 8 above: An example of a fallen tree used by birds and Fig 9 right, where a fallen tree should perhaps be removed.





This is perhaps a matter for discussion with the various stake holders with the final choice being associated with future viewing points, navigation needs, dredging requirements and maintenance.

The example provided in the photos above left shows a fallen tree used frequently by birds for diving for food, drying and resting. The second photo shows a fallen tree that is likely to be a navigation issue for small boats and possible dredging works.



Figs 10 and 11 showing trees fallen into the mud in areas where diving birds could not operate.

The photos in Figs 10 and 11 shows a series of small trees that have fallen into the mud and would ideally be removed allowing the area to be dredged and the bank reinstated.

### **3.4 Bank side vegetation**

The results of the hydrographic survey indicate that generally the lake sides drop steeply from the bank into deeper water, leaving little opportunity for fringe aquatic plants to grow. Where there is shallower water, reed beds have taken hold and extend to the extent of the shallow water. Some of these areas have been cleared in recent years.

In other locations, particularly towards the western upstream end where sediment has accumulated, large areas of mud are visible especially during the summer when water levels drop. The farthest western location has been taken over by willows, sycamore and reeds and has created its own particular habitat.

The banks to the south are largely laid to grass being the gardens of houses or other private properties. A variety of individual specimen trees have been planted along the top of the bank in front of the hotel which may have form part of the original estate design – see Fig 12. Some occasional aquatic planting can be seen elsewhere along the bank where water depths allow as seen in Fig 13 below.

Except perhaps to remove some the reed beds and substitute them for species that will not spread so readily, it is not proposed to carry out and significant changes to the southern bank. There are many individual landowners along the bank, and each may have their own ideas and it would therefore be useful if their wishes were



channelled through the Broadwater Conservation Society so that they can be coordinated.



Fig 12: Specimen trees planted along the southern bank in the hotel grounds



Fig 13: Isolated sections of aquatic plants on the south bank where shallow water permits

The northern bank has a strip of mature trees and shrubs along the full length of the lake varying in width between 10m and 40m and with the new public footpath routed through it. However there a few points where the path meets the actual bank of the lake as well as sections where the vegetation has been flattened where the public have created paths to access the shoreline.

It is therefore proposed that a number of locations are identified in consultation with interested parties, that are developed as viewpoints. A limited number of trees may need to be cleared, or at least some branches to facilitate the view. It is suggested that a harder lake edge is constructed in timber to prevent persons accidentally walking into soft mud or deeper water and a gravel area established perhaps with a seat.

Examples of possible viewpoints are provided below, in Figure 12 above and the photo on the front of this report.





Figs 14 & 15: Possible locations for future viewpoints

Where water depths are shallower along the northern bank, it may be possible to reuse the dredged sediment and reclaim these areas as vegetated fringes along the bank edge. This option will be discussed in more detail in sections 3.5 and 3.6.

During the walkover survey of the site, a significant area of Himalayan Balsam was identified at the western end on the north bank as illustrated in Fig 16 below. Himalayan Balsam is listed in Schedule 9 of the Wildlife and Countryside Act 1981 as an invasive plant species. It is prevalent around water bodies and spreads very easily when its seed pods burst in the late summer.

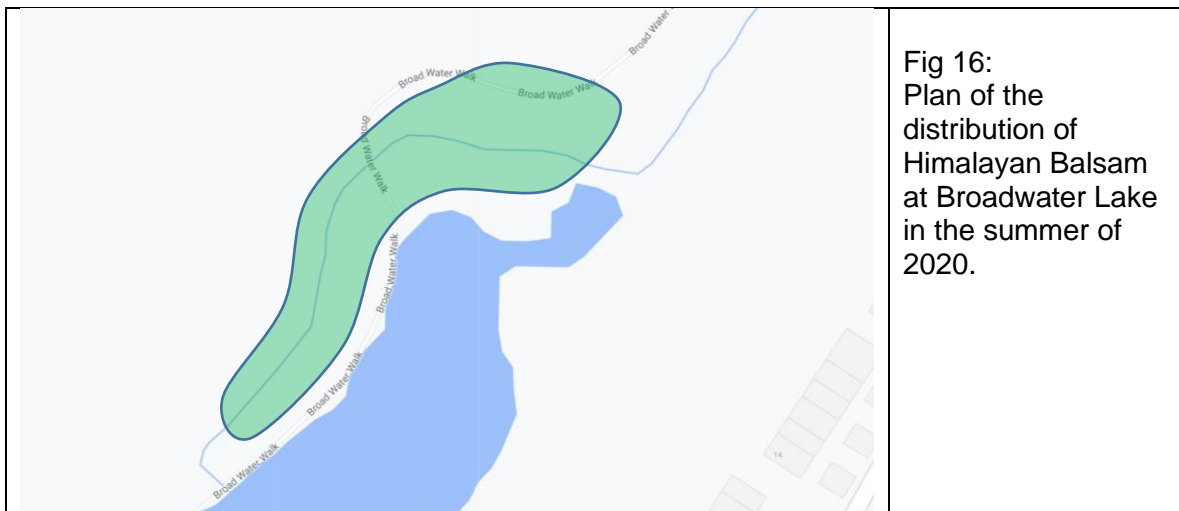


Fig 16:  
Plan of the  
distribution of  
Himalayan Balsam  
at Broadwater Lake  
in the summer of  
2020.

Although it is not a notifiable plant and landowners are not obligated to eradicate it, they are not allowed to let it spread. Fortunately Himalayan Balsam can be easily and safely controlled by pulling out the plants, or cutting below the first node, preferably in May or June before they seed. The roots are shallow and in soft moist ground the plants can be readily pulled. Once pulled, the plants will decompose and, provided that seeds have not developed, can be composted.

The plants are readily identifiable from their foliage as seen in the photos below and if allowed to flower will have a purplish pink trumpet like flower which will develop into a seed pod. These seed pods can explode spreading the seed up to 4.0m from the original plant and thus spreading rapidly in the right conditions.



Figs 17 and 18: Photos of Himalayan Balsam at Broadwater Lake

### **3.5 Dredging**

The Volume of silt in the lake has been determined as 37,360 m<sup>3</sup>, but it is clear that it is both unaffordable and unnecessary to dredge all of the sediment from the lake. Thus the question is how much should be dredged and for what purpose.

#### **3.5.1 Navigation**

It is known that boating on the lake used to be a regular activity, but that this has ceased due to the shallow water, particularly in the summer, making it impossible for rowing to take place or small outboard motors to function.

It is therefore suggested that ideally a navigation channel running the approximate length of the lake be created to allow boating to be resurrected. The depth of this channel would need to be approximately 800mm and a minimum width of 10.0m, preferably wider.

The navigation channel will need to be marked and this can be done with buoys or posts driven into the silt along the channel edges.

The alignment for such a channel has been superimposed on the hydrographic survey plans in the appendices and a dredged volume of 11,890m<sup>3</sup> calculated.

#### **3.5.2 Water Quality**

The flow of water through the lake will be determined by the amount of rainfall and catchment area and it is known that during summer months with very little rainfall the water level drops exposing areas of unsightly mud which may have an unpleasant odour.

Whilst the maximum water level should be controlled by the spillway at the eastern end of the lake, the minimum water level cannot be controlled and therefore if the exposure of mud banks is to be avoided, they will need to be removed by dredging. Such areas have been identified on the hydrographic plans in the appendices and a figure of 3,725m<sup>3</sup> identified as the volume that will need to be removed to reduce this risk.

#### **3.5.3 Environmental**

Environmental considerations will be given to all aspects of the proposed lake improvements, but size and health of the fish stock in the lake will depend largely upon the water quality and depth. Shallow water depths will increase the chances of



stress or death of fish during the hot summer months and it is therefore advisable to ensure that there are a number of deeper water refuges for the larger fish.

This is especially so if there are plans to reopen the lake to fishing as a managed activity. Consideration will need to be given to fishing locations, their interface with the public and water depths nearby.

The marked up hydrographic plans in the appendices show four locations for deepening the water to 1.5m which would be sufficient for a non-fished lake and result in a volume of 1687m<sup>3</sup> required to be dredged.

### **3.6 Sediment reuse and/or disposal**

The cost of disposing of dredged arisings will be the most influential item within the development budget and it is therefore important to examine all potential methods of reuse or recycling in the lake area in preference to disposing off site to landfill.

The possible reuse of sediment locally will require the following legislation to be considered:

#### **3.6.1 D1 Exemption to the Waste Management Regulations**

This exemption allows the dredged sediment to be used along the bank of the lake, which in this case will be behind installed natural retaining structures at selected locations. The installation of such structure is generally restricted to a retained height of no more than 1.1m which will restrict the possible areas that could be used in this way.

Potential areas are indicated in the appendices with calculated areas. The rates provided in the budget section can then be used to determine budgetary costings depending on the quantities chosen.

The exemption is a relatively simple notification to the Environment Agency and requires only to demonstrate that the dredged material is non-hazardous.

#### **3.6.2 U10 Exemption – beneficial reuse for agricultural fields**

This exemption allows dredged material to be spread on agricultural land and it is noted that there are a number of fields to the north of the lake between the Engine River and the Desborough Cut joining the Thames. At this stage no contact has been made with the landowners as it is probably too early to start such negotiations.

In order for this exemption to be used, a benefit to the receiving soils must be proven, and thus it will be necessary to sample and analyse the fields that might be used and carry out a complex analysis of the chemical components of both the field and lake sediment in order to demonstrate that a benefit will occur. This analysis will also determine the thickness of the spread sediment and therefore how much material can be spread over the area available.

#### **3.6.3 U11 Exemption or an Environmental permit for beneficial reuse on non-agricultural areas**

The U11 exemption allows dredgings to be spread on non-agricultural land to improve or maintain soils. However the permitted usage is very small at 150 tonnes per hectare and can only be increased by applying for an Environment Permit.

There is an area of land between the lake and the Engine River which is rough grass land and may be appropriate for this reuse option. The land appears to be owned by the Bannatyne Health Club & Spa and the Weybridge Equestrian Centre, but no communication has yet taken place to confirm this or to determine whether this land could be made available.

The issue of flood risk may be raised, but reference to the flood map in section 3.1 shows that the area being considered to the north and west of the site is not in any of the flood zones, so should not pose a restriction to this proposal.

The process of obtaining an Environmental Permit is a lengthy one taking up to three months, therefore if this method of sediment reuse is being considered, sufficient time should be allowed for the necessary negotiation and application.

### 3.7 Services

Prior to works in connection with the lake development commencing a full services check will need to be carried out to identify and locate on the ground any buried or overhead service that will be affected by the proposed works. It is likely that with cognisance given to such services, the proposed works will be able to avoid them.

However, it is known that there is a 11,000 volts cable crossing the lake approximately halfway along that might affect the proposed dredging regime and the position of this is shown on the plan below and is reflected in the marked up dredging plans in the appendices.

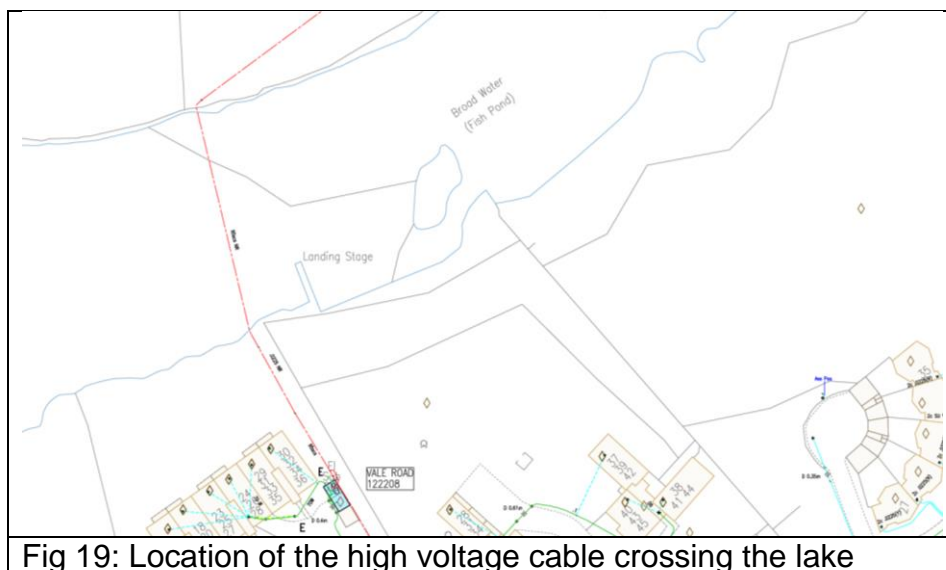


Fig 19: Location of the high voltage cable crossing the lake

### 3.8 Added Value items

As well as the improvements envisaged for the local residents and community, there is an opportunity to provide additional facilities such as the viewpoints mentioned in Section 3.4. Information Boards could also be erected providing information on the wildlife to be seen and the history of the lake and its surrounds.

In order to encourage school children to take an interest in the ecology of the lake, dipping platforms could be constructed at one or two locations along the northern bank.

### 3.9 Lake maintenance

Once the final scheme has been agreed and constructed a Maintenance Manual should be written to allow the residents to keep the lake, the plants and the wildlife in a good condition.

The manual should include inspection schedules for structures, a weeding/planting/pruning calendar and timings for periodic surveys for fish, birds and sediment accumulation.

### 4.0 Budget Costs for Options

The pricing schedule provided below is based upon 2020 prices with no allowance for inflation or VAT. It is designed as a “shopping list” but allowance should always be made for the mobilisation, demobilisation and design costs.

Item	Description	Qty	Unit	Rate	Price	
1.00	PRELIMINARIES & MOBILISATION					
1.10	Plant, tools and vehicles. Mobilisation & demobilisation	2	Each way	£11,000.00	£22,000.00	
1.20	Design & attendance	1	Sum	£4,700.00	£4,700.00	
1.30	Consents and Permits	1	Prov Sum	£8,000.00	£8,000.00	
	Subtotal					£34,700.00
2.00	LAKE WORKS					
2.10	Clear all rubbish from the banks and the lake	3	Day	£3,300.00	£9,900.00	
2.20	Remove silt from the lake	37,000	m3	£13.50	£499,500.00	
2.30	Deposition of silt to adjacent land	0	m3	£9.75	£0.00	
2.40	Remove all fallen or overhanging trees	5	Day	£3,300.00	£16,500.00	
2.50	Restructure lake banks using nicospan and dredged sediment as backfill	500	m	£210.00	£105,000.00	
2.60	Check for damage to inlet pipes to lake	1	Prov Sum	£3,000.00	£3,000.00	
2.70	Provisional Sum for repairs to inlet pipes	1	Prov Sum	£5,000.00	£5,000.00	
2.80	Check and repair outlet pipes	1	Prov Sum	£1,650.00	£1,650.00	
2.90	Provisional Sum for repairs to outlet pipes	0	Prov Sum	£2,500.00	£0.00	
2.10	Repair/replace Outlet Weir	1	Sum	£9,500.00	£9,500.00	
2.11	Wildlife Areas - Excavate reed bed areas where overgrown and leave a fringe to be managed.	500	m2	£13.50	£6,750.00	



2.12	Design and install dipping Jetties for School use	2	each	£11,500.00	£23,000.00	
2.13	Check condition of culverts	1	Sum	£2,700.00	£2,700.00	
2.14	Provide and plant UK native aquatic plants along northern bank	500	m	£48.00	£24,000.00	
2.15	Provide a Maintenance Manual for the ongoing upkeep of the lake.	1	Sum	£1,100.00	£1,100.00	
	Subtotal					£707,600.00
	Final Budget Summary					£742,300.00

## 5.0 Summary

The description and history sections of this report outline the importance of the cultural and ecological heritage of Broadwater Lake and its surrounds. The historic Oaklands Estate has been recognised in the protective status given to certain areas around the lake and to the lake itself and these must be considered when developing the proposed programme of works for the lake.

Equally opening the lake up to the general public will also be an importance part of the works and this can be reflected in incorporating viewpoints, rest areas, fishing platforms, information boards and dipping jetties for schools.

Should the lake reopened for boating in the future, the extent will depend upon the amount of dredging needed to provide sufficient depth of water. Examples of this have been provided.

Linked to this is the method of sediment disposal and programme of consultations with landowners, permissions and permitting will be required to achieve the most sustainable and economical reuse or disposal method.

The design of the works should also consider the ongoing maintenance of the lake and the surrounding area and a Maintenance Plan developed with the designers and contractors for the works.

Finally a schedule of prices has been provided which can be used as a shopping list to determine a budget for the final project scheme. It is suggested that this is checked again once the final scope has been agreed, so that inflation and any significant price changes can be included.

## **Appendices**

### **Appendix 1**

- Survey of Bed Levels (Bottom of silt) – Sheets 1 to 4 (Drawings 01 to 04)
- Survey of Top of Silt – sheets 1 to 4 (Drawings 05 to 08)

### **Appendix 2**

- Chemical Analyses of Sediment Samples 1 to 5

### **Appendix 3**

- Proposed Dredging Options
  - Shallow Areas to be Dredged – sheets 1 to 3
  - Proposed Fish Refuges – sheets 1 to 3
  - Proposed Navigation Channel – sheets 1 to 3