Appendix 7.14: Pond Survey Report

City of London

MACROINVERTEBRATE AND MACROPHYTE SURVEY OF 13 PONDS ON HAMPSTEAD HEATH

FINAL REPORT

SEPTEMBER 2013

APEM REF: 412170

APEM AQUATIC SCIENTISTS

CLIENT:	**City of London**
ADDRESS:	**PO Box 270** **Guildhall** **London** **EC2P 2EJ**
PROJECT No:	**412170**
DATE OF ISSUE:	**September 2013**

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This report should be cited as: APEM (2013) Macroinvertebrate and macrophyte survey of 13 ponds on Hampstead Heath. Report 412170 for City of London

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CONTENTS

1 INTRODUCTION

Atkins have recently undertaken a review of aquatic ecological baseline data for the Hampstead and Highgate Chains of ponds in order to determine its suitability for use in informing options for pond/water quality enhancement, the environmental impact assessment, and detail design process 2013/2014. Review of the available data identified the presence of a number of aquatic ecological reports and data sheets relating to a number of ponds within the chains; however, a number of limitations to the data were noted, including the age and consistency of the data, and the fact that National Pond Survey (NPS) and Predictive System for Multimetrics (PSYM) surveys have not been undertaken to allow conservation status to be assessed.

Thus, APEM Ltd was commissioned by City of London to undertake macroinvertebrate and macrophyte surveys at the Hampstead and Highgate Chains of ponds located on Hampstead Heath, London, and to provide PSYM output for use as a baseline conservation assessment, to be used alongside other data also being collected by APEM (e.g. on fish populations).

1.1 Project aims

The aim of this part of the project is to provide a baseline ecological assessment of the macrophyte and macroinvertebrate communities of 13 of the Hampstead and Highgate ponds, and to determine their conservation status with respect to these ecological elements. It is envisaged that these data will subsequently serve as a baseline in order to ensure a robust platform for optioneering and assessment of scheme impacts/monitoring requirements moving forward for the Hampstead Heath flood and water quality works.

2 METHODS

Macrophyte and macroinvertebrate surveys were undertaken using NPS guidelines (Biggs *et al.*, 1998) at the 13 ponds listed in **Table 2.1.** Grid references for the approximate centre of each lake are provided along with the date of the survey in **Table 2.1.** Specific details of each aspect of the survey may be found in **Section 2.1** and **Section 2.2**.

Table 2.1. Survey site identifiers, locations and dates.

Chain	Pond Name	Central Grid Reference	Date of Survey
Highgate Chain	Highgate No 1 Pond	TQ2795386400	10/07/2013
	Highgate Men's Bathing Pond	TQ2787686435	11/07/2013
	Model Boating Pond	TQ2773086738	11/07/2013
	Bird Sanctuary Pond	TQ2768286885	10/07/2013
	Kenwood Ladies' Bathing Pond	TQ2761786919	09/07/2013
	Stock Pond	TQ2750287096	10/07/2013
Hampstead Chain	Hampstead No. 1 Pond	TQ2719885870	16/07/2013
	Hampstead No. 2 Pond	TQ2724786120	12/07/2013
	Mixed Bathing Pond	TQ2726786145	17/07/2013
	Viaduct Pond	TQ2694086461	16/07/2013
	Vale of Health Pond	TQ2664686429	15/07/2013
English Heritage Ponds	Wood Pond	TQ2713987245	09/07/2013
	Thousand Pound Pond	TQ2725687201	08/07/2013

2.1 Macrophyte surveys

The presence of macrophytes was determined using a boat to investigate the perimeter of each pond. A grapnel was thrown into the water at intervals to collect samples of submerged plants. The percentage cover of submerged, floating and emergent plant species, as defined in the NPS, was recorded. Additionally, macrophyte abundance was assessed where D = 50-100% cover; A = 20-50% cover; F = 5-20% cover; O = 1-5% cover and R below 1% cover. Where accurate estimation of cover is considered impossible (e.g. submerged plants), dominant species were recorded as D and all other species as R. Furthermore, the location of dominant and/or notable species was recorded by GPS and extent of plant cover was transcribed on the base map.

Species identification of macrophytes took place *in situ*, with the aid of a hand lens where necessary. Occasional samples were removed, placed in labelled sample bags and stored below 4°C for later laboratory examination.

Field-based water chemistry measurements were made (pH, conductivity, turbidity and dissolved oxygen) using a multi-parameter probe. Samples were taken before sediments or

plants were disturbed by sampling, to avoid the possibility of water quality results being influenced by disturbance.

2.2 Macroinvertebrate surveys

A three-minute macroinvertebrate sample was collected from standing water areas within each pond by dividing the three minutes between each of the identified microhabitats in proportion to their extents, with a further one-minute search made searching for animals which may otherwise be missed in the 3-minute sample (e.g. those under stones and logs). Macroinvertebrates were sampled using a 1 mm mesh D-frame pond net, by inverting the net and sweeping several different levels of the water column (surface, midwater, and just above the sediment). Sweeps included both the open water and the zone occupied by stems of the dominant emergent vegetation in each mesohabitat. Stony or sandy substrate was lightly kicked to disturb and capture any macroinvertebrate inhabitants.

In the National Pond Survey methodology, samples are unpreserved and identified live (to family level), either on site or in the laboratory. However, for this project species-level identification was specified, which requires preservation of samples in order to allow partial dissection of invertebrates. Samples were therefore preserved in 90% Industrial Methylated Spirits solution immediately upon collection, and transported to APEM's UKAS-accredited laboratory. Macroinvertebrates were identified to species level where possible (for certain groups, such as oligochaetes and chironomids this is impractical), with reference to EA Operating Instruction BT001 (Murray-Bligh, 1999).

2.3 How PSYM is used to determine conservation status

PSYM is a waterbody quality assessment methodology which combines the predictive approach of RIVPACS[1] with multimetric-based methods used for ecological quality assessment in the United States (Biggs *et al.*, 1998).

In multimetric assessments, a range of variables (metrics), each related to degradation, is used to assess water quality, giving a broad-based assessment of quality. The values from individual metrics are combined to give a single measure which aims to represent the overall ecological quality of the waterbody. Combining this with predictive techniques gives a powerful method for comparing waterbodies of any type with their un-degraded counterpart.

The PSYM methodology directly parallels the approach defined in the EU Water Framework Directive. This includes requirements for (i) comparisons with minimally impacted baseline conditions, and for (ii) assessments to be based on multiple parameters related to degradation.

The metrics used in PSYM for assessing environmental degradation in ponds are:

- Invertebrates
    - Average score per taxon (ASPT)[2]

[1] The River InVertebrate Prediction And Classification System, developed by the Institute of Freshwater Ecology and Environment Agency (Wright *et al.* 2000).

[2] The total Biological Monitoring Working Party (BMWP) score divided by the number of qualifying families; this gives an indication of organic pollution. BMWP scores for each family range from 1-10; thus an average

  - Number of dragonfly (Odonata) and alderfly (Megaloptera) families (F_OM)[3]
  - Number of beetle (Coleoptera) families (F_COL)[4]
- Plants:
  - Number of submerged and emergent plant species (SM_NTX)
  - Trophic ranking score for aquatic and emergent plants (TRS_ALL)[5]
  - Number of uncommon plant species ((PL_NUS)

As in RIVPACS, the PSYM method assesses quality by comparing actual and predicted quality scores for each waterbody. The predictions of unimpaired waterbody quality are made using physico-chemical data gathered from the waterbody. In ponds the main predictors of unimpaired community type fall into nine major variable categories. Of these, three are relatively invariant (e.g. grid reference, altitude, base geology) which need only be assessed once. The remaining six categories of variables require on-site field measurement when each assessment is made. These are area, pH, shade, grazing, presence of an inflow and emergent plant cover.

When a waterbody is assessed, each individual metric is calculated and compared to the computer predicted score for that metric. The relationship between observed and expected is presented as a percentage of similarity, and then transformed to a 4 point scale e.g. 0, 1, 2 and 3 where 0 represents poor quality, and 3 represents good quality (i.e. no deviation from expected). All metric scores are then summed to give an overall quality index, which is presented as a percentage of the maximum score and, potentially, forms the basis of General Quality Assessment (GQA) categorisation of a site. The resulting quality categories are shown in **Table 2.2**. If a pond is determined to be in the Good quality category it is deemed to be a priority pond in terms of the UK's Biodiversity Action Plan (BAP)[6]. The results presented include the overall quality index and its resultant quality category (hereafter, pond conservation status) (see **Section 3**).

Table 2.1 – Trophic Ranking Score classifications

Score	Category
0-1	D = strongly associated with dystrophic waters
1.1-2	d = weakly associated with dystrophic waters
2.1-3	o = weakly associated with oligotrophic waters (linked with D or d)
3.1-4	O = strongly associated with oligotrophic waters
4.1-5	o = weakly associated with oligotrophic waters (linked with M or m)
5.1-6	m = weakly associated with mesotrophic waters (linked with 0 or o)
6.1-7	M = strongly associated with mesotrophic waters
7.1-8	m = weakly associated with mesotrophic waters (linked with E or e)
8.1-9	e = weakly associated with eutrophic waters
9.1-10	E = strongly associated with eutrophic waters

score of 5 indicates average tolerance to organic pollution (although this does not take into account the habitat and site conditions)

[3] Gives an indication of the occurrence of sensitive taxa which are intolerant to pollution

[4] Used, in part, as a measure of marginal habitat quality and bank structure and can therefore be used to help assess the physical quality of the lake environment

[5] As shown in Table 2.1

[6] More details are available here: http://www.pondconservation.org.uk/pond_hap/targets.htm

Table 2.2 – PSYM quality categories as determined using the average Index of Biological Integrity percentage

Index of Biological Integrity	Resulting PSYM quality category
>75%	Good
51-75%	Moderate
25-50%	Poor
<25%	Very Poor

2.4 Community Conservation Index

In addition to the biological indices and other metrics reported under the PSYM methodology, Community Conservation Index (CCI; Chadd and Extence, 2004) measures the conservation value of the macroinvertebrate community at a site in the national context of England and Wales, based on both the rarity of individual species and the overall diversity of the community. The resultant scores are assigned a conservation value, as shown in **Table 2.3**.

Table 2.3 - CCI scores and their associated macroinvertebrate community conservation value

CCI score	Community conservation value
0-5	Low
5.1-10	Moderate
10.1-15	Fairly High
15.1-20	High
Above 20	Very High

3 RESULTS

The following sections of this report present the results of the macrophyte and macroinvertebrate surveys undertaken at each of the surveyed lakes. For the georeferenced GIS output, including mesohabitat photographs, please see the 'PSYM' DVD, sent separately.

The field data sheets are located in **Appendix I**, including a list of macrophyte species recorded at each pond, and the environmental parameters recorded on site. The PSYM output is shown in **Appendix II**.

Macroinvertebrate species lists are presented in **Appendix III**, with individual species of interest and conservation indices described below.

3.1 Highgate Pond Chain

Figure 3.1 shows the biotic indices from the macroinvertebrate surveys. The BMWP scores ranged from 40, in Model Boating Pond, to 121, in Bird Sanctuary Pond. ASPT scores ranged from 3.89, in Highgate No.1 pond, to 5.04, in Bird Sanctuary Pond. All of the ponds in the Highgate chain show some degree of organic pollution, with only Bird Sanctuary Pond having an ASPT of above 5. CCI scores ranged from 4.6 (representing low conservation value of the aquatic macroinvertebrate communities), in Ladies Bathing Pond, to 14.6 (representing fairly high conservation value), in Highgate No. 1 pond.
The majority of ponds in the Highgate chain were found to have aquatic macroinvertebrate communities of moderate conservation value. One notable, but not red data book, species has been found in the Highgate chain, namely *Glossiphonia paludosa* (a leech), in Stock Pond.

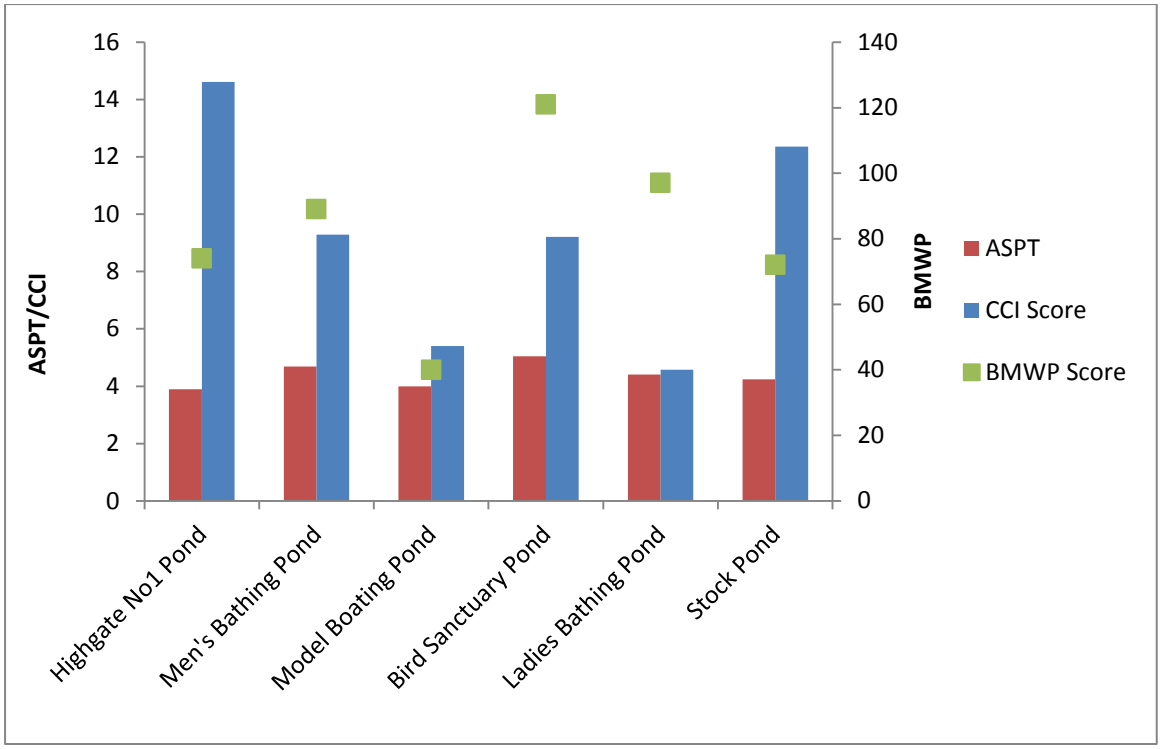

Figure 3.1 - Highgate pond chain macroinvertebrate results

A summary of the PSYM output from the macroinvertebrate and macrophyte surveys in the Highgate pond chain are shown in **Table 3.1**. All of the ponds in the Highgate chain are in the Poor or Moderate conservation status category based on the PSYM metrics. None of the Highgate ponds are deemed to be priority ponds in terms of their quality.

Trophic Ranking Score classifications for macrophytes are shown in **Table 2.1**. All of the ponds within the Highgate chain are 'weakly associated with eutrophic waters', apart from Bird Sanctuary Pond, which is 'weakly associated with mesotrophic waters (linked with eutrophic waters)'. All of the Highgate ponds contained one or more uncommon plant species, with the exception of Stock Pond.

Table 3.1 – Highgate pond chain PSYM output summary

Pond Name	Macroinvertebrate results			Macrophyte results				PSYM output		
	ASPT	Odonata + Megaloptera (OM) families	Coleoptera families	No. of submerged + marginal plant species	Number of uncommon plant species	Uncommon plant species[7]	Trophic Ranking Score	Index of biotic integrity	PSYM quality category	Is this a priority pond?
Highgate No 1 Pond	3.89	2	0	16	3	*Schoenoplectus lacustris, Potamogeton pusillus, and Ceratophyllum demersum*	8.98	56%	Moderate	No
Highgate Men's Bathing Pond	4.68	1	0	8	3	*Chara* sp., *Potamogeton pusillus, and Zannichellia palustris*	8.40	50%	Moderate	No
Model Boating Pond	4.00	0	0	14	1	*Spirodela polyrhiza*	8.44	33%	Poor	No
Bird Sanctuary Pond	5.00	1	0	9	1	*Nitella sp.*	7.83	33%	Poor	No
Kenwood Ladies' Bathing Pond	4.41	2	2	8	1	*Nuphar lutea*	8.28	56%	Moderate	No
Stock Pond	4.24	2	0	9	0	-	8.72	44%	Poor	No

[7] Plants with a rarity score of 2 or more on the PSYM form

3.2 Hampstead Pond Chain

Figure 3.2 shows the biotic indices from the macroinvertebrate surveys. The BMWP scores ranged from 51, in Vale of Health pond, to 75, in Hampstead No. 1 pond. ASPT scores ranged from 3.40, in Vale of Health pond, to 4.69, in Hampstead No.1 pond. All of the ponds in the Hampstead chain show some degree of organic pollution, with no ponds calculated to have an ASPT of above 5. CCI scores ranged from 9.1 (representing moderate conservation value of the aquatic macroinvertebrate communities), in Hampstead No. 1 pond, to 18.5 (representing high conservation value), in Viaduct pond. Two notable, but not red data book, species were found in the Hampstead chain, namely *Glossiphonia paludosa*, in Mixed Bathing Pond, Viaduct Pond and Vale of Health Pond, and *Glossiphonia verrucata* (also a leech), in Viaduct Pond.

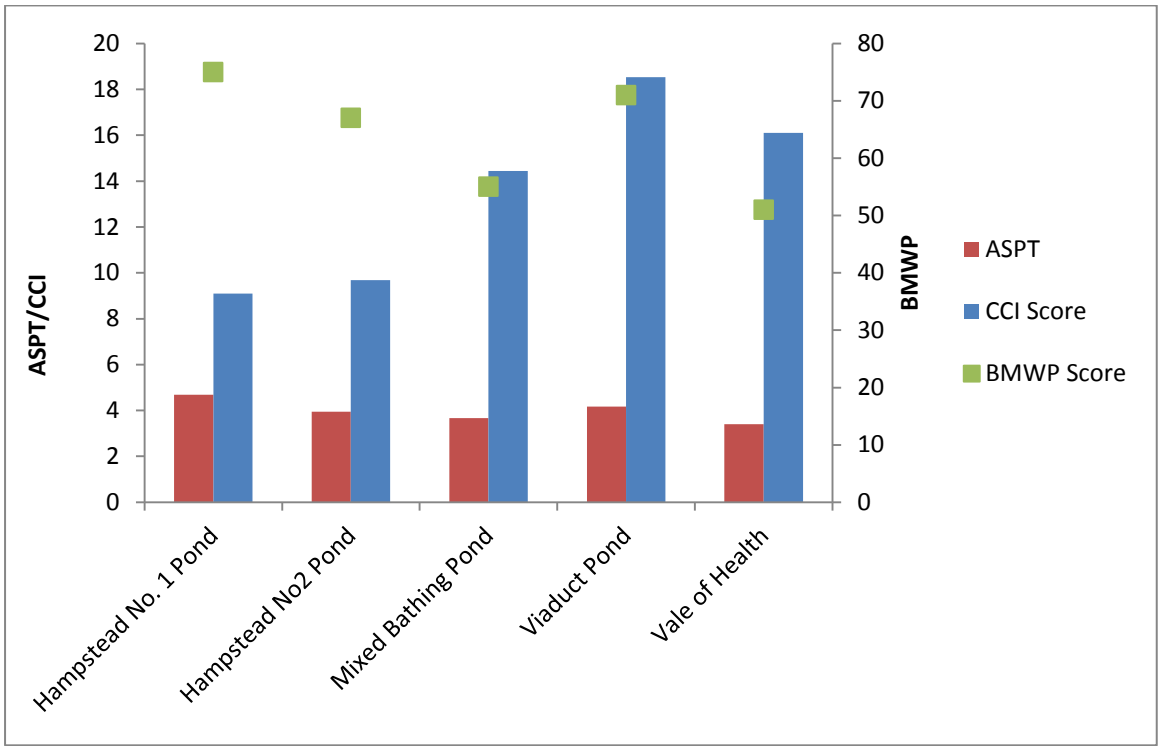

Figure 3.2 - Hampstead pond chain macroinvertebrate results

A summary of the results of the macroinvertebrate and macrophyte surveys in the Hampstead pond chain are shown in **Table 3.2**. All of the ponds in the Hampstead chain are in the Poor or Moderate conservation status category based on the PSYM metrics. None of the Hampstead ponds are deemed to be priority ponds in terms of their quality.

Trophic Ranking Score classifications for macrophytes are shown in **Table 2.1**. All of the ponds within the Hampstead chain are 'weakly associated with eutrophic waters', apart from Mixed Bathing Pond, which is 'strongly associated with eutrophic waters'. All of the Highgate ponds contained one or more uncommon plant species.

Table 3.2 – Hampstead Chain

Pond Name	Macroinvertebrate results			Macrophyte results				PSYM output		
	ASPT	Odonata + Megaloptera (OM) families	Coleoptera families	No. of submerged + marginal plant species	Number of uncommon plant species	Uncommon plant species	Trophic Ranking Score	Index of biotic integrity	PSYM quality category	Is this a priority pond?
Hampstead No. 1 Pond	4.69	1	0	16	4	*Schoenoplectus lacustris, Nymphaea alba, Zannichellia palustris, and Ceratophyllum demersum*	8.75	56%	Moderate	No
Hampstead No. 2 Pond	3.94	1	0	13	2	*Zannichellia palustris and Ceratophyllum demersum*	8.64	44%	Poor	No
Mixed Bathing Pond	3.67	0	0	4	2	*Nuphar lutea and Potamogeton pusillus*	9.17	33%	Poor	No
Viaduct Pond	4.18	2	1	11	3	*Spirodela polyrhiza, Nuphar lutea and Chara* sp.	8.83	61%	Moderate	No
Vale of Health Pond	3.40	0	0	14	4	*Nymphaea alba, Ceratophyllum demersum, Potamogeton pusillus and Chara* sp.	8.66	44%	Poor	No

3.3 English Heritage Ponds

Figure 3.3 shows the biotic indices from the macroinvertebrate surveys. The BMWP scores ranged from 93, in Thousand Pound Pond, to 108, in Wood Pond. ASPT scores ranged from 4.50, in Wood Pond, to 5.17, in Thousand Pound Pond. Both English Heritage ponds show some degree of organic pollution, with both ponds calculated to have an ASPT of close to 5. CCI scores ranged from 8.9 (representing moderate conservation value of the aquatic macroinvertebrate communities), in Wood Pond, to 10.6 (representing fairly high conservation value), in Thousand Pound Pond. No notable or rare species were found in either pond.

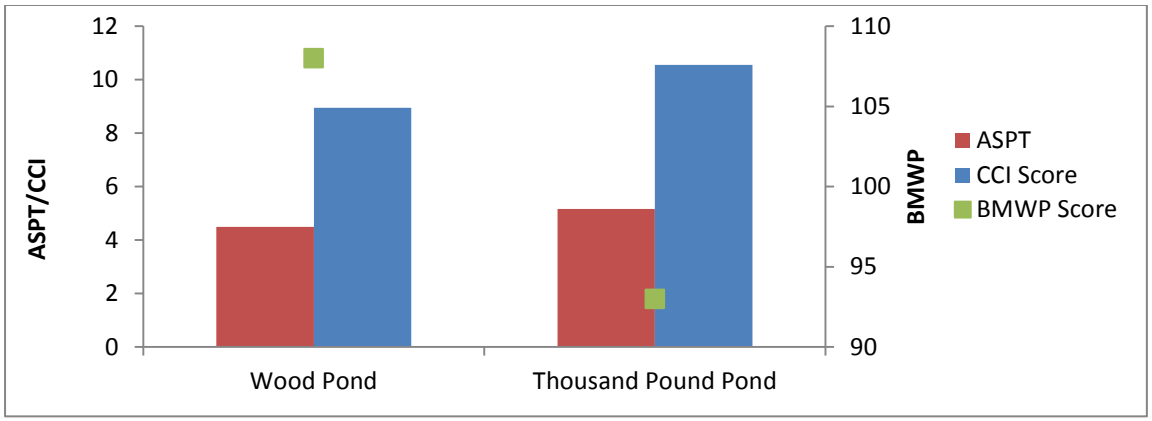

Figure 3.3 – English Heritage ponds macroinvertebrate results

A summary of the results of the macroinvertebrate and macrophyte surveys in the English Heritage ponds are shown in **Table 3.3**. Both of the English Heritage ponds are in the Poor or Moderate conservation status category based on the PSYM metrics. Neither of the English Heritage ponds are deemed to be priority ponds in terms of their quality.

Trophic Ranking Score classifications for macrophytes are shown in **Table 2.1**. Wood Pond is 'weakly associated with mesotrophic waters (linked with eutrophic waters)' and Thousand Pound Pond is 'weakly associated with eutrophic waters'. Both of the English Heritage ponds contained one or more uncommon plant species.

Table 3.3 – English Heritage ponds

Pond Name	Macroinvertebrate results			Macrophyte results				PSYM output		
	ASPT	Odonata + Megaloptera (OM) families	Coleoptera families	No. of submerged + marginal plant species	Number of uncommon plant species	Uncommon plant species	Trophic Ranking Score	Index of biotic integrity	PSYM quality category	Is this a priority pond?
Wood Pond	4.50	2	4	12	3	*Nuphar lutea, Nymphaea alba and Nitella* sp.	7.57	67%	Moderate	No
Thousand Pound Pond	5.17	1	1	4	1	*Nuphar lutea*	8.27	39%	Poor	No

3.4 Summary

Table 3.4 shows a summary of results, including PSYM conservation status, conservation value (indicated by CCI score) and notable macroinvertebrate taxa for each pond.

Table 3.4 – Summary of PSYM results, including PSYM conservation status, conservation value and notable macroinvertebrate taxa

Chain	Pond Name	PSYM Conservation Status	CCI Conservation Value	Notable macroinvertebrate taxa
Highgate Chain	Highgate No 1 Pond	Moderate	Fairly high	None
	Highgate Men's Bathing Pond	Moderate	Moderate	None
	Model Boating Pond	Poor	Moderate	None
	Bird Sanctuary Pond	Poor	Moderate	None
	Kenwood Ladies' Bathing Pond	Moderate	Low	None
	Stock Pond	Poor	Fairly high	*Glossiphonia paludosa*
Hampstead Chain	Hampstead No. 1 Pond	Moderate	Moderate	None
	Hampstead No. 2 Pond	Poor	Moderate	None
	Mixed Bathing Pond	Poor	Fairly High	*Glossiphonia paludosa*
	Viaduct Pond	Moderate	High	*Glossiphonia paludosa* and *Glossiphonia verrucata*
	Vale of Health Pond	Poor	High	*Glossiphonia paludosa*
English Heritage Ponds	Wood Pond	Moderate	Moderate	None
	Thousand Pound Pond	Poor	Fairly High	None

4 CONCLUSIONS

The PSYM output (Index of Biological Integrity; IBI) shows that all of the ponds surveyed are of poor or moderate conservation status. This suggests that they are impacted by anthropogenic influences (such as nutrient enrichment or excessive fine sediment inputs), and given their eutrophic state, is as expected. BMWP scores indicate a organic pollution in most of the ponds, particularly the Model Boating Pond. ASPT scores ranged from 3.40 to 5.17, indicating that the macroinvertebrate community are exhibiting signs of stress due to poor water quality. No ponds were found to be UK BAP priority ponds.

Several ponds were found to contain notable (but not red data book) macroinvertebrate species: namely Stock Pond, Mixed bathing Pond, Viaduct Pond and Vale of Health pond. Although the ponds are of poor to moderate conservation status (as indicated by the PSYM IBI), they are valuable as uncommon habitats in the area, for both biodiversity and recreational purposes. At least one pond in each chain exhibited a CCI of 10.1 or above, indicating at least fairly high conservation value (as determined by CCI scores), and two ponds (Viaduct Pond and Vale of Health pond) were found to have high conservation value.

5 REFERENCES

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APPENDIX I – FIELD DATA SHEETS

Environmental data

See accompanying pdf attachment 'Appendix Ii – Field data sheets'.

Macrophyte species data

The following plant species are classified according to the DAFOR scale:

- D – dominant
- A – abundant
- F – Frequent
- O – Occasional
- R – Rare

Pond name	Species name	DAFOR scale
Thousand Pound	*Myosotis scorpiodies*	R
	Cladophora	R
	Iris pseudacorus	R
	Mentha aquatica	R
	Epilobium hirsutum	R
	Nuphar lutea	O
Ladies Bathing	*Nuphar lutea*	F
	Iris pseudacorus	F
	Acorus calamus	F
	Mentha aquatica	O
	Phragmites australis	R
	Solanum dulcamara	O
	Epilobium hirsutum	R
	Carex pendula	R
	Juncus inflexus	R
Wood Pond	*Nuphar lutea*	R
	Iris pseudacorus	O
	Mentha aquatica	R
	Carex pendula	O
	Juncus inflexus	R
	Oenanthe crocata	R
	Lemna minor	O
	Juncus effusus	R
	Epilobium hirsutum	R
	Callitriche hamulata	A

	Crassula aquatica	F
	Lythrum salicaria	R
	Cladophora	O
	Rumex sp.	R
	Sparganium erectum	R
	Nymphaea alba	O
	Carex sp.	O
	Nitella sp.	R
Stock Pond	*Acorus calamus*	R
	Potamogeton crispus	O
	Phragmites australis	O
	Iris pseudacorus	O
	Myosotis scorpiodies	R
	Rumex sp.	R
	Mentha aquatica	R
	Epilobium hirsutum	R
	Lycopus europaeus	R
	Green filamentous algae	R
	Solanum dulcamara	R
Bird Sanctuary	*Phragmites australis*	F
	Solanum dulcamara	F
	Lythrum salicaria	R
	Iris pseudacorus	O
	Acorus calamus	O
	Cladophora	A
	Carex pendula	R
	Lycopus europaeus	R
	Mentha aquatica	R
	Nitella flexus	O
Viaduct Pond	*Potamogeton crispus*	O
	Nuphar lutea	O
	Elodea canadensis	A/D
	Green algae	F
	Cladophora	A
	Typha latifolia	O
	Lemna minor	A
	Glyceria maxima	F
	Iris pseudacorus	O
	Solanum dulcamara	O

	Epilobium hirsutum	O
	Carex pendula	R
	Juncus effusus	R
	Rumex sp.	R
	Juncus inflexus	R
	Chara sp.	O/F
	Blue/green algae	F
	Spirodela polyrhiza	F
Hampstead No. 1	Blue/Green algae	A
	Cladophora	A
	Epilobium hirsutum	O
	Ceratophyllum demersum	A
	Filamentous green algae	F
	Rumex. sp.	R
	Lemna minor	O
	Solanum dulcamara	R
	Acorus calamus	O
	Iris pseudacorus	O
	Sparganium erectum	O
	Apium nodiflorum	O
	Unknown exotic *(Iris sp.)*	R
	Fallopia japonica	R
	Nymphaea alba	O
	Carex pendula	O
	Lythrum salicaria	R
	Typha latifolia	O
	Mentha aquatica	O
	Schoenoplectus lacustris	O
	Phragmites australis	O
	Glyceria maxima	O
	Zannichellia palustris	O
Men's Bathing	*Iris pseudacorus*	O
	Mentha aquatica	R
	Oenanthe crocata	R
	Urtica dioica	R
	Green filamentous algae	F
	Potamogeton pusillus	O

	Chara sp.	O
	Lycopus europaeus	R
	Acorus calamus	O
	Zannichellia palustris	O
Model Boating	*Typha latifolia*	O
	Phragmites australis	O
	Iris pseudacorus	R
	Glyceria maxima	R
	Carex sp.	R
	Lycopus europaeus	R
	Juncus effusus	R
	Epilobium hirsutum	O
	Myosotis scorpiodies	R
	Lythrum salicaria	O
	Calthra palustris	R
	Mimulus guttatus	R
	Spirodela polyrhiza	R
	Veronica beccabunga	R
	Mentha aquatica	R
Hampstead No.2	*Ceratophyllum demersum*	A
	Iris pseudacorus	O
	Blue-green algae	F
	Filamentous green algae	F
	Carex pendula	R
	Mentha aquatica	R
	Typha latifolia	R
	Solanum dulcamara	R
	Lemna minor	F
	Myosotis scorpiodies	R
	Carex sp.	R
	Menyanthes trifoliata	R
	Glyceria maxima	O
	Lycopus europaeus	R
	Zannichellia palustris	O
	Elodea canadensis	R
Vale of Health	*Iris pseudacorus*	O
	Epilobium hirsutum	O

	Potamogeton crispus	O
	Cladophora	A
	Ceratophyllum demersum	A
	Chara sp.	F
	Potamogeton pusillus	F
	Carex pendula	O
	Nymphaea alba	O
	Nymphaea sp. (exotic)	O
	Lythrum salicaria	O
	Mentha aquatica	O
	Lemna minor	F
	Glyceria maxima	O
	Juncus effusus	R
	Acorus calamus	O
	Myosotis scorpiodies	R
	Phragmites australis	O
	Exotic introduced (rhubarb)	R
Mixed Bathing	*Solanum dulcamara*	O
	Nuphar lutea	O
	Green filamentous algae	F
	Lycopus europaeus	R
	Epilobium hirsutum	O
	Potamogeton pusillus	O
Highgate No.1	*Iris pseudacorus*	O
	Sparganium erectum	O
	Lemna minor	O
	Acorus calamus	O
	Mentha aquatica	R
	Myosotis scorpiodies	R
	Apium nodiflorum	R
	Ceratophyllum demersum	F
	Elodea nuttallii	O
	Oenanthe crocata	R
	Enteromormpha	R
	Potamogeton	F

	pusillus	
	Lycopus europaeus	R
	Carex pendula	R
	Rumex sp.	R
	Solanum dulcamara	R
	Phragmites australis	O
	Schoenoplectus lacustris	O
	Glyceria maxima	O
	Blue-green algae	O

General photos #1159 – 1160

Diatoms @ TQ 27935 86442

POND NAME	Highgate No 1	DATE	10/07/13	TIME	15:00
pH	9.87	% Grazed (people and dogs)	5%		
Condo	~~———~~	% Overhang shade	10%		
SPC	460.3	Substrate	Gravel 90% Silt 90%		
Temp	24.5	Inflow	No		
O2 %	198.4	% Emergent plant cover	10%		
O2 mg/l	16.64	Other Info	Terrapin ↑ filamentous algae Dense Macro coverage		
Salinity	0.22				
Turbidity	75cm Secchi				

*

	GRID REF	PHOTO	HABITAT DEF
MESO 1	TQ 27960 86474 TQ 27935 86442 TQ 27954 86384	1161 1162 1163	Reeds – 1min
MESO 2	———	—	Gravel – 1min
MESO 3	TQ27960 86382	1164	Submerged macro – 1min
MESO 4			
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

* Probe readings

– reading 101.3 in air

General photos # 1187/1188

Diatoms @ TQ 2781 8560 8 From Acorns

POND NAME	Mens Bathing Pond		DATE	11/7/13	TIME	1100
pH	8.53	% Grazed (people and dogs)	30%			
~~Conde~~	—	% Overhang shade	20%			
SPC	473.2 µS	Substrate	Gravel 40	Sand	Silt	60
Temp	22.0	Inflow	2			
O2 %	108.8	% Emergent plant cover	5%			
O2 mg/l	9.31	Other info	Swimmers out GCG nesting (W) west ff			
Salinity	0.23					
Turbidity	0.6m					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	① TQ 27811 86400 ② TQ 27824 86510	① 1182 ② 1184	Reeds 1min 30sec
MESO 2	TQ 27340 86483	1185	Submerged plants. 40secs.
MESO 3	① TQ 27827 86496 ② TQ 27929 86523	① 183 ② 1186	Trees. 30sec | 30sec
MESO 4			[redacted]
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

POND NAME	Model Boating		DATE	11/7/13	TIME	0830
pH	8.16	% Grazed (people and dogs)		90% (re-inforced bank)		
~~Condo~~		% Overhang shade		1%		
SPC	506.5	Substrate		Gravel 50% silt 50%		
Temp	22°C	Inflow		4		
O2 %	80.4	% Emergent plant cover		5%		
O2 mg/l	7.01	Other info		Fisherman Crayfish		
Salinity	0.24					
Turbidity	0.5m					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	① TQ 27741 86735 ② TQ 27739 86723	① #1175. #1176	Under saloon; 1m (1x30sec)
MESO 2	① TQ 27726 86771 ② TQ 27759 86790	① 1172 ② 1173.	Reed bed. 1min.30 (3x30sec)
MESO 3	TQ 27853 86645	1174	Overhanging veg. (terrestrial) 30secs
MESO 4			
MESO 5	③ TQ 27729 86742	1177	
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms from emergent reeds @ TQ 27765 86787.

Gravel substrate

General photos #1155/1156

POND NAME	BIRD SANCTUARY POND		DATE	10/7/13	TIME	1120
pH	7.89	% Grazed (people and dogs)	0 - fenced off			
~~Conds~~	~~—~~	% Overhang shade	20%			
SPC	565	Substrate	clay / silt			
Temp	22.1 °C	Inflow	No			
O2 %	85.6	% Emergent plant cover	10%			
O2 mg/l	7.44	Other Info	Swans + cygnets. Swan mussels			
Salinity	0.27					
Turbidity	1m Secchi					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	TQ 27666 86872	1154	ACORUS - 30
MESO 2	TQ 27674 86806 TQ 27642 86788	1150 1152	Phragmytes - 1:30min
MESO 3	TQ 27670 86812	1153	Submersed terrestrial trees - 30
MESO 4	TQ 27678 86797	1149	Clay substrate 30 ~~Grass~~
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms from emergent plants - Acorus

POND NAME	Ladies Bathing Pond		DATE	9/7/13	TIME	0730
pH	7.90	% Grazed (people and dogs)		2% (geese)		
~~Cond~~	~~[redacted]~~	% Overhang shade		15%		
SPC	598 uS	Substrate		100% silt (3)		
Temp	20.7	Inflow		0		
O2 %	78.7	% Emergent plant cover		10%		
O2 mg/l	7.05	Other info		Swan numbers present. Alder + Willow		
Salinity	0.29					
Turbidity	1.2m					

(3) TQ 27582 87020.

	GRID REF	PHOTO	HABITAT DEF
MESO 1	(1) TQ 27591 86915 (2) TQ 27598 86918	(1) 1105 (3) 1112 (2) 1106	Lillies (1) 30sec. (3) 25 (2) 30sec
MESO 2	(1) TQ 27598 87030 (2) TQ 27591 86994	(1) 1111 (2) 1113 (3) 1115	Reeds. (1) 30sec (3) 25 (2) 30sec.
MESO 3	1 TQ 27590 86966	1107.	Shading 10sec
MESO 4			
MESO 5	(3) TQ 27634 86935.		
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

General photos # 1131-1132.

POND NAME	STOCK POND		DATE	10/7/13	TIME	0830
pH	7.73	% Grazed (people and dogs)	0%			
~~Cond~~		% Overhang shade	15%			
SPC	553.9	Substrate	100% silt (3)			
Temp	19.7°C	Inflow	0			
O2 %	67.8	% Emergent plant cover	5%			
O2 mg/l	6.19	Other info	Scum on surface. Turbid.			
Salinity	0.27					
Turbidity	0.5m					

	GRID REF	PHOTO	HABITAT DEF (phragmytes australis)
MESO 1	TQ27497 87156	1140	Reedbed - 1 min
MESO 2	TQ 27519 87142	1139	Tree cover - (Salix) - 1min
MESO 3	TQ27513 87136	1142	Potomogeton - 40 sec
MESO 4	TQ27529 87137	1141	Acorus stands 20 sec
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

General photos # 1220 | 1221 | 1222

POND NAME	Hampstead no 1 Pond.	DATE	16/7/13	TIME	0830
pH	9.06	% Grazed (people and dogs)	10%		
~~Cond~~	~~2~~	% Overhang shade	20%		
SPC	526	Substrate	40% gravel 60% silt		
Temp	24.9	Inflow	1		
* O2 %	172.7	% Emergent plant cover	15		
O2 mg/l	14.27	Other info	Blue / Green Algae Coot chicks Grebe chicks		
Salinity	0.25				
Turbidity	1m				

	GRID REF	PHOTO	HABITAT DEF
MESO 1	TQ 27204 85874.	1223	Phragmites 20secs.
MESO 2	① TQ 27242 85929 ② TQ 27310 85870	① 1225 ② 1228	Acorus / Iris ~~1min~~ 40secs
MESO 3	TQ 27312 85895	1227	Lillies / 10secs.
MESO 4	① TQ 27280 85840 ② TQ 27220 85820	1230 1231 1232	Submerged 1min
MESO 5	① TQ 27302 85983 ② TQ 27295 85831	① 1226 ② 1229	Shading 30secs
MESO 6	TQ 27235 85914	1224	Gravel 20secs.
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms from A. col @ TQ 27289 85894.

* Out of water 102.3

Diatoms @ TQ 27225 86072

POND NAME	Hampstead no 2 pond		DATE	12/07/2013	TIME	0830
pH	8.66	% Grazed (people and dogs)		80%		
~~Condo~~		% Overhang shade		10%		
SPC	606	Substrate		40% Gravel 60% Silt		
Temp	20.7	Inflow		NO		
O2 %	92.2	% Emergent plant cover		10%		
O2 mg/l	8.27	Other info		Blue/Green algae present		
Salinity	0.29					
Turbidity	1.3m					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	(1) TQ 27316 86091	(1) 1193	Reeds 1min
	(2) TQ 27198 86092	(2) 1198	
MESO 2	(1) TQ 27225 86072	1197	Gravel. 1min
MESO 3	(1) TQ 27323 86070	(1) 1195	Under trees. 1min
	(2) TQ 27208 86066	(2) 1196	
MESO 4			
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

General. #1263 | 1264.

POND NAME	Mixed	Bathgyny Pond	DATE	17/7/13	TIME	0700
pH	7.64	% Grazed (people and dogs)		30%		
~~Condo~~		% Overhang shade		40%		
SPC	659	Substrate		20% gravel 80 silt		
Temp	22.9	Inflow		0		
O2 %	35.4	% Emergent plant cover		1%		
O2 mg/l	3.04	Other info		Lots of swimmers		
Salinity	0.33					
Turbidity	0.7m					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	TQ 27202 86161	1256	Gravel 30secs
MESO 2 (1)	TQ 27200 86173	(1) 1257	Tree lined shading 2min 30sec.
(2)	TQ 27203 86206	(2) 1259	
MESO 3 (3)	TQ 27199 86256	(3) 1260	
(4)	TQ 27234 86193	(4) 1261	
MESO 4 (5)	TQ 27228 86217	(5) 1262	
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms taken from Lillies

General # 1233 - 1235

POND NAME	Viaduct		DATE	16/7/13	TIME	1130
pH	7.77	% Grazed (people and dogs)		10%		
Condo	———	% Overhang shade		10%		
SPC	583	Substrate		100%		
Temp	22.4	Inflow		0		
O2 %	107.2	% Emergent plant cover		15%		
O2 mg/l	9.05	Other info		Dragonflies/ Damselflies Tench in invert sample #1246/1247		
Salinity	0.28					
Turbidity	0.7					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	① TQ 26943 86529 ② TQ 26936 86504	① 1240 ② 1245.	[redacted] Grazed 1min (Glyceria)
MESO 2	TQ 26928 86466	1243	Lillies 10secs.
MESO 3	TQ 26941 86461	1244	Open bank 20 secs.
MESO 4	TQ 26937 86501	1252.	Shade 30 secs.
MESO 5	TQ 26933 86554	1250	Typha. 20 secs
MESO 6	TQ 26928 86465.	1253	Submerged. 40 secs.
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms @ ~~TQ 26928 86505~~
(Glyceria)

POND NAME	Vale of Health		DATE	15/7/13	TIME	1315.
pH	7.95	% Grazed (people and dogs)		20%.		
~~Condo~~		% Overhang shade		25%		
SPC	588	Substrate		40% gravel 60% silt/sand.		
Temp	25.1	Inflow		0		
O2 %	107.2	% Emergent plant cover		2%.		
O2 mg/l	8.87	Other Info		Carp.		
Salinity	0.28					
Turbidity	2m Secchi					

	GRID REF	PHOTO	HABITAT DEF
MESO 1	TQ 26582 86450.	1203	Lillies 40sec.
MESO 2	① TQ 26634 86444. ② TQ 26622 86377	① 1200 ③ 1204	Reeds. 1min (2x30)
MESO 3	TQ 26603 86478.	1201	Open gravel. 30sec
MESO 4	TQ 26662 86374.	1205.	Dog swimming area. 30sec.
MESO 5	TQ 26606 86444	1202	Gabions 20sec (island - floating)
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

General photos # 1125 - 1127.

POND NAME	WOOD POND	DATE	9/07/13	TIME	10:00
pH	7.52	% Grazed (people and dogs)	0%		
~~Condo~~		% Overhang shade	20%		
SPC	495.1	Substrate	10% Gravel 90% Sand/Silt		
Temp	21.4	Inflow	4 Pipes - ferrus deposits		
O2 %	96.7	% Emergent plant cover	10%		
O2 mg/l	8.56	Other info	Tufted Ducks Silver Birch / Rhododendron Holly Alder		
Salinity	0.24				
Turbidity	1.2m				

Stickleback in invert sample-

	GRID REF	PHOTO	HABITAT DEF
MESO 1	TQ 29126 87244	1120	Gravel shallows - 20 sec
MESO 2	(1) TQ 29164 87249 (2) TQ 29113 87200	1119 1122	Reeds - 40 sec
MESO 3	TQ 29097 87177	1124	Emergent Herbs - 20 sec
MESO 4	TQ 29155 87242	1118	Lilly - 40 sec
MESO 5	(1) TQ 29125 87217 (3) TQ 29175 87162	1121 1123	Floating - 1 min
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms taken from emergent reeds - Nitzschia

General photos #1128 - 1130

POND NAME	Thousand Pound	DATE	08/07/13	TIME	14:00
pH	7.85	% Grazed (people and dogs)	30%		
Condo	~~~~	% Overhang shade	20%		
SPC	463.6 us	Substrate	10% cobble / 10% Gravel 80% Sand/silt		
Temp	21.6	Inflow	1 (Pipe - not flowing		
O2 %	102.8	% Emergent plant cover	2%		
O2 mg/l	9.16	Other info	Rudd & carp observed Alder & Rhododendron Hwed banks		
Salinity	0.22				
Turbidity	1.0m				

	GRID REF	PHOTO	HABITAT DEF
MESO 1		#1088	Gabions with emergent veg - 1min
MESO 2		#1090	overhanging trees 1min 30sec
MESO 3		#1091	lilys - 20 sec
MESO 4		#1089	Under Bridge - 10 sec
MESO 5			
MESO 6			
MESO 7			
MESO 8			
MESO 9			
MESO 10			
MESO 11			
MESO 12			
MESO 13			
MESO 14			
MESO 15			

Diatoms - taken from cobbles
(2 covered in algae)

APPENDIX II – PSYM OUTPUT

See accompanying pdf attachment ‘Appendix II – PSYM output’.

Pond PSYM Datasheet

Site details													
Site name	**Stock Pond**	**Thousand Pound**	**Vale of Health**	**Viaduct**	**Wood Pond**	**Bird Sanctuary Pond**	**Hampstead No. 1**	**Highgate No.1**	**Ladies' Bathing Pond**	**Men's Bathing Pond**	**Mixed Bathing Pond**	**Model Boating**	**Hampstead No.2**
Plant metrics													
No. of submerged + marginal plant species (not including floating leaved)	9	4	14	11	12	9	16	16	8	8	4	14	13
Number of uncommon plant species	0	1	4	3	3	1	4	3	1	3	2	1	2
Trophic Ranking Score (TRS)	8.72	8.266666667	8.56	8.825	7.57	7.83	8.75	8.983333333	8.275	8.4	9.166666667	8.442857143	8.64
Invertebrates metrics													
ASPT	4.235294118	5.166666667	3.4	4.176470588	4.5	5	4.6875	3.894736842	4.409090909	4.684210526	3.666666667	4	3.9411765
Odonata + Megaloptera (OM) families	2	1	0	2	2	1	1	2	2	1	0	0	1
Coleoptera families	0	1	0	1	4	0	0	0	2	0	0	0	0
Environmental variables													
Altitude (m)	84	90	106	89	93	76	69	65	79	69	77	73	72
Easting	5276	5272	5266	5269	5271	5276	5272	5279	5275	5278	5272	5277	5273
Northing	1868	1871	1864	1865	1872	1868	1858	1864	1869	1865	1861	1867	1860
Shade (%)	20	20	25	10	20	20	20	10	15	20	40	1	10
Inflow (0/1)	0	1	0	0	1	0	1	0	0	1	0	1	0
Grazing (%)	0	30	20	10	0	0	10	5	2	30	30	90	80
pH	7.89	7.85	7.93	7.77	7.52	7.89	9.06	9.87	7.9	8.53	7.64	8.16	8.66
Emergent plant cover (%)	10	2	2	15	10	10	15	10	10	5	1	5	10
Base clay (1-3)	3	2	2	3	3	3	2	3	3	2	3	2	2
Base sand, gravel, pebbles (1-3)	1	2	2	1	1	1	2	1	1	2	1	2	2
Base peat (1-3)	1	1	1	1	1	1	1	1	1	1	1	1	1
Base rock (1-3)	1	1	1	1	1	1	1	1	1	1	1	1	1
Area (m^2)	4385	4071	8584	2456	7978	7554	15048	13634	6904	18342	6909	16184	10877

Results

Submerged + marginal plant species (SM)													
Predicted (SM)	28.0	27.1	31.1	24.8	31.7	31.1	33.6	32.8	30.3	35.1	31.6	33.7	31.5
Actual (SM)	9	4	14	11	12	9	16	16	8	8	4	14	13
Environmental Quality Index (EQI) (SM)	0.32	0.15	0.45	0.44	0.38	0.29	0.48	0.49	0.26	0.23	0.13	0.41	0.41
Index of Biological Integrity (IBI) (SM)	1	0	1	1	1	1	1	1	1	0	0	1	1
Uncommon plant species (U)													
Predicted (U)	4.7	4.5	5.3	4.1	5.4	5.2	5.6	5.2	5.1	5.8	5.5	5.4	5.1
Actual (U)	0	1	4	3	3	1	4	3	1	3	2	1	2
EQI (U)	0.00	0.22	0.76	0.73	0.56	0.19	0.72	0.57	0.20	0.51	0.36	0.18	0.39
IBI (U)	0	0	3	2	2	0	2	2	0	2	1	0	1
Trophic Ranking Score (TRS)													
Predicted (TRS)	8.77	8.71	8.71	8.77	8.77	8.77	8.75	8.81	8.77	8.73	8.77	8.75	8.75
Actual (TRS)	8.72	8.27	8.56	8.83	7.57	7.83	8.75	8.98	8.28	8.40	9.17	8.44	8.64
EQI (TRS)	0.99	0.95	0.98	1.01	0.86	0.89	1.00	1.02	0.94	0.96	1.04	0.96	0.99
IBI (TRS)	3	2	3	3	1	1	3	3	2	3	3	3	3
ASPT													
Predicted (ASPT)	5.08	5.15	5.06	5.05	5.18	5.10	5.18	5.13	5.09	5.18	5.09	5.16	5.05
Actual (ASPT)	4.24	5.17	3.40	4.18	4.5	5	4.69	3.89	4.41	4.68	3.67	4.00	3.94
EQI (ASPT)	0.83	1.00	0.67	0.83	0.87	0.98	0.90	0.76	0.87	0.90	0.72	0.78	0.78
IBI (ASPT)	2	3	1	2	3	3	3	2	3	3	2	2	2
Odonata + Megaloptera (OM) families													
Predicted (OM)	3.03	3.21	2.95	2.96	3.28	3.06	3.29	3.13	3.04	3.28	3.11	3.22	2.94
Actual (OM)	2	1	0	2	2	1	1	2	2	1	0	0	1
EQI (OM)	0.66	0.31	0.00	0.68	0.61	0.33	0.30	0.64	0.66	0.30	0.00	0.00	0.34
IBI (OM)	2	1	0	2	2	1	1	2	2	1	0	0	1
Coleoptera families (CO)													
Predicted (CO)	3.74	3.81	3.72	3.71	3.83	3.75	3.84	3.78	3.75	3.83	3.75	3.81	3.71
Actual (CO)	0	1	0	1	4	0	0	0	2	0	0	0	0
EQI (CO)	0.00	0.26	0.00	0.27	1.04	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00
IBI (CO)	0	1	0	1	3	0	0	0	2	0	0	0	0
Sum of Individual Metrics	**8**	**7**	**8**	**11**	**12**	**6**	**10**	**10**	**10**	**9**	**6**	**6**	**8**
Index of Biotic Integrity (%)	**44%**	**39%**	**44%**	**61%**	**67%**	**33%**	**56%**	**56%**	**56%**	**50%**	**33%**	**33%**	**44%**
PSYM quality category (IBI >75%=Good, 51-75%= Moderate, 25-50%=Poor, <25%=V Poor)	**Poor**	**Poor**	**Poor**	**Moderate**	**Moderate**	**Poor**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Poor**	**Poor**	**Poor**
Is this a Priority Pond? (Good quality category)	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**

APPENDIX III – MACROINVERTBRATE SPECIES DATA

See accompanying Excel spread sheet ‘Appendix III - Macroinvertebrate data’.

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APEM Ltd is accredited by UKAS to ISO 17025 for the analysis of:
Marine and freshwater phytoplankton,
Marine and freshwater diatoms,
Marine and freshwater macroinvertebrates

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Stockport.	Dorset.	Midlothian.	Llantrisant.
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Freshwater Macroinvertebrate Analysis Report

The analysis on adjacent tab(s) of this workbook has been carried out by APEM Ltd under UKAS accredited method FINV-01

Client Name:	APEM Internal Project	
Address:	APEM Internal Project	
Phone Number:	APEM Internal Project	
P.O. Number:	APEM Internal Project	
Issued by:	Susan A. Watson	Laboratory Manager
Issue Date:	12/08/2013	

If you have any comments or complaints regarding this or any other piece of work conducted by APEM Ltd, please contact M. Heaney (Quality Manager) m.heaney@apemltd.co.uk

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				Sample Number	7675	7676	7677	7678	7679	7680	7681	7693	7694	7695	7696	7697	7698
				Watercourse													
				Site Description	Men's Bathing Pond	Ladies Bathing Pond	Hampstead No2 Pond	Model Boating Pond	Wood Pond	Highgate No1 Pond	Thousand Pound Pond	Hampstead No. 1 Pond	Bird Sanctuary Pond	Stock Pond	Mixed Bathing Pond	Viaduct Pond	Vale of Health
				Sample Date	11/07/2013	09/07/2013	12/07/2013	11/07/2013	09/07/2013	10/07/2013	08/07/2013	16/07/2013	10/07/2013	10/07/2013	17/07/2013	16/07/2013	15/07/2013
Code	BMWP	LIFE	CS	Taxa ID	7675	7676	7677	7678	7679	7680	7681	7693	7694	7695	7696	7697	7698
03110100				Hydra sp.										1			
04000000				Microturbellaria									1				
5000000				Tricladida			2							1		1	11
5110201	5	2	3	Polycelis felina												1	
5120101	5	4	2	Dugesia lugubris												2	
10220000	5			Dugesia lugubris/polychroa			3					1	1	5	4		37
10220100	5	3	3	Dugesia tigrina			1	1	2	4						3	3
10230101	5	4	2	Dendrocoelum lacteum	1							3	2				1
10420000				Nematoda		1								1			
14120200				Plumatella sp.										1			
16000000				Gastropoda						13		1				1	
16130100	3			Valvata sp.						156							
16130111	3	4	2	Valvata cristata													1
16130131	3	4	1	Valvata piscinalis		3	41			30					1		31
16140301	3	3	1	Potamopyrgus antipodarum	77	4	4	35	2			34		1	12		2
16160100	3			Bithynia sp.		11	5			37	8			6	1		
16160111	3	4	1	Bithynia tentaculata	3		70			126	3		4	5	19		50
16160121	3	4	5	Bithynia leachii											96	11	
16210000	3			Physidae	6		1	1	1	16							
16210202	3	3	1	Physa fontinalis						28					2		
16210Z00	3			Physella acuta group	4		6	1	1			126	5		1		
16220000	3			Lymnaeidae	8				1								
16220105	3	4	1	Lymnaea stagnalis						11						1	
16220401	3	6	2	Stagnicola palustris		1											
16220601	3	4	2	Radix auricularia						2							1
16220602	3	4	1	Radix balthica						55					2		
16230100	3			Planorbis sp.			10										
16230111	3	4	1	Planorbis carinatus						4							
16230112	3	4	1	Planorbis planorbis			26										
16230221	3	4	1	Anisus vortex		1											1
16230412	3	4	1	Gyraulus albus			9		28	10	14	33		2		7	15
16230421	3	5	6	Gyraulus laevis													2
16230431	3	4	2	Gyraulus crista									3				
16230601	**3**	**5**	**3**	**Hippeutis complanatus**	5	2	31		4	3	9	1	4	20	10	20	6
16230801	3	4	4	Planorbarius corneus						8							
16241211				Ferrisia clessiniana		6		2							1	2	
16250101	6	4	2	Acroloxus lacustris	1						4			1			
162Y0000	6			Ancylus group (incl. Ancylus, Ferissia & Acroloxus)												1	
16320000				Succineidae		5			1		1	1	3				
17130000	3			Sphaeriidae		5	4		6	22		4	7	47	17		
17130100	3			Sphaerium sp.		2	11		3	21		1			34		
17130200	3			Pisidium sp.	7	13	2	4	90	69		45	14		112		11
17130301	3	5	3	Musculium lacustre	3	1	15		4	9				11	17		
20000000	1			Oligochaeta	65	77	126	44	14	285	4	4	14	115	443	20	1987
22110101	4	2	2	Piscicola geometra			2										2
22120000	3			Glossiphoniidae					2	3	1						
22120201	3	4	2	Theromyzon tessulatum			2			4				3			1
22120301	3	4	4	Hemiclepsis marginata											3		1
22120401	3	4	1	Glossiphonia complanata									1				
22120403	3	4	7	Glossiphonia verrucata												1	
22120404	3	4	7	Glossiphonia paludosa						5				3	5	10	14
22120701	3	4	1	Helobdella stagnalis	3	40	46			144	11		42	201	29	11	34
22120801	3	4	4	Alboglossiphonia heteroclita	2	6	3		1								2
22310000	3			Erpobdellidae		5	7		4	24				5		1	2
22310100	3			Erpobdella sp.									1				3
22310101	3	4	1	Erpobdella octoculata					3	1			1		1	1	
22310102	3	5	5	Erpobdella testacea			1										
24000000				Hydracarina	12	20	7			5		13	1	13	28	125	29
25000000				Oribatei							1						
29000000				Cladocera	173	994	4			26	14			16	85		379
30000000				Ostracoda	2	20	150					3	48	3	101		2
31000000				Copepoda									1				1
32010100				Argulus sp.									3				
32010102				Argulus foliaceus	22	4			2		15			2			
36110000	3			Asellidae		4	3				1						
36110101	3	4	1	Asellus aquaticus	75	271	240	7	6	46	26	58	354	343	420	24	51
36110202	3	4	3	Proasellus meridianus								2	2				
37130101	6	4	1	Crangonyx pseudogracilis	12	29	92	9		10	3	46	28	3	29	1	14
37140206	6	2	1	Gammarus pulex		6								6			
40120000	4			Baetidae		1								1	11	33	1
40120301	4	4	1	Cloeon dipterum	32	42	2		11	7	1	83	27	17	50	23	22
40510201	7	4	1	Caenis horaria	2	1			4		10						
4051020Z	7			Caenis luctuosa/macrura				1									
42120000	6			Coenagrionidae			1		3			1				1	
42120201	6	4	1	Ischnura elegans		6			7		1			4			
42120301	6	4	2	Enallagma cyathigerum	2	2			3	1	2						
42120405.1	6			Coenagrion puella / pulchellum					4								
42230203	8	5	2	Aeshna grandis												1	
42230301	8	5	5	Anax imperator						1							
43220100				Velia sp.							3						2
43410101	5	4	4	Ilyocoris cimicoides					48		1						
43420101	10	2	5	Aphelocheirus aestivalis								1					
43510100	5			Notonecta sp.		3	1		2	6			4	3		5	
43510102	5	4	5	Notonecta maculata												3	
43520101	5	4	4	Plea minutissima						5			1				
43610000	5			Corixidae						1			1	5		11	
43610100	5			Micronecta sp.	13												
43610111	5	4	6	Micronecta scholtzi							2						
43610911	5	4	1	Sigara dorsalis	20				13							4	
43610911.2	5	4		Sigara dorsalis/striata	27	3			27	3	23	1				11	
43610921	5	4	3	Sigara distincta							1						
43610922	5	4	1	Sigara falleni	3					2				1			
43610921.23	5			Sigara distincta gp (incl.falleni&fallenoidea)		7					40		5	3		2	
43610924.43610925	5			Sigara fossarum/scotti										1			
45000000				Coleoptera						1							
45110300	5			Haliplus sp.					1							1	
45110300Z	5			Haliplus ruficollis group					2								
45140000	5			Dytiscidae					1								
45140300	5			Hyphydrus sp.							1						
45140301	5	4	2	Hyphydrus ovatus					1								
45141300	5			Nebrioporus sp.							2						
45330152	5	4	1	Helophorus brevipalpis		1											
45330167	5			Helophorus longitarsis/greiseus/minutus					1								
45620200	5			Dryops sp.		1											
45630604	5	4	2	Oulimnius tuberculatus					1								
46110102	4	4	1	Sialis lutaria		2			4				2	4			
48000000				Trichoptera									4				
48130101	6	4	1	Agraylea multipunctata	2							2	27				
48130300	6			Hydroptila sp.		1											
48220100	8			Lype sp.									1				
48240000	7			Polycentropodidae									8				
48240103	7	4	3	Cyrnus trimaculatus				2			5						
48240402	7	2	2	Plectrocnemia conspersa									20				
48310500	10			Phryganea sp.					1								
48310501	10	4	2	Phryganea bipunctata							5		2	1			
48341401	7	4	2	Anabolia nervosa		2					1						
48341703	7	5	5	Limnephilus binotatus									1				
48390101	10	4	2	Molanna angustata	8								3				
483A0104	10	2	1	Athripsodes cinereus	1				1								
483A0400	10			Mystacides sp.			2										
483A0401	10	4	2	Mystacides azurea	1												
483A0402	10	4	1	Mystacides longicornis		1			2			2	1		1		
483A0403	10	4	6	Mystacides nigra	1												
483A0902	10	4	3	Oecetis lacustris							2						
483A0904	10	4	2	Oecetis ochracea	2												
49110000				Pyralidae								1					
50000000				Diptera						3		1	1			3	
50320100				Chaoborus sp.								2			3	5	9
50320112				Chaoborus flavicans						6				2			
50350000				Ceratopogonidae	1	4	12		4	4		29				5	1
50400000	2			Chironomidae	250	415	280	59	213	159	130	77	438	306	187	371	188
50710000.2				Hemerodrominae												1	