

*Lowestoft Ponds Aquatic  
Macroinvertebrate Diversity and  
Bathymetry Report 2021*

Carried out for:

**Lowestoft Town Council**

**Prepared by:**

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Issue/revision	1
Remarks	
Prepared by	AJK
Date	January 2021
Checked by	TRA
Authorised	TRA

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## **2 Methods**

Macroinvertebrate sampling points were distributed across aquatic habitats within the ponds to be affected by works (Figure 2). An existing standard protocol for assessing watercourses (Drake et al. 2013) was followed throughout the survey. All staff at Abrehart Ecology Ltd. are familiar with using this protocol. Data and sample collection were undertaken by a pair of surveyors, including an experienced on-site surveyor (Toby Abrehart) and a second team member responsible for recording pond features and assisting with sample collection. Sampling was undertaken in November 2020.

### **2.1 Aquatic invertebrate sampling**

Samples were collected using ten-second sweeps of a net with 0.5mm mesh. Sweeps were repeated three times in different sections of the pond profile, i.e., floating vegetation (where present), the benthic layer and the submerged edge of the nearside bank. Once collected each sample was placed into a 5-litre bucket and preserved in 99% ethanol for long-term storage.

For identification, all invertebrates were separated from the retained sediment, detritus and vegetation under 40 - 80x stereo, binocular microscopes. All specimens were then separated into major taxonomic groups, preserved in fresh 99% ethanol, and referred to an appropriate taxonomist for identification. Where possible, all specimens were identified to species level. Exceptions to this are groups that require specialist, time-consuming preparatory techniques such as head capsule dissection for chironomid larvae and prolonged clearing procedures for oligochaetes species. Such procedures are beyond the remit of this study.

### **2.2 Bathymetry**

Water and silt depths were recorded within all waterbodies. This included transects across the ponds, varying in length and density depending on the habitats present and accessibility. Transects were walked where possible (Gainsborough Drive, Kensington Gardens, and Uplands Road North) and completed using a boat where necessary (Kirkley Fen Park). Data were recorded at regular intervals along the transect and has been mapped using ArcGIS to provide topographical information of the pond bases.

### **2.3 SAFIS analysis**

Data collected during the surveys were processed using SAFIS analysis (Site Analysis for Freshwater Invertebrate Surveys v.30.0). This was used to give an indication of the current conservation value of ditches around Lowestoft, to assess water quality, and to highlight any species of conservation interest already present.

### **2.4 Limitations**

Species within the orders Hirundinea (leeches) and Tricladida (flatworms) can be affected by preservation in ethanol (damage to eyes and genital pores – often key features of identification). During future monitoring surveys, samples should be preserved using preservatives such as Bonuin's or Fleming's fixative, as recommended by Elliott & Mann (1998) among others.

### 3 Results

2020 baseline surveys identified at least 34 taxa of aquatic invertebrate, with 21 identified to species. Overall richness varied greatly across the sample sites and ranged from only six taxa within a waterbody (Kirkley Fen Park) to 20 taxa within a waterbody (Gainsborough Drive). A full species/taxonomy list has been provided in Appendix B.

Two 'Local' species were recorded during surveys (see Table 1 below). Only a single specimen of each species was recorded, and no species of conservation concern were identified (such as RDB listed or NERC S41 Species of Principal Importance).

Two invasive species, the amphipod *Crangonyx pseudogracilis* and the gastropod *Physella acuta* were recorded within samples. Often these species comprised a significant proportion of the total species count, in particular within the Gainsborough Drive samples – where 462 *Physella acuta* and 65 *Crangonyx pseudogracilis* were recorded (total specimen count of 1627; *Cladocera* sp. were also dominant within the sample (607)).

Table 1. Species of interest found during 2020 surveys.

Local
<i>Plea minutissima</i>
<i>Sigara stagnalis</i>

The ponds were also found to have significant silt deposits and often significant build up of leaf litter. The pond at Uplands Road North also contained high levels of litter and household/construction waste.

#### 3.1.1 Sample Site 1 – Gainsborough Drive

These samples were taken from a pond off Gainborough Drive, within a modern housing development. The pond was located within an area of managed grassland and surrounded by native and non-native trees – including *Fraxinus excelsior*, *Betula pendula*, and *Alnus incana*. The waterbody had a width of 2-3m, the maximum depth recorded was 136cm (water depth 46cm and silt depth of 90cm). Vegetation had receded from the water surface (only *Lemna minor* remained); however marginal/emergent vegetation included *Juncus inflexus*, *Epilobium hirsutum*, *Mentha aquatica*, *Callitriche* sp., *Carex pendula*, *Juncus effusus*, *Ranunculus sceleratus*, *Nasturtium officinale*, *Cardamine flexuosa*, *Sparganium erectum*, and *Juncus bufonius*.

Anecdotal evidence provided by local residents indicated that the pond regularly dries, it does not support fish, but fowl numbers are high and often fed by residents – likely the source of non-native and non-typical plants recorded at the pond margins. In addition, a large willow had been removed, possibly using poison.

At least 20 taxa of aquatic invertebrates were present within the sample; of which 12 were identified to species. Gastropoda and Amphipoda were the most frequent order of aquatic invertebrates recorded within the sample (numbers were dominated by *Physella acuta* (non-native), *Cladocera* group sp., *Asellus aquaticus*, and *Crangonyx pseudogracilis* (non-native)); with the orders, Diptera, Hemiptera, Hirudinea, Tricladida, Ephemeroptera, and Coleoptera also represented.

No rare or uncommon species were recorded within this pond.

#### 3.1.2 Sample Site 2 – Kensington Gardens

Samples were taken from the kidney-shaped ornamental pond within the gardens. The pond was shaded by trees, surrounded by ornamental shrub beds, and had numerous pathways leading around and over it

(footbridge). Vegetation within the pond was very limited and restricted to stands of *Phragmites australis*. Along with ornamental species, the banks/immediate surrounding habitats supported *Carex riparia*, *Epilobium hirsutum*, *Juncus inflexus*, *Rubus fruticosus* agg., *Symphoricarpos* sp., *Solanum dulcamara*, *Scrophularia auriculata*, *Galium aparine*, *Filipendula ulmaria*, and *Ulex europaeus*. The base of the pond was rubble and concrete covered by a layer of silt and leaf litter from overhanging willow trees, and there was a single inflow from a water feature.

Species richness similar to Sample Site 1, with at least 16 taxa recorded; 13 of which were identified to species. Again, the sample was dominated by a few taxa (*Asellus aquaticus*, *Helobdella stagnalis*, *Chironomidae* sp., and *Cloeon dipterum*) – with 393 of the 420 specimens comprising these species. The most varied Order within the sample was Hemiptera, with five species identified. Additional Orders represented were Coleoptera, Hirudinea, and Gastropoda.

Although the same non-native species were recorded (*Crangonyx pseudogracilis* and *Physella acuta*), these were in much lower numbers and did not dominate the sample. In addition, a single 'Local' species was identified, *Sigara stagnalis*.

### **3.1.3 Sample Site 3 – Kirkley Fen Park**

Within Kirkley Fen Park, this pond varied greatly in depth and, in places, was over 2m deep (at the north-eastern end of the pond). Throughout the pond was abundant litter and fallen branches. The surface was largely covered by a thick 'crust' of *Lemna minuta*, shading the water column below. The only other aquatic species (non-emergent) recorded within the pond was *Ceratophyllum demersum*. Additional species recorded within/adjacent to the pond (not bankside as banks were vertical concrete structures) were *Phragmites australis*, *Urtica dioica*, *Lycopus europaeus*, *Epilobium hirsutum*, *Pulicaria dysenterica*, and *Cladium mariscus*. There were two islands within the pond, both heavily vegetated with mature scrub and trees – *Rubus fruticosus* agg., *Betula pendula*, *Salix* sp., *Alnus glutinosa*, *Populus* sp., *Acer pseudoplatanus*, and stands of bamboo. Surrounding and crossing the pond were several public footpaths and the pond was near to a stream and an Anglian Water treatment centre. Anecdotal evidence suggested that the treatment centre occasionally overflowed into the pond.

This was the most depauperate of the samples; only six taxa were found, of which four were identified to species. These represented five different Orders (Amphipoda, Tricladida, Gastropoda, Hemiptera, and Diptera).

Despite being the least diverse sample site, it contained one 'Local' species (*Plea minutissima*) and two non-native species (*Crangonyx pseudogracilis* and *Physella acuta*). The most numerous species within the sample was *Asellus aquaticus*, which comprised 22 of the 33 specimens.

### **3.1.4 Sample Site 4 – Uplands Road North**

Sample site 4 was also within a modern housing development. It was surrounded by residential properties, dense scrub, and Uplands Road North. Due to the dense vegetation and discarded waste, only a small portion of the bank could be safely accessed for the survey. Where accessed, it was noted that the bank was constructed of recycled tyres and the litter/waste was also present within the waterbody – possibly affecting bathymetry readings and creating obstacles along transect lines. Scrub surrounding the pond was dominated by *Rubus fruticosus* agg., with occasional *Crataegus monogyna*, *Acer pseudoplatanus* and *Prunus spinosa*. Emergents were limited to *Iris pseudacorus* and the introduced *Equisetum hyemale*.

As with previous samples, the large specimen count was dominated by a low number of taxa. Within this sample these were *Cladocera* sp. (approximately 1000 animals recorded), *Asellus aquaticus*, *Chironomidae* sp., *Physella acuta*, and *Cloeon dipterum*. In addition to these taxa, this was the only sample site to contain species

of Trichoptera – *Limnephilus marmoratus* and an unidentified *Limnephilus* sp. larva, and the only location to support the molluscs *Gyraulus crista* and *Stagnicola palustris*.

There were no rare or uncommon species recorded within this pond.

### **3.2 SAFIS analysis**

Full results from SAFIS are presented in Appendix D.

Water quality across the site was classed as “Moderate” or “Poor” (Appendix C); the sample points with “Poor” water quality coinciding with lowest taxa richness and abundance.

According to the CCI value produced by SAFIS, the conservation value of the site ranged from “Low” to “Fairly high”. This assessment considers both the overall taxa richness at a sample site, and the presence of conservation priority species (for example rare species or species with limited distributions). Although the sample from Kirkley Fen Park had poor water quality and taxa richness, one of the six species recorded was of Local importance – *Plea minutissima*.

The LIFE and PSI scores indicate the flow and sedimentation of the sample sites, determined using the species present and their overall abundance. This analysis tool was not used for this study as the samples were taken from still water (i.e., ponds) and so was not appropriate.

## 4 Discussion and Mitigation

The surveys detailed in this report assessed the diversity and conservation value of aquatic invertebrate communities at four ponds across Lowestoft and are used to provide baseline data for future monitoring post mitigation. This mitigation will be informed by the bathymetry data also included within the report.

The surveys identified a limited taxa/species diversity that contained very few species of interest. Often, the samples were dominated by a few species, including non-native amphipods and molluscs. In total; at least 34 taxa of aquatic invertebrate, with 21 identified to species; however, one site (Kirkley Fen Park) was depauperate and supported only six taxa of aquatic invertebrate.

It is considered that the following recommendations would help create improved habitat for aquatic invertebrate diversity and encourage species of conservation interest to utilise them:

- Reduction of silt/sediment and leaf litter on the base of the ponds. At present the ponds contain large quantities of silt and detritus that can create anoxic environments. Approximate quantities of silt within the ponds are shown on the maps within Appendix D.
- Reduction of shade surrounding the ponds. This could include selective removal of overhanging trees and dense scrub growth, to allow more light into the pond (valuable for aquatic macrophytes) and reduce total leaf litter accumulation in the pond.
- Reprofilng of banks and shore habitats where possible. The creation of stepped or gently sloped shelves would provide habitat for a greater diversity of aquatic plant and could provide habitat for aquatic invertebrates.
- Planting of aquatic plants – marginal, submersed, and emergent. A planting plan/species list can be provided by Abrehart Ecology.
- The poor quality of Kirkley Fen Pond should be addressed. The creation of a drainage system around the Anglian Water site could prevent damaging overflow into the pond, as such events could cause eutrophication. In addition to this, reconnecting the pond with the adjacent stream or external water sources would help oxygenate the water and prevent stagnation.

Several invertebrates recorded in samples were not identified to species level, due to these groups requiring either specific preservation techniques or identification skills which are beyond the remit of this study. Consequently, disparity exists between the SAFIS species richness results and taxon richness actually recorded. This is caused by the spreadsheet used for the analysis (which requires a certain level of identification) and has been taken into account in this assessment. Species of the order Tricladida (flatworms) noted at Gainsborough Drive and Kirkley Fen Park were affected by preservation in ethanol (resulting in damage to eyes and genital pores – often key features of identification).

Care should be taken to avoid hazardous materials from construction works entering the watercourses, to prevent long-term significant pollution impact to these habitats, and spill kits should be kept with each vehicle. Should hazardous materials enter the watercourses, then the area should be re-surveyed to assess the impact to invertebrate fauna.

## 5 References

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## Appendix A – Site photos



Sample Point 1



Sample Point 2



Sample Point 3



Sample Point 4

## Appendix B – Full Species Lists

BMWP group	Family	Species	Kirkley Fen Park	Kensington Gardens	Gainsborough Drive	Uplands Road North
Flatworms						
Tricladida						
	Planariidae					
		Tricladida indet.	2		4	
Snails						
Gastropoda						
	Acroloxidae					
		Acroloxus lacustris		2		
	Physidae					
		Physella acuta	2	1	462	37
	Lymnaeidae					
		Galba truncatula			1	
		Stagnicola palustris				1
	Planorbidae					
		Gyraulus crista				11
	Valvatidae					
		Valvata cristata		4		
Worms						
Oligochaetidae						
	Lubricidae					
		Lubricidae sp.			4	
	Oligochaetidae					
		Oligochaetidae sp.			7	
Leeches						
Hirudinea	Erpobdellidae					
		Erpobdella octoculata		1	1	
		Erpobdella sp.		2		
	Glossiphoniidae					
		Helobdella stagnalis		24	2	
		Theromyzon tessulatum			1	
	Piscicolidae					
		Piscicola geometra				
Crustaceans						
Amphipoda						
	Asellidae					
		Asellus aquaticus	22	77	46	67
	Crangonyctidae					
		Crangonyx pseudogracilis	1	4	65	2
	Podonidae					
		Cladocera group			607	1000
True bugs						
Hemiptera						

	Aphidoidea					
		Aphid sp.				4
	Corixidae					
		Corixa punctata		4	1	
		Hesperocorixa sahlbergi		4		2
		Sigara dorsalis/striata		1		
		Sigara stagnalis		1		
	Notonectidae					
		Notonecta glauca		2	1	3
	Pleidae					
		Plea minutissima	1			
True flies						
Diptera						
	Chaboridae					
		Chaboridae sp.	5			
	Chironomidae					
		Chironomidae sp. (larvae)		213	38	157
	Diptera					
		Diptera sp. (larvae)			5	
Beetles						
Coleoptera						
	Coleoptera					
		Coleoptera sp. (larvae)		1		
	Dytiscidae					
		Hydroporus dorsalis			1	
		Hydroporus palustris			1	
		Hygrotus sp. (larvae)			17	
Caddisflies						
Trichoptera						
	Limnephilidae					
		Limnephilus marmoratus				1
		Unidentified (instar III) larva				1
Mayflies						
Ephemeroptera						
	Baetidae					
		Cloeon dipterum		79	2	87

## Appendix C – Full SAFIS Results

Sample ID	Taxa	Specimen Count	Revised BMWP	ASPT	Families Contributing to BMWP	Water Quality	LQI	CCI	Conservation Value
Gainsborough Drive	20	1267	42.1	3.51	12	Moderate	E	4.91	Low
Kensington Gardens	16	420	39.2	3.56	11	Moderate	E	8.85	Moderate
Kirkley Fen Park	6	33	12.3	3.08	4	Poor	G	13.75	Fairly High
Uplands Road North	13	1373	37.7	3.77	10	Moderate	D	5.33	Moderate

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## **Appendix D – Bathymetry Results**

# Kirkley Fen Park Pond, Lowestoft, Suffolk

Ecological and Biodiversity Surveys 2020

## Key

⊕ Sample points

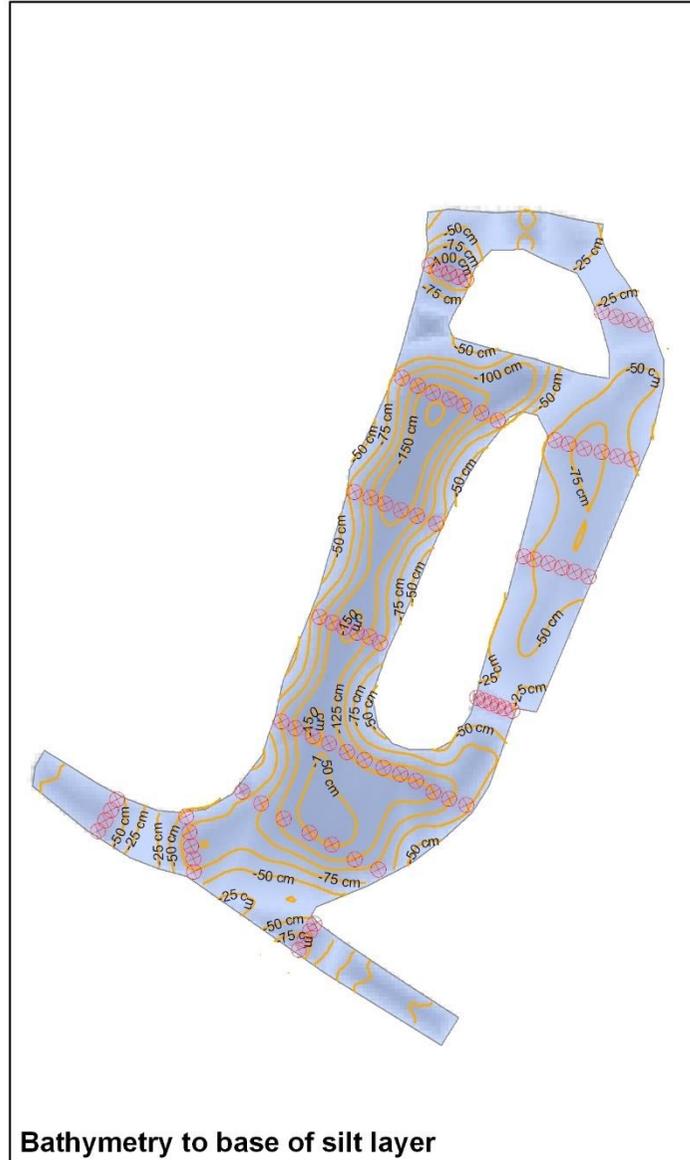
Accumulated silt volume  
approximately 65,800 m<sup>3</sup>

Drawing Title: Bathymetry maps  
Date Printed: 13/01/2021  
Projection: British National Grid

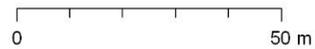
Produced by Abrehart Ecology for  
Lowestoft Town Council



Bathymetry to base of pond



Bathymetry to base of silt layer

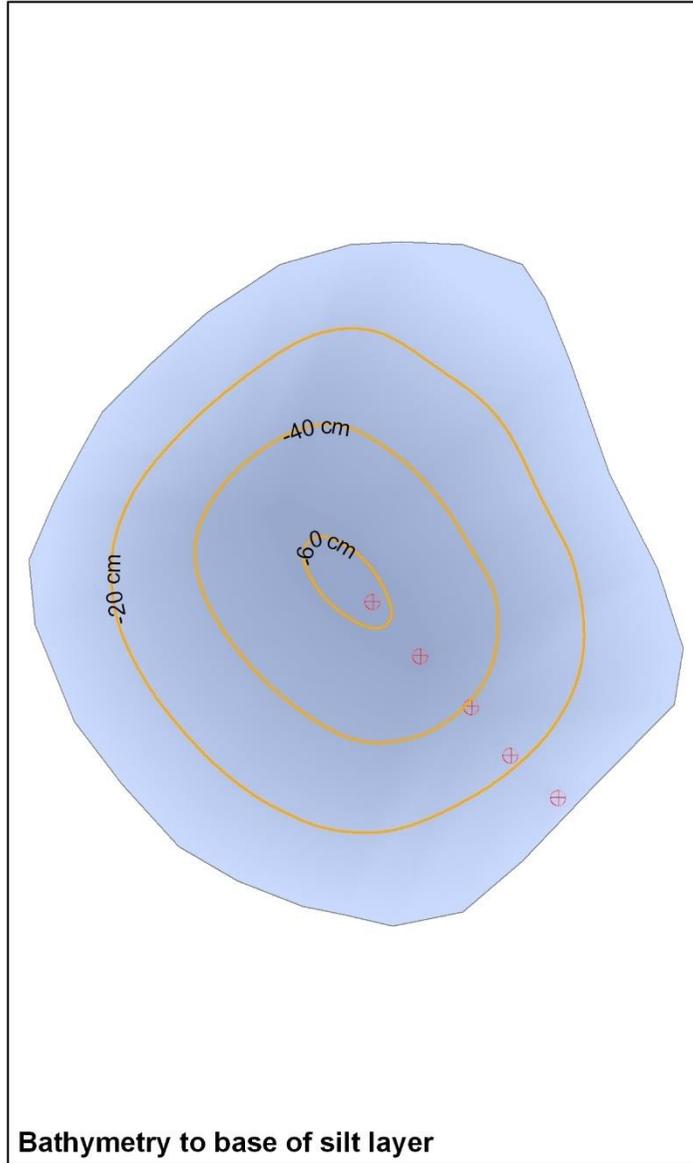
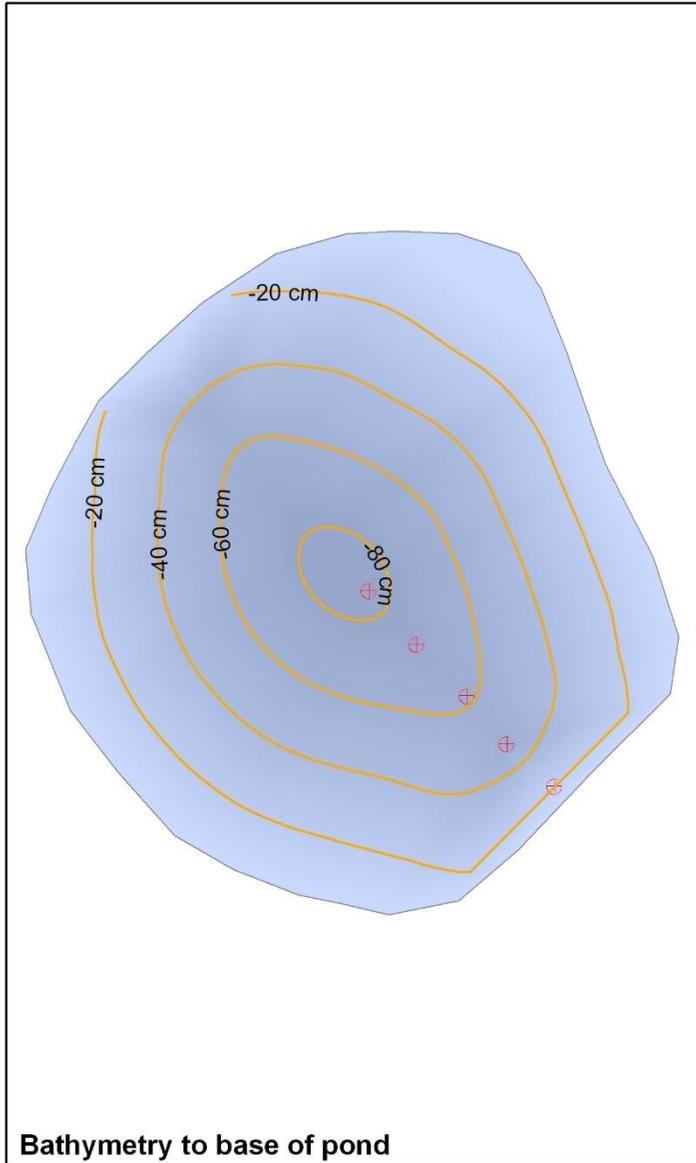


Scale at A4: 1:1,250



# Uplands Road North Pond, Lowestoft, Suffolk

Ecological and Biodiversity Surveys 2020



## Key

⊕ Sample point

Accumulated silt volume  
approximately 3,300 m<sup>3</sup>

**Drawing Title:** Bathymetry maps  
**Date Printed:** 13/01/2021  
**Projection:** British National Grid

Produced by Abrehart Ecology for  
Lowestoft Town Council



0 10 m

Scale at A4: 1:200



# Gainsborough Pond, Lowestoft, Suffolk

Ecological and Biodiversity Surveys 2020

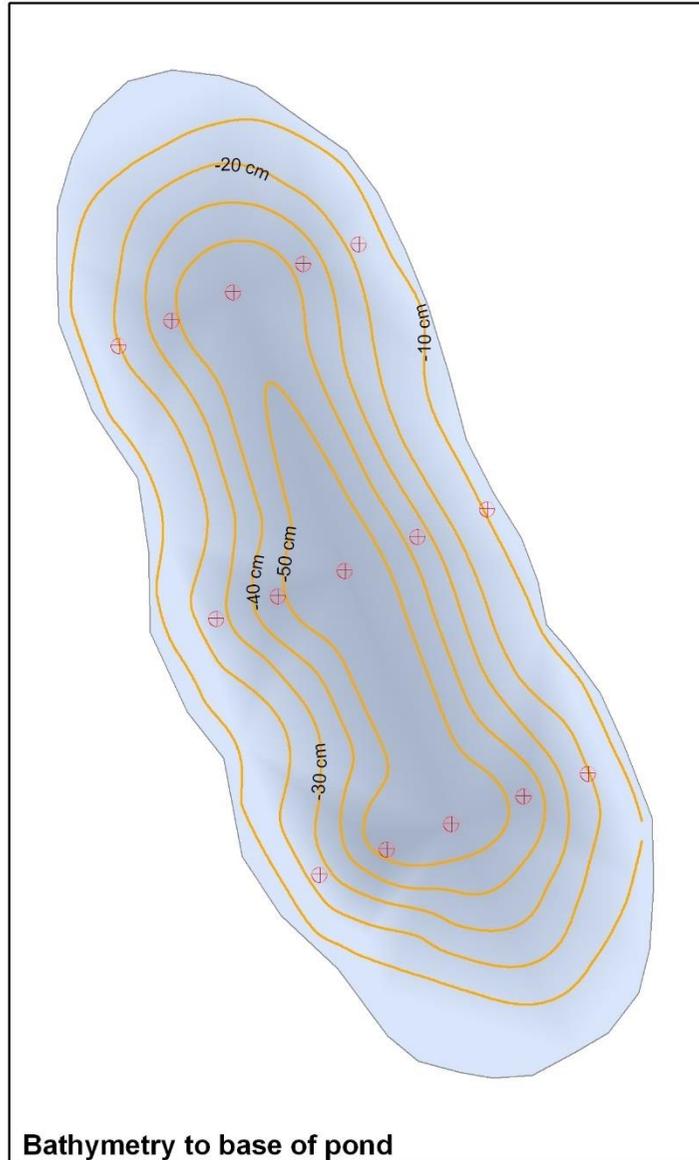
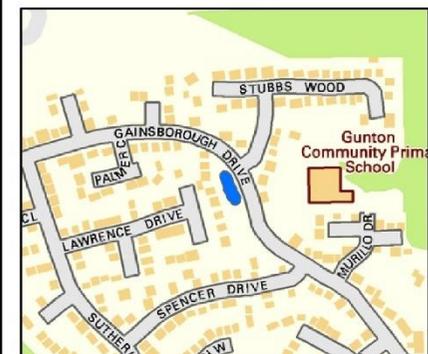
## Key

⊕ Sample point

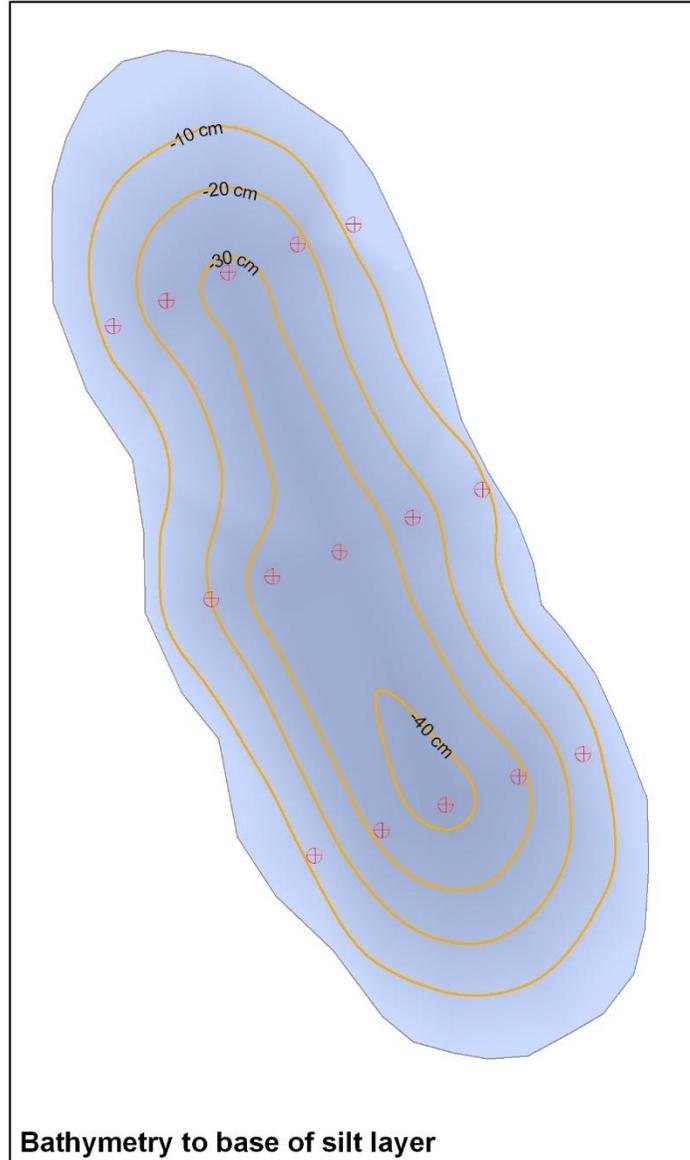
Accumulated silt volume  
approximately 3,800 m<sup>3</sup>

**Drawing Title:** Bathymetry maps  
**Date Printed:** 13/01/2021  
**Projection:** British National Grid

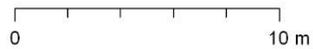
Produced by Abrehart Ecology for  
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Bathymetry to base of pond



Bathymetry to base of silt layer



Scale at A4: 1:250



# Kensington Gardens Pond, Lowestoft, Suffolk

Ecological and Biodiversity Surveys 2020

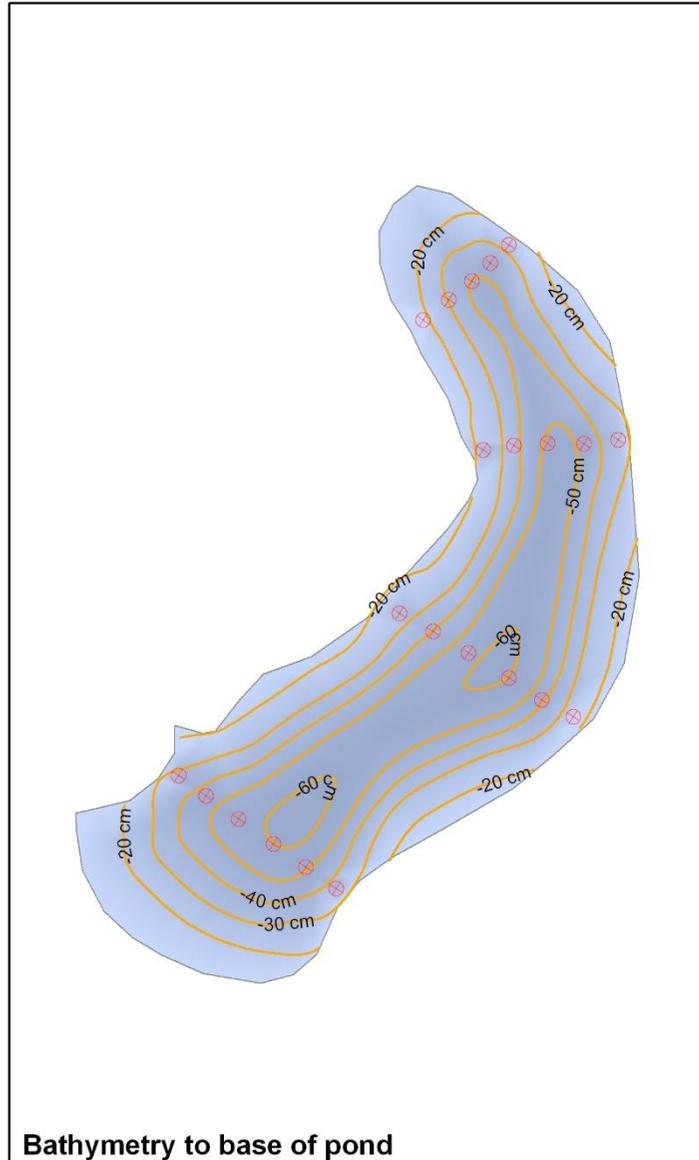
## Key

⊕ Sample point

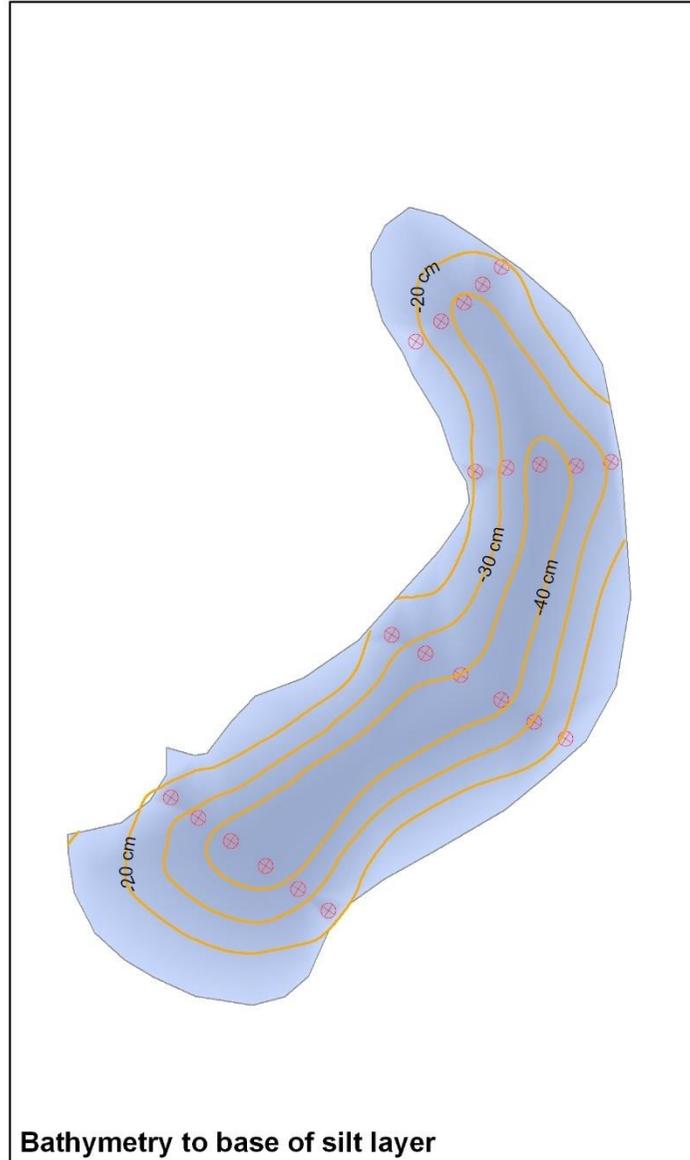
Accumulated silt volume  
approximately 3,200 m<sup>3</sup>

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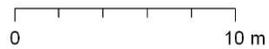
Produced by Abrehart Ecology for  
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Bathymetry to base of pond



Bathymetry to base of silt layer



Scale at A4: 1:300

