WWT CONSULTING

Client: Friends of St George's Park

Project: St George's Park Lake

Date: June 2011

Report: Recommendations for Ecological Enhancement

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Approved by: RW	

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1. INTRODUCTION

1.1 In August 2010, Gina Holmes, on behalf of the 'Friends of St. George's Park', approached Wildfowl & Wetlands Trust (Consulting) Ltd. (WWT Consulting) seeking advice on possible ecological enhancements and general improvements that could potentially be made to the lake at St. George's Park, Bristol. In March 2011, WWT Consulting were appointed to undertake an initial assessment of the status of the lake and provide a short report providing recommendations on how the ecology and public value of the lake could be improved within the confines of a limited budget.

1.2 On 12 May 2011, Phil Shepherd, a Senior Consultant from WWT Consulting, visited St. George's Park Lake and met with Gina Holmes and the Park Keeper to undertake the assessment.

Aims and objectives

1.3 The aim of this document is to form a basis for fund-raising activities that might enable 'Friends of St. George's Park' to secure funding for improvement works to the lake. This would be aimed at increasing its ecological value, aesthetic appeal and educational value to the park's visitors.

1.4 The objective is to describe and assess the existing status of the lake and to make recommendations on what measures and tasks might need to be undertaken to improve and enhance the lake's ecological and public value.

2. SITE DESCRIPTION

Location

2.1 St. George's Park Lake is located within St. George's Park, off Church Road, St. George in east Bristol, UK (see Photograph 1, Appendix I), approximately 0.75km north of the River Avon

Physical features

2.2 The lake dates from the Victorian era, constructed in 1894 as an ornamental boating lake, and has the following physical features:

- Area of approximately 0.6ha;
- Depth is uniform at approximately 1.2m, though is thought to be slightly deeper (up to 1.5m) in the central area, and slightly shallower near the inlet in the north-east due to siltation;
- The substrate is thought to be clay, of unknown thickness;
- Edges are vertical and built from stone, and have been repaired with concrete in places;
- Immediate surrounding zone is a public pedestrian tarmac path, approx. 2.5m wide;
- Island area is approximately 0.03ha, and is tree-covered (see Photograph 2). Ground level on the island is approximately 0.6m above lake water level as seen on day of site visit (see Photograph 3);
- General nature of surrounding area is open parkland with mown grass and mature trees;
- Water inlet point is located in the north-east 'corner', and exit point at the water level control structure/overflow point in the south-west. See Photographs 2, 4 and 5; and
- Two water recirculation pumps are situated in the central open area of the lake.

Hydrology

2.3 The lake receives water from three primary sources:

- Rainwater as a direct input and as runoff from the immediate surrounding catchment area;
- Springwater from a small, intermittent spring rising in the north-east corner which enters into a manhole (see Photograph 6) and then via the inlet point to the lake; and
- Stormwater from a nearby culvert, also entering via the manhole (see Photograph 6) and inlet point.

2.4 At the time of the site visit, the upstream stormwater culvert was blocked – cause unknown. The springwater flow had been minimal, rainfall had been low and so the volume of water input to the lake was very small. This is apparently a common problem and at such times evaporation exceeds input and the lake level drops by several centimetres. Since the time of the site visit, this culvert has been re-opened, establishing a much greater input to the lake.

2.5 Water exits the lake via:

- Evaporation; and
- Overtopping the water level control structure (Photograph 6).

2.6 The water level control structure at the outflow point of the lake is set at a fixed level approximately 150mm below the surrounding pathway. A sluice valve is also located at this point, enabling near-complete drainage of the lake if desired.

Water quality

2.7 Regular (near-monthly) monitoring of water quality has taken place at the lake since 1995, which is to be commended. Bristol City Council kindly provided the data to the Client, which are shown in Appendix II. Apart from a few early high faecal colliform readings (esp. June 1996 – highlighted in yellow in Appendix II), none of the water quality data give particular cause for concern given the lake's urban setting. Ammonia levels have been a little higher than average since October 2010, which might coincide with the upstream culvert blockage, leading to a lack of dilution.

Ecology

2.8 The general ecology of the lake is very basic. No specific surveys were conducted during the visit, and the park management are not aware of any existing systematic ecological data.

2.9 No submerged or floating aquatic plants were noted, and the lake margins are entirely hard-edged, supporting no marginal emergent vegetation.

2.10 The island is tree-covered, primarily with poplars *Populus* sp., Sycamore *Acer pseudoplatanus* and Ash *Fraxinus excelsior*, with a ground cover of mainly Butcher's Broom *Ruscus aculeatus*.

2.11 The lack of vegetation within and around the lake suggests the invertebrate fauna within the lake is likely to be highly impoverished.

2.12 Fish species within the lake are known to include varieties of carp *Cyprinus* sp., Roach *Rutilus rutilus*, Perch *Perca* sp., Tench *Tinca tinca* and perhaps catfish. Fish numbers and density are very high.

2.13 One Common Frog *Rana temporaria* was seen within the water inlet chamber. No other species of amphibian or reptile were noted.

2.14 Birds species noted were Mute Swan *Cygnus olor* (one breeding pair with cygnets), Mallard *Anas platyrhynchos*, Coot *Fulica atra*, Moorhen *Gallinula chloropus* and Feral Pigeon *Columba livia*. Black-headed Gull *Larus ridibundus* is a winter visitor and the lake occasionally also attracts Grey Heron *Ardea cinerea*, Cormorant *Phalacrocorax carbo*, Canada Goose *Branta canadensis* and Kingfisher *Alcedo athis*. No bird species was present in particularly high numbers.

2.15 No aquatic mammal species are known to use the lake, but bats are present within the park and are likely to feed in the vicinity of the lake.

3. CURRENT ISSUES AND RECOMMENDATIONS

Angling activities

3.1 High nutrient inputs and excess baiting lead to abnormally high fish densities, resulting in there being no aquatic vegetation within or around the lake, and probably minimal invertebrate diversity. This inevitably means the lake's ecological status is severely impoverished, as wetland vegetation is typically a pre-requisite component of a bio-diverse habitat.

3.2 Anglers' litter, especially discarded nylon fishing line and hooks (often resulting in bird deaths) raises animal welfare issues, rather than ecological or conservation issues.

Recommendation

3.3 Assess the size of the fish population and manage appropriately to ensure the biomass is at a sustainable level that a lake of this size can support. A good relationship with anglers is an important element of the successful management of the lake, but solutions to this issue are beyond the scope of this report. Signage illustrating the effects of carelessness and the resulting animal welfare issues would be beneficial but any potential vandalism issues would need to be considered.

Feeding of waterbirds

3.4 This very popular activity adds more nutrient loading to the lake and results in artificially-sustained bird numbers. This is not considered to be a particularly acute problem at this site, as waterbird numbers are not especially high. Ducks, geese, swans, moorhens and coots will all readily graze any vegetation they can access, and this needs to be considered in any planting proposals for the lake.

Recommendation

3.5 Provision of wheat dispensers is not recommended at this site, due to risk of vandalism and/or misuse and subsequent attraction of rats and mice.

3.6 Signage requesting people to feed small amounts of bread or not to feed the birds at all, and the reasons why would be beneficial, as the main problem arising from artificial feeding is normally due to excessive amounts being thrown into the lake, remaining uneaten.

Landform & wetland vegetation

3.7 The existing lake edge is not currently suitable for establishment of marginal vegetation, even if new planting could survive the pressure from the fish and birds. The island edges are more suitably profiled but the heavy shading from the tree cover is likely to prevent successful establishment of new marginal planting.

Recommendation

3.8 Creation of shallow areas for bankside, marginal and aquatic planting, either at the lake edge or within the lake, is recommended. Examples of suitable locations are shown in Photograph 7. Gabion cages are probably the most cost-effective, long-lasting and robust method of creating these shallow areas and an example of their use is shown in Photograph 8. The cages would need to be

back-filled with subsoil (that can be borrowed from within the lake) to a depth of approximately 100mm below normal operating water level.

3.9 Planting with hardy native species, ideally of local provenance such as Common Reed *Phragmites australis* is recommended, as this species is very robust and tolerant of a wide range of water qualities and depths. Other emergent species could include Greater Pond-sedge *Carex riparia*, Reed Canary-grass *Phalaris arundinacea* and Great Waterdock *Rumex hydrolapathum*. Moisture loving plants could include Hemp-agrimony *Eupatorium cannabinum*, Meadowsweet *Filipendula ulmaria*, Ragged-robin *Lychnis flos-cuculi*, Purple loosestrife *Lythrum salicaria*, Water mint *Mentha aquatica* and Water Forget-me-not *Myosotis palustris*. All new planting would need to be protected from grazing by temporary fencing – above water for birds, and below water for fish for two growing seasons to ensure successful establishment.

3.10 The lake would also benefit from a de-silting operation, primarily to reduce nutrient status and improve water clarity. This is probably best achieved via drainage of the lake and subsequent excavation and haulage of the silt off site, but this would have to be done at an appropriate time of year and the temporary impoundment of the fish within the lake would need to be undertaken. This could represent an opportunity for selective removal of some fish from the lake.

3.11 Sensitive removal of some of the trees on the island could be considered, to improve the chances of marginal vegetation establishment around the island edge and to allow a more diverse understorey vegetation layer and ground flora to establish, improving the overall wildlife value of the island. A bat survey should be conducted before any trees are removed. Any marginal planting would need to be protected with temporary fencing and will probably require some form of bank revetment, either willow spiling or coir rolls to create a barrier to hold soil in place. Coir rolls are likely, however, to be the subject of much attention from the waterbirds and will get picked apart over time.

Water clarity

3.12 Water clarity is not likely ever to be high at the site, due to the high densities of fish. The frequency of incidence of algal blooms is also likely to remain high as long as high densities of fish are maintained. Improved clarity is, however, desirable primarily for aesthetic purposes.

Recommendation

3.13 Re-opening of the inflowing culvert will help improve water clarity, as will establishment of wetland vegetation.

3.14 Use of a mechanical water agitator, such as an Oloid (http://www.oloid.ch/frame.php3?lang=en&nav=fir&content=firma) is recommended as a method of improving water clarity.

Public awareness

3.15 Vandalism and apparent lack of care for animal welfare issues are prevalent at this site.

Recommendation

3.16 Whilst solving these problems is beyond our remit, we would recommend robust signage at the lake aimed at raising visitor awareness of the value and benefits the lake brings to the community, and how this can be improved for future generations.

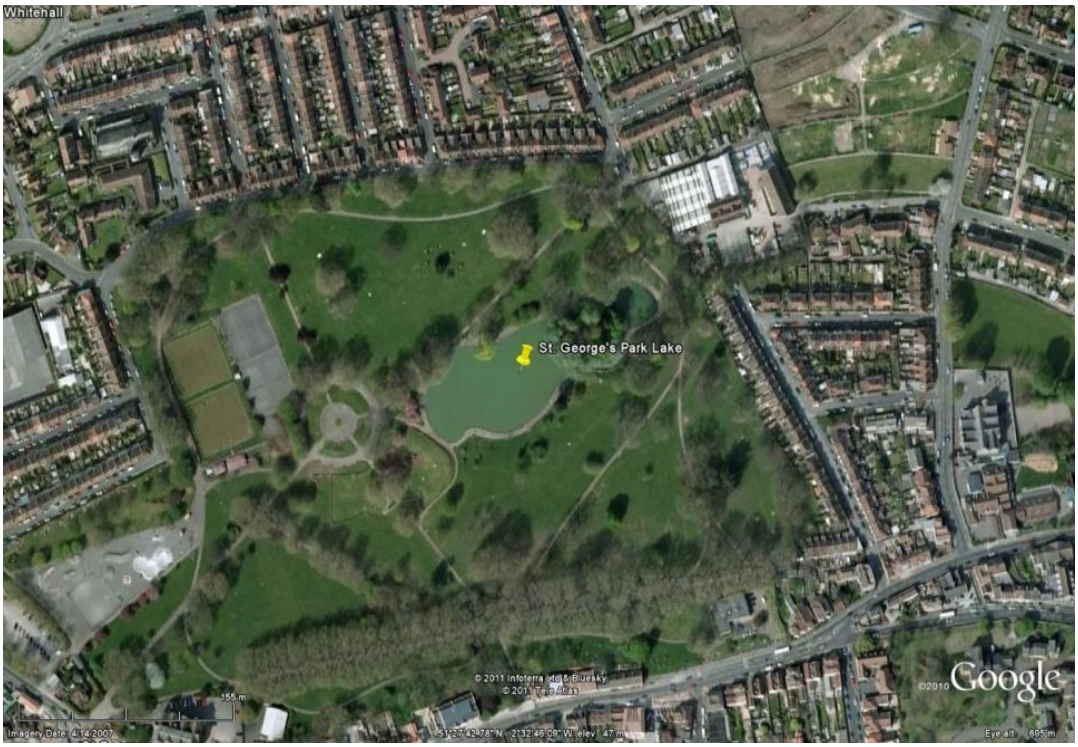
4. CONCLUSION

4.1 Whilst facing all the common problems of an urban park lake within a densely populated area, St. George's Park Lake is an important local asset with improvement potential in the areas of its ecological, aesthetic and educational value.

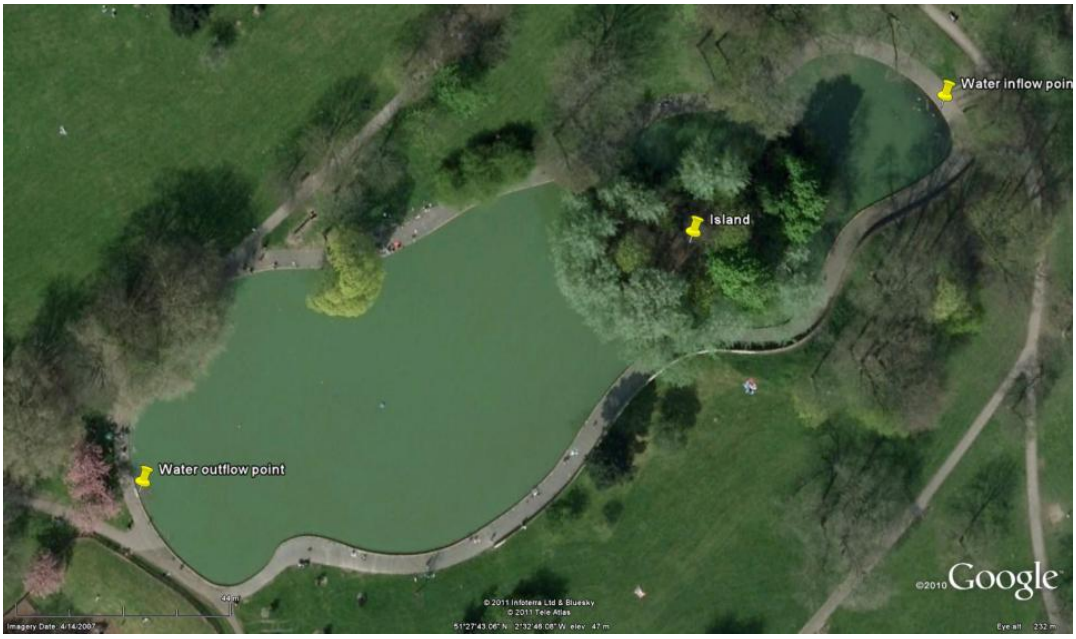
4.2 WWT Consulting can provide designs and costings for gabion islands, planting plans, interpretation design and production to assist with potential future funding applications.

APPENDIX I. Site visit photographs

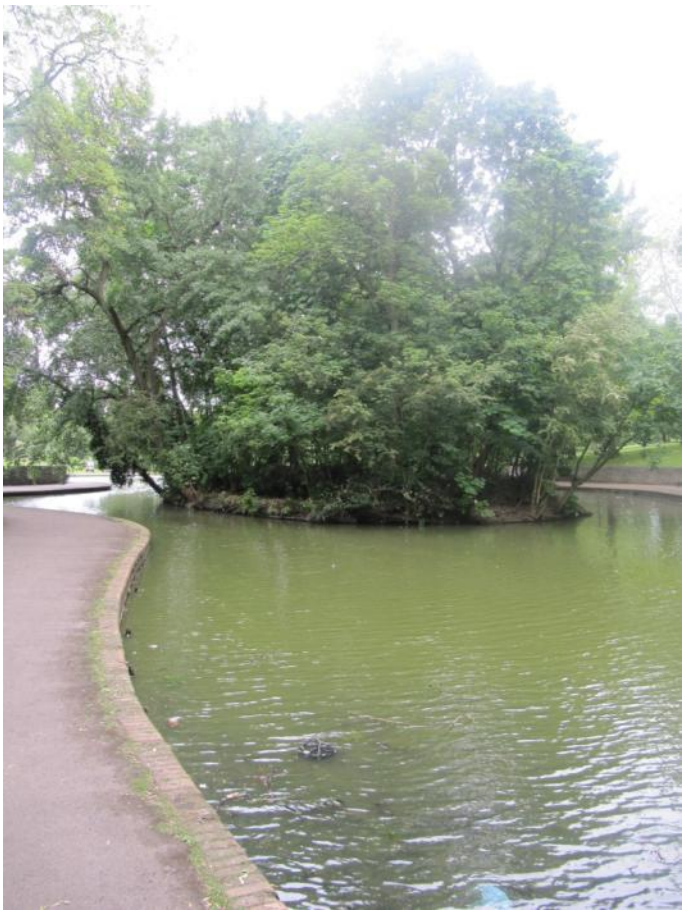
Photograph 1 - Lake location within St George's Park



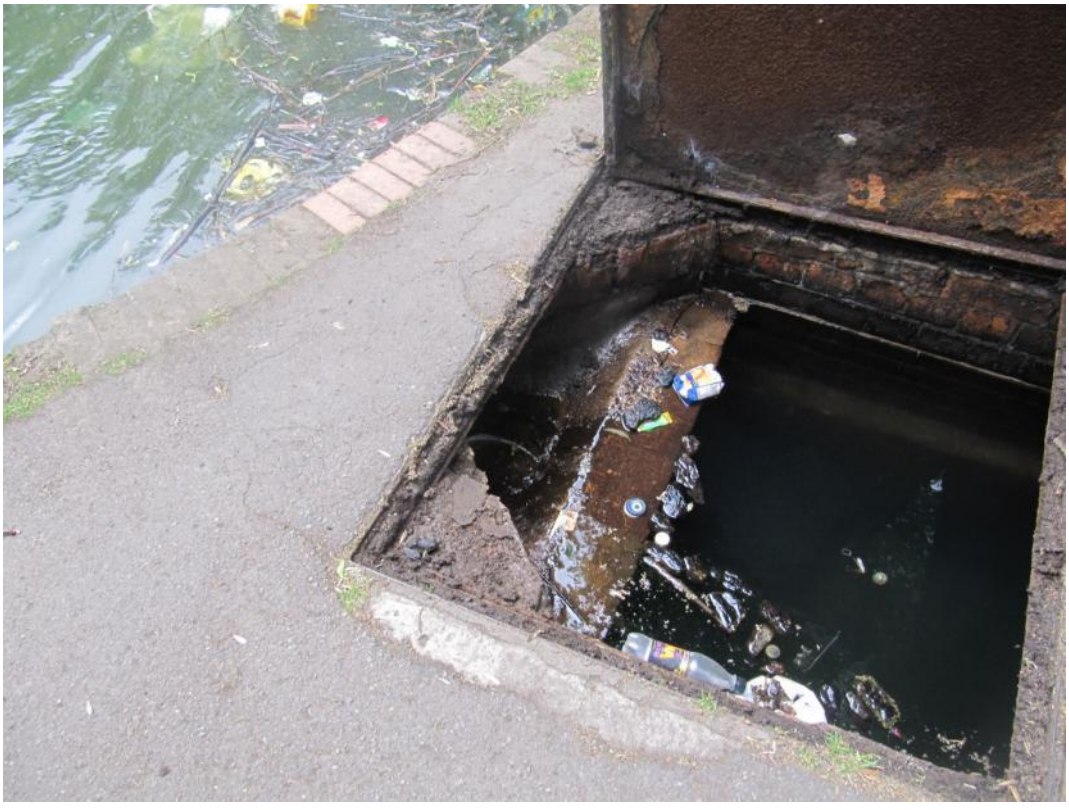
Photograph 2 - Locations of island and water inflow/ outflow points



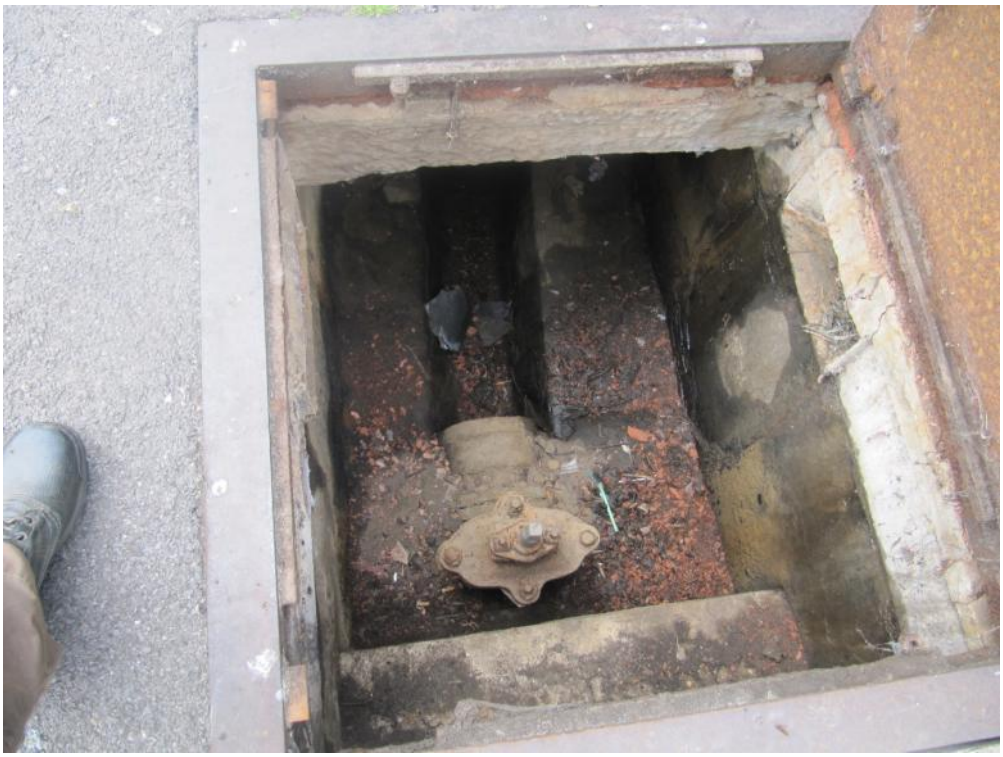
Photograph 3 - Island



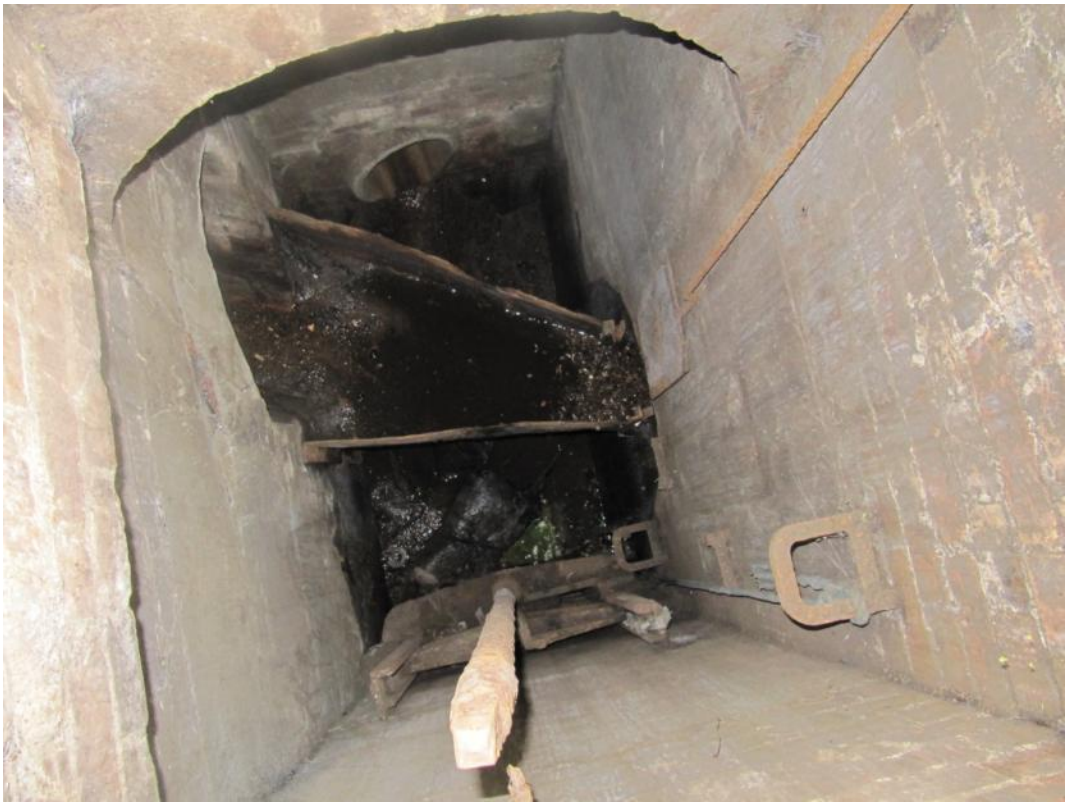
Photograph 4 – Water inlet point



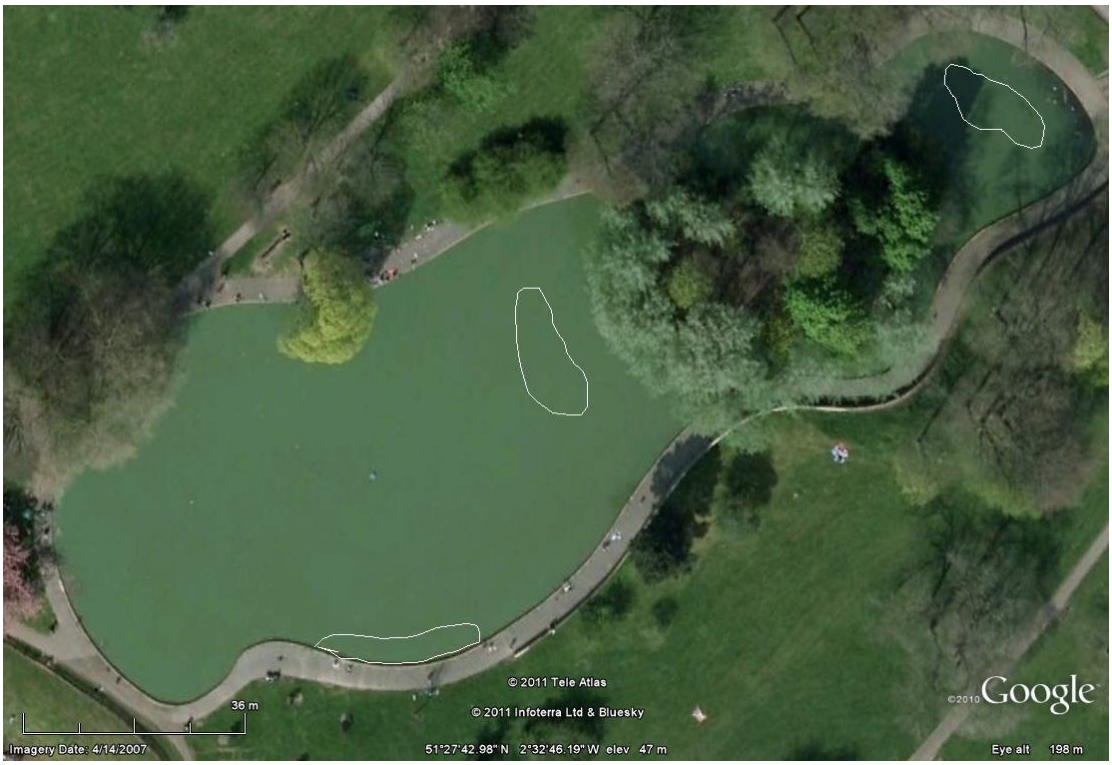
Photograph 5 – Water outflow point



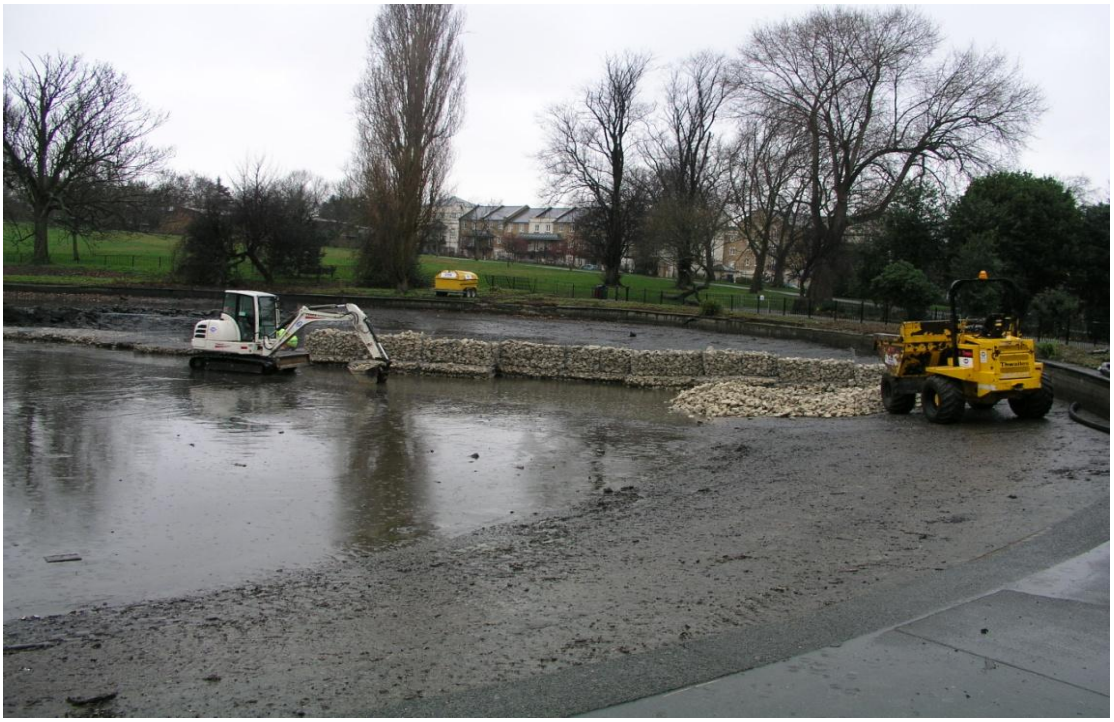
Photograph 6 – Upstream manhole showing culvert



Photograph 7 – Example planting areas shown edged white



Photograph 8 – Gabion cages to create shallow areas for planting



APPENDIX II. Water quality data

Month	Date	Site No.	deg C Temp	pH units pH	mS Cond	mg/l D.O.	% D.O. %	Salinity (ppt)	per 100ml counts TC	per 100ml counts FC	Ammonium as NH4 (mg/l)	Ammonia as N	mg/l 5 day B.O.D.	Phosphate (mg/l)
January	26-Jan-95	11	6		470				1000	740				
February	24-Feb-95	11	6	7.00					22000	4000			9	
April	26-Apr-95	11							80000	11000				
June	23-Jun-95	11	20	7.60	810		45		1600	400			5	
July	19-Jul-95	11	23	7.70	798				600	400			4	
August	01-Sep-95	11			953				3000	800			4	
September	22-Sep-95	11	16	8.20	670		92		4200	200			2	
October	25-Oct-95	11	13	7.90	725		70		2000	1800			2	
November	01-Dec-95	11	9	7.50	756		34		2000	450				
January	24-Jan-96	11	4.5	7.60	749				53000	25000			8	
February	01-Mar-96	11	5.2	9.20	719				760	200			24	
March	28-Mar-96	11	5.9	8.10	600				60000	2400			10	
April	26-Apr-96	11	14	8.90	702				4600	800			10	
June	06-Jun-96	11	19	8.40			37		16000	3200			15	
June	27-Jun-96	11	20.3	8.60	709		49		760000	540000			13	
July	31-Jul-96	11	20.6	8.10	760		62		7400	5800			27	
September	20-Sep-96	11	14.6	7.50	700		46		1200	600			12	
October	30-Oct-96	11	12	7.50	683		20		1000	1000			5	
November	27-Nov-96	11	4.4	8.10	630		25		2600	600			2	
December	12-Dec-96	11	4.6	7.15	640		58		1200	1000			3	
January	17-Jan-97	11	3.6	6.90	630		5		600	600			4	
February	28-Feb-97	11	8.4	7.10	340		48		400	400			5	
March	20-Mar-97	11	11.8	7.20	400		69		1200	1200			8	
April	22-Apr-97	11	12.6	7.20	400		78		400	400			3	
May	22-May-97	11							1800	1800			10	
July	01-Jul-97	11	15.2	7.60	606				1400	1400			6.4	
September	23-Sep-97	11	15.4	6.70	755				400	400			9.8	

January	24-Jan-98	11	1.6	7.16	729			2200	1600	
February	18-Feb-98	11	9.2	7.05	470			400	400	
March	20-Mar-98	11	10.8	7.30	380			400	200	
April	30-Apr-98	11	13.4	7.35	390			400	400	
May	22-May-98	11	19.8	7.30	420			1800	200	
June	24-Jun-98	11	19.0	6.80	390			2400	2200	
July	31-Jul-98	11	18.8	7.20	440		54			
September	01-Oct-98	11	16.2	7.60	520		68	1200	200	
October	05-Nov-98	11	8.2	7.20	510		45	2200	600	
November	19-Nov-98	11	5.8	7.60	550		71	400	200	
December	18-Dec-98	11	9	7.50	540		51	2000	1200	
January	04-Feb-99	11	7.8	7.65	520	8.5	71	600	600	3
February	25-Feb-99	11	6.4	7.60	490	8.5	70	200	<200	5
April	29-Apr-99	11	13.2	7.60	520		95	400	400	9
May	20-May-99	11	15.6	7.45	500	6.7	67	1200	800	5
July	22-Jul-99	11	18.2	7.35	510	4.5	47	4800	1000	
October	21-Oct-99	11	8.2	7.20	510		45	2000	1800	3
February	16-Feb-00	11	7	7.75	520	7.8	63	200	<200	
March	16-Mar-00	11	12.2	7.80	580	9	82	600	200	
June	21-Jun-00	11	18	7.55	590	6.6	75	1200	800	6
July	27-Jul-00	11	19.4	7.75	560	5.4	59	600	200	18
Aug	23-Aug-00	11	20.4	8.15	580		75	2000	400	6
Oct	26-Oct-00	11	11	7.45	550	4.1	37	400	400	3
Nov	26-Nov-00	11		7.65	636					3
Nov	29-Nov-00	11	8	7.80	490			2600	<200	2
Dec	14-Dec-00	11	8.2	7.95	520			1000	800	
January	31-Jan-01	11	4.4	7.40	570			200	<200	2
May	31-May-01	11	19	7.35	410	1.3	14	400	200	
July	09-Jul-01	11						4600	2200	10
August	30-Aug-01	11	18.4	7.45		3.2	34	3200	2600	4
September	13-Sep-01	11	14.4	7.10	610	3.4	24	1800	1600	2
September	13-Sep-01	11	14.2	7.10	610	1.9	18			
September	13-Sep-01	11	14.6	7.15	600	2.4	24	3200	1600	
September	13-Sep-01	11	14.4	7.10	610	2.1	21			
September	13-Sep-01	11	14.2	7.10	610	2.4	24	1600	1000	

September	13-Sep-01	11	14	7.05	610	2.2	22				
September	27-Sep-01	11	13.6	7.55	670	6.8	63	11000	4200		6
October	25-Oct-01	11	12.4	7.40	620	6.1	48	2000	1000		5
November	29-Nov-01	11	7.2	7.15	540	6	49	15000	6600		3
January	17-Jan-02	11	5.2	7.00	440	4.8	34	400	400		3
February	27-Feb-02	11	5.8	7.50	360	8.7	71	4400	2600		3
March	26-Mar-02	11	9.2	7.75	360	7.4		4200	< 200		5
April	17-Apr-02	11	11.2	8.35	410	82	11.2	600	400		5
May	23-May-02	11	14.4	7.45	420	5.9	57	1400	1000		3
June	24-Jun-02	11	17.2	7.50	400	6.9	70	400	200		7
July	25-Jul-02	11	17.2	7.65	460		84	600	200		11
August	22-Aug-02	11	136	7.60	660	8.4	83		200		
September	19-Sep-02	11	16	7.62	660	4.8	47	600	400		5
October	29-Oct-02	11						800	800		5
November	28-Nov-02	11						1000	200	0.3	3
January	22-Jan-03	11		7.79	386	7.7		200	200	0.74	2
February	26-Feb-03	11		7.58	409			1000	800	0.39	4
March	20-Mar-03	11		7.93	405			200	200	0.15	6
May	15-May-03	11		8.20	433			200	200	0.12	6
June	23-Jun-03	11						8600	2200	0.14	11
July	30-Jul-03	11		7.89	410			3200	400	0.18	5
September	04-Sep-03	11		8.23	423					0.13	6
October	02-Oct-03	11	13.86	7.54	506.5	2.92	28.3	400	600	0.11	8
November	06-Nov-03	11	10.59	7.60	485.9	6.1	54.9	2000	800	0.25	10
December	04-Dec-03	11	7.33	7.13	462.5	4.64	38.5	3400	400	0.9	3
January	29-Jan-04	11	2.82	7.58	447.3	7.7	57	600	600	1.1	4
February	19-Feb-04	11	7.43	7.95	455.9	7.51	62.6	1000	800	1.5	5
March	11-Mar-04	11	5.67	7.89	457	8.03	64	<200	<200	0.22	12
April	29-Apr-04	11	13.88	7.74	436.1	5.41	52.4	800	400	0.1	8
May	13-May-04	11	15.99	7.74	444.7	5.3	53.8	200	200	0.1	11
June	17-Jun-04	11	21.51	7.91	481.7	4.97	56.3	600	200	0.51	8
July	22-Jul-04	11	19.26	7.79	475.2	3.94	42.7	2800	2000	0.46	12
August	19-Aug-04	11	16.54	8.15	733.9	9.21	94.6	1400	200	0.2	2
September	09-Sep-04	11	19.58	7.89	461.7	5.08	55.5	600	200		10
October	28-Oct-04	11	11.27	7.90	426.5	3.71	33.9	200	200	0.52	3

November	25-Nov-04	11	8.33	8.10	431.7	4.89	41.7	600	200	0.68		4
December	16-Dec-04	11	7.27	7.96	442	3.42	28.4	200	200	1.57		3
January	27-Jan-05	11	4.47	8.23	423.1	11.26	87.1	200	200	0.45		6
February	24-Feb-05	11	4.41	8.39	414.1	15.34	118.5	2200	<200	0.18		10
March	17-Mar-05	11	9.17	7.54	407.1	no data	no data	800	<200	0.29		5
April	21-Apr-05	11	13.83	7.89	412.4	7.81	75.6	200	<200	0.05		7
May	25-May-05	11	15.46	8.11	391.4	9.73	97.5	3400	1000	0.22		7
June	29-Jun-05	11	21.47	7.59	417	3.76	42.6	4200	2200	0.58		7
July	27-Jul-05	11	18.69	7.91	424.3	6.48	69.5	800	600	0.24		7
August	24-Aug-05	11	18.35	7.73	432.9	5.3	56.4	1400	1000	0.61		6
September	28-Sep-05	11	14.96	7.65	428.4	4.49	44.5			0.18		10
October	26-Oct-05	11	13.21	7.43	426.7	1.89	18	600	1000	3.58		3
November	23-Nov-05	11	4.6	7.75	431.8	5.57	43.3	<200	<200	4.66		2
December	14-Dec-05	11	4.91	7.67	423.9	6.16	48.2	400	200	4.49		<2
January	18-Jan-06	11	7.07	7.78	425.2	9.48	78.4	200	200	4.14		3
February	08-Feb-06	11	4.55	7.89	437.4	11.76	91.2	200	200	2.74	2.1	3
March	15-Mar-06	11	6.15	7.93	415.5	12.86	103.8	<200	<200	0.79	0.6	5
April	26-Apr-06	11	13.53	8.14	416.8	8.71	83.7	200	<200	0.35	0.3	6
May	10-May-06	11	15.6	8.13	421.1	8.57	86.2	1800	<200	0.18	0.1	9
June	14-Jun-06	11	20.22	7.20	404.9	3.25	35.9	800	200	0.51	0.4	13
July	06-Jul-06	11	24.22	7.77	406.3	7.18	85.7	<200	<200	0.49	0.4	4
August		11	18.1	7.65	413.4	6.09	64.5	1000	400	1.05	0.8	6
September	06-Sep-06	11	20.09	7.79	411.7	6.35	70	3200	800	0.49	0.4	10
October	18-Oct-06	11	13.95	7.11	409	6.38	61.9	3400	1400	0.69	0.5	6
November	15-Nov-06	11	10.17	7.59	423.2	5.17	46.1	1000	600	0.81	0.6	3
December	12-Dec-06	11	6.64	5.98	397.1	8.95	73.2	20	<200	1.04	0.8	2
January	09-Jan-07	11	8.33	7.41	380.2	9.77	83.3			1.2	0.9	5
February	06-Feb-07	11	4.1	7.41	399	9.46	72.5	200	200	0.55	0.4	4
March	06-Mar-07	11	8.87	7.67	362.1	12.01	103.7	1400	2200	0.33	0.3	11
April	17-Apr-07	11	15.85	7.74	351.5	7.13	72.1	5400	400	0.21	0.2	12
May	30-May-07	11	14.38	8.13	351.8	9.97	97.6	3600	1600	0.58	0.4	13
June	12-Jun-07	11	19.6	7.58	352	2.06	22.4	1800	400	0.16	0.1	12
July	17-Jul-07	11	18.93	7.68	373.5	2.37	25.6	600	200	2.58	2.0	5
August	14-Aug-07	11	18.67	8.37	287.5	6.09	65.3	6200	4800	0.09	0.1	12
September	25-Sep-07	11	15.01	8.03	362.2	5.74	57	8200	5200	0.4	0.3	9

October	23-Oct-07	11	10.87	7.89	386.5	2.22	20.1		2200	1200	1.34	1.0	8	
November	13-Nov-07	11	7.78	8.11	399.4	5.29	44.5		400	400	2.04	1.6	6	
December	04-Dec-07	11	6.99	8.25	383	8.79	72.4		200	200	2.02	1.6	5	
January	29-Jan-08	11	6.85	8.38	370.9	7.4	60.8		800	<200	0.2	0.2	2	
February	26-Feb-08	11	7.66	8.25	388.3	8.97	75.2		600	<200	1.88	1.4	4	
March	18-Mar-08	11	8.01	8.37	480.6	12.26	103.7		400	400	0.12	0.1	8	
April	22-Apr-08	11	10.57	8.68	623.8	13.67	122.9		400	<200	0.28	0.2	8	
May	28-May-08	11	14.17	7.92	642.6	7.63	74.5		2400	1200	0.19	0.1	6	
July	02-Jul-08	11	18.67	8.24	685.9	8.23	88.3		1400	600	0.12	0.1	6	
July	21-Jul-08	11	17.73	8.73	697.9	9.48	99.7		600	<200	0.15	0.1	6	
August	19-Aug-08	11	no data	no data	no data	no data	no data		7800	6000	0.2	0.2	7	
September	24-Sep-08	11	14.78	8.30	651.3	6.95	68.7		1400	200	0.07	0.1	10	
October	29-Oct-08	11	7.98	8.13	617.6	9.45	79.9		400	400	0.07	0.1	12	
November	26-Nov-08	11	5.21	7.83	585	6.52	51.4		800	200	0.79	0.6	4	
December	16-Dec-08	11	4.47	7.89	640.2	10.83	83.8		600	400	0.34	0.3	5	
January	20-Jan-09	11	5.11	7.95	689.4	10.27	80.8		<200	<200	0.85	0.7	< 2	
February	24-Feb-09	11	8.69	8.14	680.6	11.53	99.2		600	<200	0.32	0.2	4	< 0.10
March	19-Mar-09	11	12.64	5.68	698.8	14.1	133		400	<200	0.03	0.0	4	< 0.10
April	28-Apr-09	11	13.29	4.44	697.7	7.02	67.2		200	<200	0.08	0.1	7	< 0.10
May (June)	02-Jun-09	11	20.78	6.61	698.3	6.34	71		2600	400	0.08	0.1	7	< 0.10
June	01-Jul-09	11	23.49	8.20	650.4	6.05	71.3		800	200	0.03	0.0	7	< 0.10
July	14-Jul-09	11	19.49	7.51	619.5	5.22	56.9		7800	1600	0.13	0.1	6.0	< 0.10
August	11-Aug-09	11	21.16	8.77	560.1	6.82	76.9		1600	200	0.66	0.5	6	< 0.10
September	23-Sep-09	11	No data	No data	No data	No data	No data		1800	600	0.11	0.1	24	< 0.10
October	21-Oct-09	11	No data	No data	No data	No data	No data		800	600	0.09	0.1	10	< 0.10
November	17-Nov-09	11	9.66	7.63	469.8	9.95	87.6		400	<200	1.04	0.8	5	< 0.10
December	15-Dec-09	11	5.15	8.99	434.5	9.05	71.2		<200	<200	1.96	1.5	4	< 0.10
January	19-Jan-10	11	3.73	10.83	427.1	11.04	83.7		200	<200	0.89	0.7	4	< 0.10
February	18-Feb-10	11	4.22	8.20	401.1	9.77	75	0.19	200	<200	0.72	0.6	7	< 0.10
March	18-Mar-10	11	9.37	8.30	412.6	10.38	90.7	0.2	400	<200	0.27	0.2	7	<0.1
April	20-Apr-10	11	14.88	8.49	415.6	8.47	83.9	0.2	<200	<200	0.13	0.1	16	<0.10
May	27-May-10	11	13.34	6.84	1.7	9.83	94	0.22	6000	1000	0.36	0.3	11	<0.10
June	23-Jun-10	11	21.95	8.14	481.1	6.75	77.2	0.23	400	400	0.05	0.0	24.5	<0.10

July	21-Jul-10	11	20.16	8.18	495.5	7.83	86.5	0.24	1000	200	0.21	0.2	12	<0.10
August	25-Aug-10	11	17.94	7.77	471.6	4.97	52.6	0.23	2200	1400	0.09	0.1	18	<0.10
September	20-Sep-10	11	15.87	7.91	475.8	7.65	77.4	0.23	600	< 200	0.18	0.1	18	<0.10
October	20-Oct-10	11	10.65	7.63	515.7	3.52	31.7	0.25	4000	400	6.56	5.0	4.22	<0.10
November	24-Nov-10	11	6.17	7.60	492.3	7.2	58.2	0.24	800	200	5.88	4.5	9	<0.10
December	16-Dec-10	11	3.16	7.34	525.4	3.69	27.6	0.25	200	<200	1.26	1.0	8	<0.10
January	18-Jan-11	11	7.44	6.97	403.1	4.13	34.4	0.19	400	400	6.91	5.3		<0.10
February	16-Feb-11	11	6.92	7.19	407	9.74	80.2	0.2	200	200	6.97	5.4		<0.10
March	21-Mar-11	11	11.09	8.03	398.9	8.25	75.1	0.19	<200	<200	4.05	3.1		<0.10
April	11-Apr-11	11	15.38	8.01	375.4	10.04	100.5	0.18	200	< 200	1.38	1.1		0.69