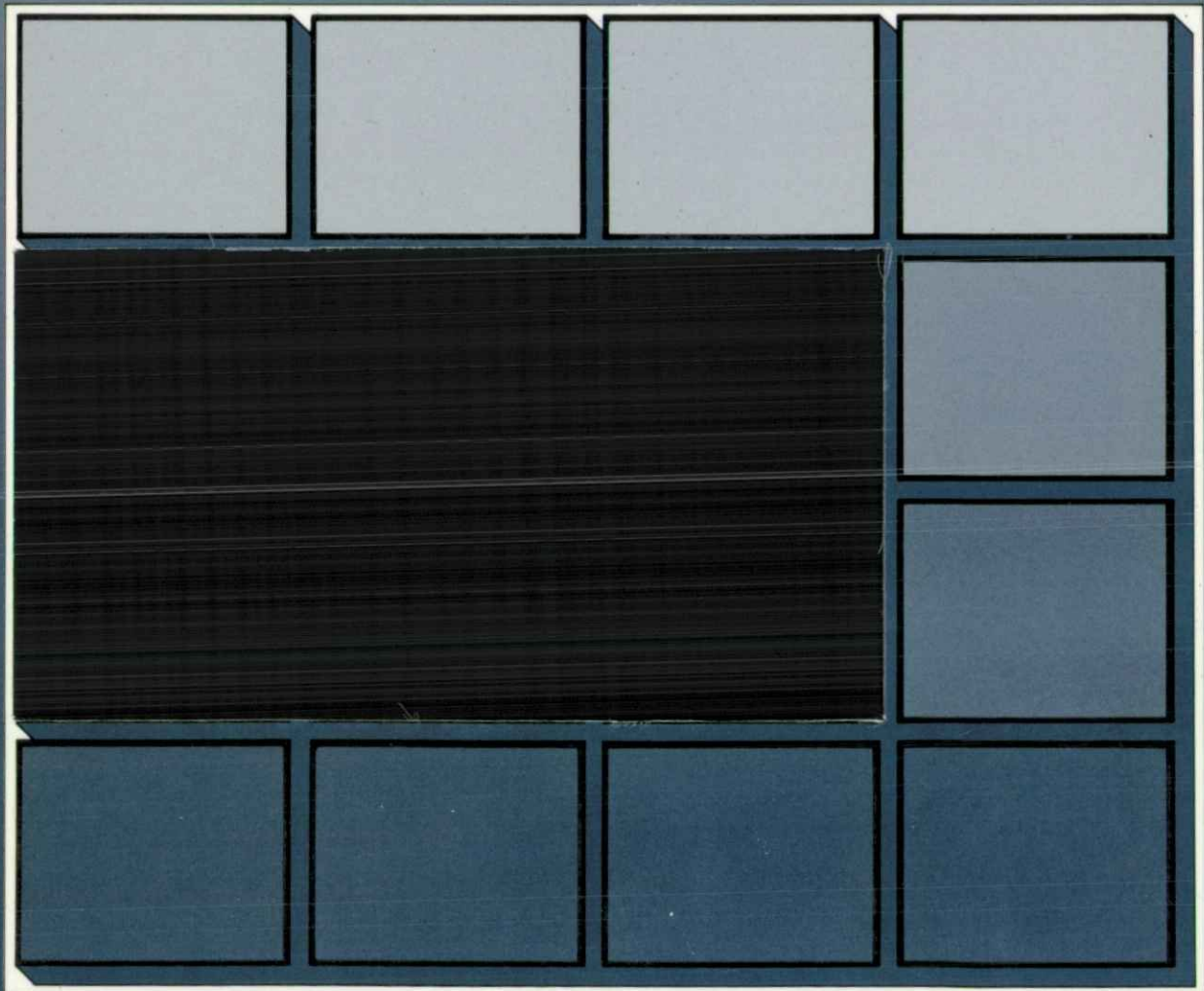
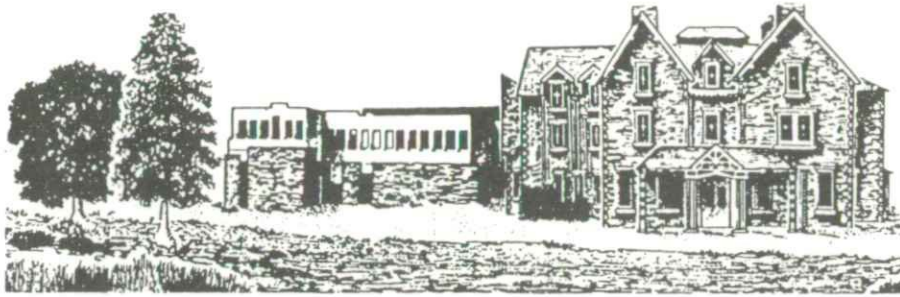




FRESHWATER  
BIOLOGICAL  
ASSOCIATION





The **Freshwater Biological Association** is the leading scientific research organisation for the freshwater environment in the United Kingdom. It was founded in 1929 as an independent organisation to pursue fundamental research into all aspects of freshwater biology and chemistry. The FBA has two main laboratories. The headquarters is at Windermere in the Lake District and the River Laboratory is in the south of England. A small unit has recently been established near Huntingdon to study slow-flowing eastern rivers.

The FBA's primary source of funding is the Natural Environment Research Council but, in addition, the Association receives substantial support from the Department of the Environment and the Ministry of Agriculture, Fisheries and Food who commission research projects relevant to their interests and responsibilities. It also carries out contracts for consulting engineers, water authorities, private industry, conservation bodies, local government and international agencies.

The staff includes scientists who are acknowledged experts in all the major disciplines. They regularly attend international meetings and visit laboratories in other countries to extend their experience and keep up to date with new developments. Their own knowledge is backed by a library housing an unrivalled collection of books and periodicals on freshwater science and with access to computerized information retrieval services. A range of experimental facilities is available to carry out trials under controlled conditions. These resources can be made available to help solve many types of practical problems. Moreover, as a member of the Terrestrial and Freshwater Sciences Directorate of the Natural Environment Research Council, the FBA is able to link up with other institutes to provide a wider range of environmental expertise as the occasion demands. Thus, the FBA is in a unique position to bring relevant expertise together for problems involving several disciplines.

Recent contracts have involved a wide variety of topics including biological monitoring, environmental impact assessment, fisheries problems, salmon counting, ecological effects of reservoirs and other engineering works, control of water weeds, control of insect pests and effects of chemicals on plants and animals.

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**FRESHWATER BIOLOGICAL ASSOCIATION**

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A30 Okehampton Bypass  
Control of Pollution  
Biological Monitoring  
Interim Report, June 1988

An interim report to Babbie Shaw & Morton, Consulting  
Engineers

by

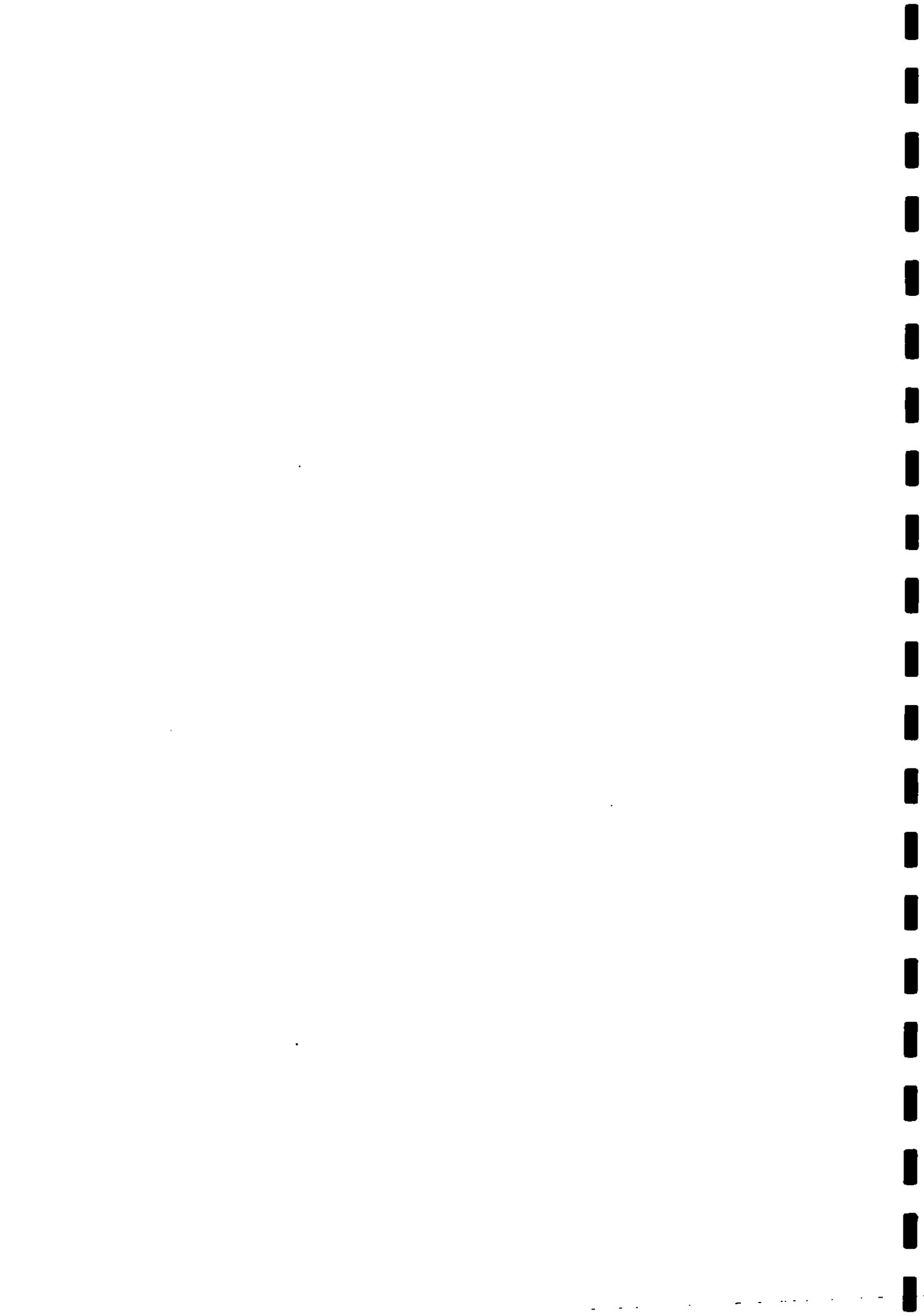
M.T. Furse, R.J.M. Gunn, & H.A. Johnson

Project Leader:	M.T. Furse
Report Date:	August 1988
Report to:	Babbie Shaw & Morton, Consulting Engineers
FBA Report Ref. No.:	RL/TO4021-1
FBA Project No.:	TO4021-1

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The Freshwater Biological Association is part of the  
Terrestrial and Freshwater Sciences Directorate of the  
Natural Environment Research Council.

A30 Okehampton Bypass  
Control of Pollution  
Biological Monitoring  
Interim Report, June 1988



Interim Report - June 1988

Sampling Programme

Sampling of aquatic macro-invertebrate communities was undertaken at the following sites on Monday 13th June 1988.

West Okement

<u>Code</u>	<u>Site Name</u>	<u>NGR</u>	<u>Chemical sampling Point</u>
W1	Vellake Cottage	SX 555 906	SB1
W2	U/S of Meldon Quarry Adit and Bypass	SX 565 928	SB2
W3	D/S of Bypass	SX 566 932	SB3
W4	U/S of Wigney	SX 568 935	SB4
W5	Okehampton Golf Course	SX 575 939	SB5
W6	Okehampton Castle	SX 585 944	SB6

East Okement

E7	U/S of Bypass	SX 604 947	SB7
E8	D/S of Bypass	SX 602 948	SB8
E9	Ball Hill	SX 597 946	SB9
E10	Okehampton Grammar School	SX 589 949	SB10

Sampling procedure

Three macro-invertebrate samples were collected at each site using a box-sampler of the type recommended by the Standing Committee of Analysts. The area enclosed by the sampler was 0.05 m<sup>2</sup>.

Sample Analysis

Samples were examined in the laboratory. In most cases all macro-invertebrates were removed from the sample for identification, but occasionally sub-sampling procedures were adopted. Most taxa, with the exception of Oligochaeta (worms) and Chironomidae (midges), were identified to species where possible.

The following data were recorded:

1. Abundances of individual species in each sample.
2. Abundances of individual families in each sample.
3. Biological Monitoring Working Party (BMWP) scores, number of scoring taxa and Average Score per Taxon (ASPT). Details of these indices are given in the June 1987 Interim Report.

## Results (Assessment of Environmental Quality)

Full results of the sampling programme are presented at the end of this report (Appendices 1-6).

The climatic conditions in the weeks prior to sampling were unexceptional and water levels in both the West and East Okement were considered "normal" for the time of year.

Results for the two streams are considered separately.

### West Okement

The highest BMWP Scores, number of taxa and Average Scores per Taxon (ASPTs) were recorded at the two control sites W1 and W2 (Fig. 1; Appendix 3). There was very little difference between the values for the two sites which were generally within the range of previously recorded data (Table 1).

Marked declines in environmental quality were indicated at sites W3 and W4, downstream of the Meldon Quarry adit and the bypass crossing point. Partial recovery took place at the two downstream sites W5 and W6.

This pattern is similar to that observed on all previous sampling occasions but comparison with earlier data (Table 1) shows that all three indices of environmental quality, score, number of taxa and ASPT, were at their lowest ever recorded level. This deterioration was particularly marked at sites W3 and W4. June 1988 values from W6 lay within the lower half of the previously recorded range (Table 1).

A decline in environmental quality between June 1987 and June 1988, and more particularly between March 1988 and June 1988, is indicated for sites W3-W5.

### East Okement

Biotic index values from site E7 (Fig. 2; Appendix 6) were higher than on any previous occasion during the study period (Table 2).

Values decline immediately downstream of the bypass crossing point, at site E8, but are generally satisfactory and lie within the upper part of the previously recorded range.

Further successive falls were recorded at sites E9 and E10 (Fig. 2) continuing the deterioration first noted in March 1988. Thus, at both downstream sites, all three measures of environmental quality were at their lowest recorded values in June 1988 (Table 2), with the single exception of number of taxa at site E9.

No significant source of environmental disturbance, other than the bypass construction, is known for the reach of river between sites E7 and E10. However no specific enquiries about other possible impacts have yet been made. The heavy suspended solid load noted in March 1988, and emanating from a seepage at the bypass crossing point, was no longer apparent.

### Future Programme

A further series of biological samples will be collected in September 1988. These will be fully analysed and an interim report prepared. These samples are the last currently scheduled for collection. Samples originally planned for December 1988 will only be taken with the agreement of the contractors.

A full report for the whole contract period will be prepared and submitted, as agreed, following consultation with the contractors. This could include historical biological data collected by South West Water and now made available to the Freshwater Biological Association.

Figure 1. Indices of environmental quality, West Okement, June 1988. Combined box samples.

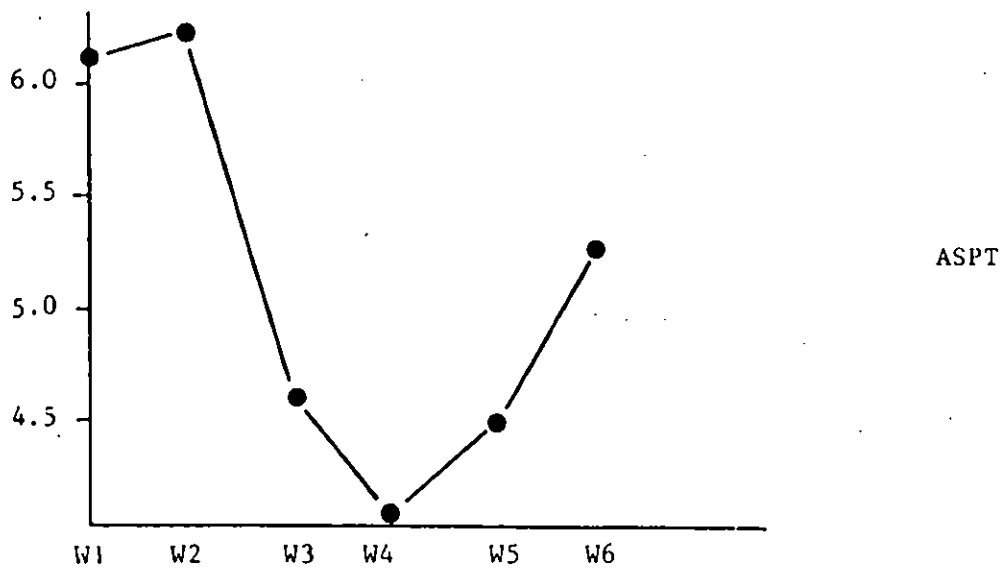
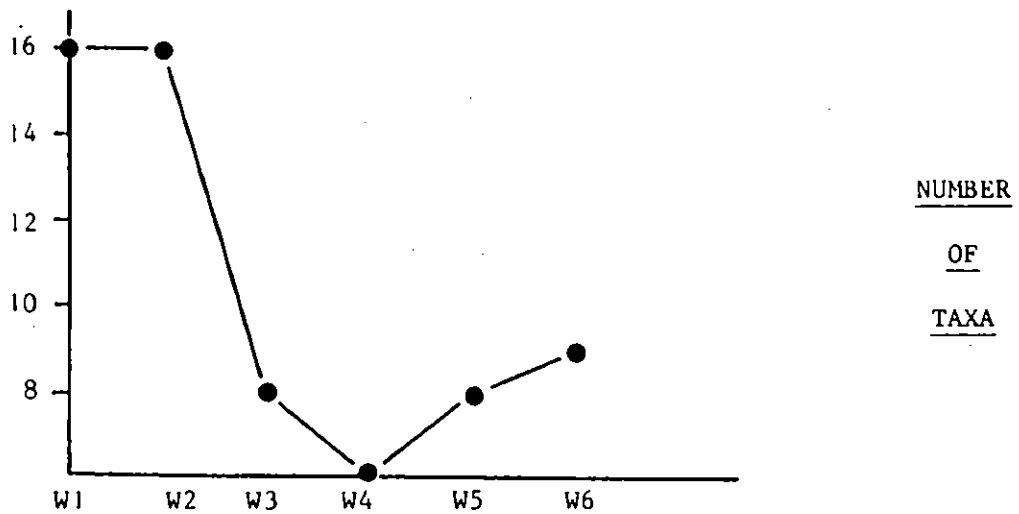
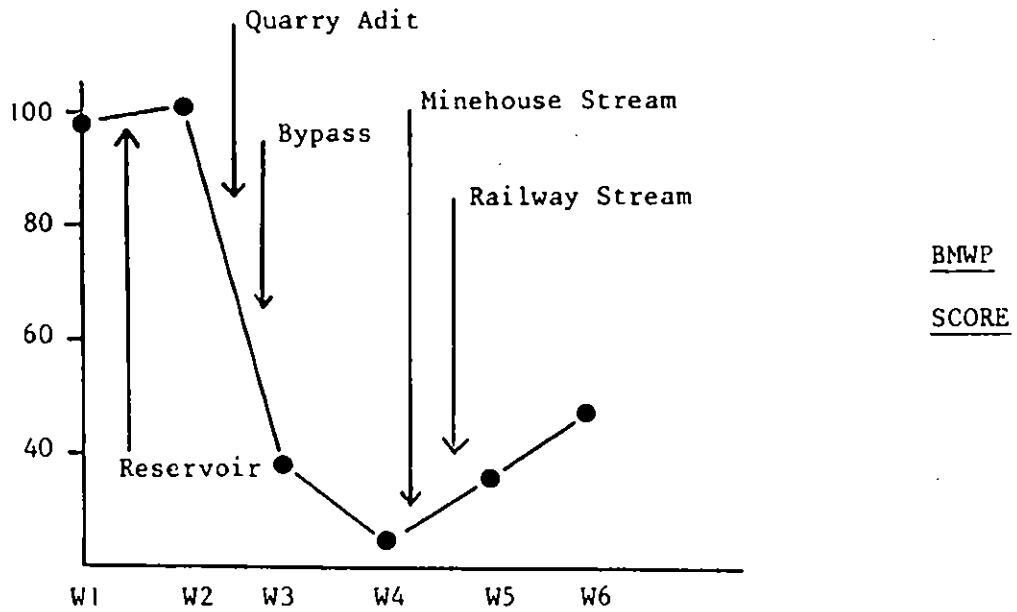




Table 1. Comparison of measures of environmental quality, West Okement, June 87 - June 88

			Score	Taxa	ASPT
W1	June	87	74	12	6.17
Vellake	Sept	87	113	17	6.65
Cottage	March	88	99	15	6.60
	June	88	98	16	6.13
W2	June	87	108	16	6.75
u/s Adit	Sept	87	118	19	6.21
u/s Bypass	March	88	107	16	6.69
	June	88	100	16	6.25
W3	June	87	53	10	5.30
d/s Bypass	Sept	87	63	11	5.73
	March	88	70	11	6.36
	June	88	37	8	4.63
W4	June	87	68	11	6.18
u/s Wigney	Sept	87	40	8	5.00
	March	88	57	9	6.33
	June	88	25	6	4.17
W5	June	87	37	8	4.63
Okehampton	Sept	87	58	11	5.27
Golf Course	March	88	45	8	5.63
	June	88	36	8	4.50
W6	June	87	71	12	5.92
Okehampton	Sept	87	39	8	4.88
Castle	March	88	44	9	4.89
	June	88	48	9	5.33

Figure 2. Indices of environmental quality, East Okement, June 1988. Combined box samples.

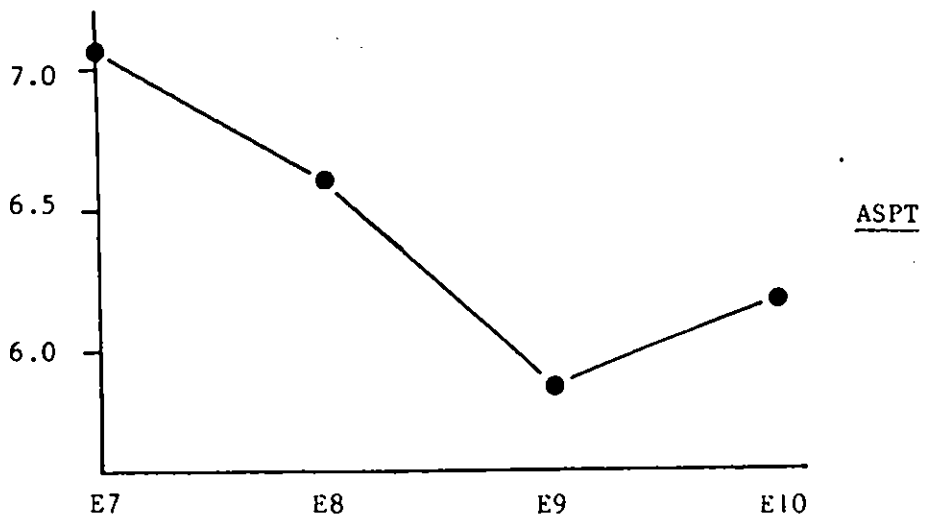
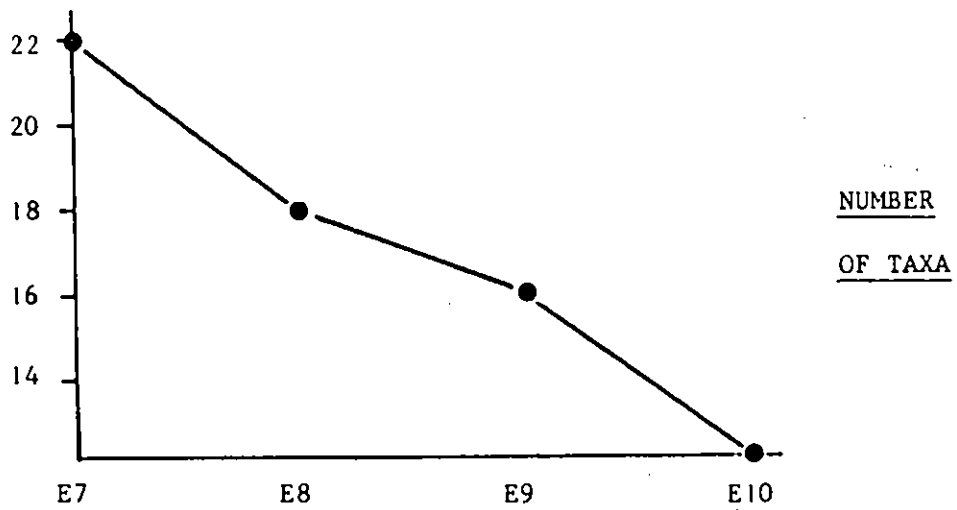
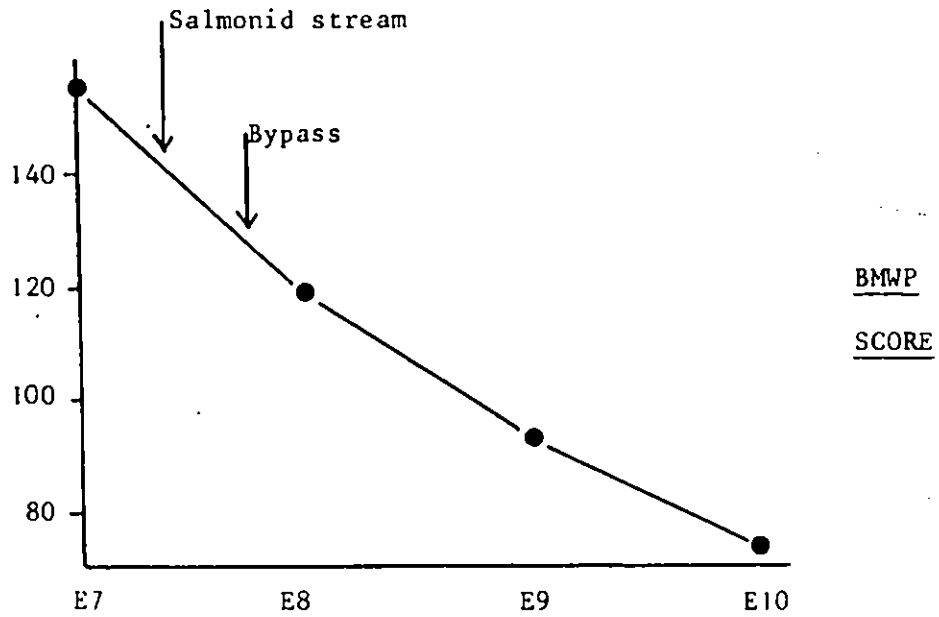


Table 2. Comparison of measures of environmental quality, East Okement,  
June 87 - June 88

		Score	Taxa	ASPT
E7 u/s Bypass	June 87	93	14	6.64
	Sept 87	135	21	6.43
	March 88	101	16	6.31
	June 88	155	22	7.05
E8 d/s Bypass	June 87	93	16	5.81
	Sept 87	128	20	6.40
	March 88	107	16	6.69
	June 88	119	18	6.61
E9 Ball Hill	June 87	106	17	6.24
	Sept 87	145	21	6.90
	March 88	99	15	6.60
	June 88	94	16	5.88
E10 Okehampton Grammar School	June 87	124	18	6.89
	Sept 87	139	19	7.32
	March 88	95	15	6.33
	June 88	74	12	6.17

## Appendix 1.

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS.  
WEST OKEMENT - JUNE 13th 1988 (BS-BOX SAMPLE)  
ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME	SITE NAME																	
	VELLAKE COTT			U/S ADIT/BYPASS			D/S BYPASS			U/S WIGNEY			GOLF COURSE			OKEHAMP. CASTLE		
	SITE W1			SITE W2			SITE W3			SITE W4			SITE W5			SITE W6		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
<b>TRICLADIDA (FLATWORMS)</b>																		
Planariidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Polycelis felina	0	4	2	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0
Phagocata vitta	14	15	4	0	0	0	0	0	0	1	3	0	1	0	1	1	0	0
<b>BIVALVIA (BIVALVE SNAILS)</b>																		
Sphaeriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<b>OLIGOCHAETA (TRUE WORMS)</b>																		
	653	152	232	49	14	316	344	40	108	68	62	56	100	16	46	9	33	23
<b>ARACHNIDA (SPIDERS &amp; MITES)</b>																		
Hydracarina	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
<b>EPHEMEROPTERA (MAYFLIES)</b>																		
<b>Baetidae</b>																		
Baetis sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis scambus	0	0	0	2	1	6	0	0	0	0	0	0	0	0	0	0	0	0
Baetis vernus	59	61	32	0	0	11	0	0	0	0	0	0	0	0	2	0	0	0
Baetis rhodani	0	0	0	1	0	4	0	1	3	0	0	0	1	0	0	0	0	0
<b>Heptageniidae</b>																		
Heptagenia lateralis	0	0	0	8	4	2	0	0	0	0	0	0	0	0	0	1	0	0
<b>Ephemerellidae</b>																		
Ephemerella ignita	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Caenidae</b>																		
Caenis rivulorum	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<b>PLECOPTERA (STONEFLIES)</b>																		
<b>Meuridae</b>																		
Protonemura meyeri	15	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphinemura sulcicollis	29	20	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Leuctridae</b>																		
Leuctra sp.	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctra inerals	30	34	6	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Leuctra fusca	28	80	14	6	6	36	0	0	0	0	0	0	0	0	0	0	0	0
<b>Periodidae</b>																		
Isoperla grammica	7	2	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0
<b>Chloroperlidae</b>																		
Chloroperla torrentium	18	18	1	3	3	13	0	0	0	0	0	0	0	0	0	0	0	0
Chloroperla tripunctata	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>COLEOPTERA (BEETLES)</b>																		
<b>Hydrophilidae</b>																		
Hydraena gracilis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Dytiscidae</b>																		
Oreodytes sanmarkii	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Eloidae</b>																		
Elois aeneus	4	15	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Limnius volckneri	16	22	11	1	0	1	1	0	0	1	0	0	0	0	4	0	1	0
Dulianius sp.	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1

Cont.

Appendix 1 (cont.)

ASO OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS.  
WEST OKEMENT - JUNE 13th 1988 (BS-BOX SAMPLE)  
ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME	SITE NAME																	
	VELLAKE COTT.			U/S ADIT/BYPASS			D/S BYPASS			U/S WIGNEY			GOLF COURSE			OKEHAMP. CASTLE		
	SITE W1			SITE W2			SITE W3			SITE W4			SITE W5			SITE W6		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
<b>SIALIDAE (ALDERFLIES)</b>																		
Sialidae																		
<i>Sialis fuliginosa</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TRICHOPTERA (CADDISFLIES)</b>																		
Rhyacophilidae																		
<i>Rhyacophila</i> sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Rhyacophila dorsalis</i>	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycentropodidae	0	0	0	9	5	5	0	0	0	0	0	1	0	1	4	0	0	0
<i>Plectrocnemia</i> sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Plectrocnemia geniculata</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Polycentropus flavonaculatus</i>	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0
<i>Polycentropus kingi</i>	0	0	0	1	4	0	0	0	0	0	1	0	0	0	0	2	1	2
Hydropsychidae																		
<i>Hydropsyche siltalai</i>	2	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Limnephilidae																		
<i>Potamophylax cingulatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Sericostomatidae																		
<i>Sericostoma personatus</i>	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	1	1
LEPIDOPTERA (MOTHS - AQUATIC LARVAE)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>DIPTERA (TRUE FLIES)</b>																		
Tipulidae																		
<i>Eloeophila</i> sp.	0	0	0	1	1	0	0	0	0	0	4	1	0	1	0	0	0	1
<i>Dicranota</i> sp.	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simuliidae																		
<i>Simulium cryophilum</i> group	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Simulium vernalis</i> group	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Simulium ornatum</i> group	3	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Simulium variegatum</i> group	3	4	9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Chironomidae	10	2	13	31	61	12	22	2	6	8	20	24	14	12	17	45	183	156
Epididae																		
<i>Chelifera</i> group	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Miedemannia</i> group	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rhaqtonidae																		
<i>Atherix ibis</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Atherix marginata</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0

Appendix 2.

A30 OKHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS,  
WEST OKEMENT - JUNE 13th 1988 (BS-BOX SAMPLE)  
FAMILY ABUNDANCES

TAXON NAME (BNWP SCORE)	SITE NAME																	
	VELLAKE COTT			U/B ADIT/BYPASS			D/B BYPASS			U/B WIGNEY			GOLF COURSE			OKEMAMP. CASTLE		
	SITE W1			SITE W2			SITE W3			SITE W4			SITE W5			SITE W6		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
Planariidae (5)	14	19	6	1	1	0	0	0	1	2	4	0	1	0	1	1	0	0
Sphaeriidae (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
OLIGOCHAETA (1)	653	152	232	49	14	316	344	40	108	68	62	56	100	16	46	9	33	23
Hydracarina (/)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
Baetidae (4)	59	61	32	4	1	21	0	1	3	0	0	0	1	0	2	0	0	0
Heptageniidae (10)	0	0	0	8	4	2	0	0	0	0	0	0	0	0	0	1	0	0
Ephemereilidae (10)	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caenidae (7)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Neouridae (7)	44	27	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae (10)	58	112	20	8	9	39	0	0	0	0	0	0	0	0	0	0	0	0
Perlodidae (10)	7	2	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0
Chloroperlidae (10)	18	18	1	5	3	13	0	0	0	0	0	0	0	0	0	0	0	0
Dytiscidae (5)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrophilidae (5)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elmidae (5)	20	38	18	2	0	1	1	0	0	1	0	0	0	0	4	1	2	1
Sialidae (4)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophilidae (7)	4	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycentropodidae (7)	2	1	0	11	9	8	0	0	0	0	1	1	0	1	4	2	1	2
Hydropsychidae (5)	2	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Liemphllidae (7)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Sericostomatidae (10)	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	1	1
Lepidoptera (/)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tipulidae (5)	0	1	2	1	1	0	0	0	0	0	4	1	0	1	0	0	0	1
Simuliidae (5)	7	11	12	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Chironomidae (2)	10	2	13	31	61	12	22	2	6	8	20	24	14	12	17	45	183	156
Epididae (/)	1	0	0	1	2	1	0	0	0	0	1	0	0	0	0	0	0	0
Rhagionidae (/)	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BNWP) SCORE FOR THE FAMILY. (/)=NON-SCORING TAXON.

Appendix 3.

A30 OXENHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKENENT RIVERS,  
WEST OKENENT - JUNE 13th 1988 (BS-BOX SAMPLE)  
BIOLOGICAL MONITORING WORKING PARTY (BMWP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

INDEX	SITE NAME																	
	VELLAKE COTTAGE SITE W1			U/S ADIT/BYPASS SITE W2			D/S BYPASS SITE W3			U/S WIGNEY SITE W4			GOLF COURSE SITE W5			OXENHAMPTON CASTLE SITE W6		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
BMWP SCORE	88	93	76	79	68	81	18	12	17	13	20	15	19	15	24	30	25	33
COMB. SCORE	98			100			37			25			36			48		
No. TAXA	14	15	13	13	11	12	4	4	5	4	5	4	5	4	6	6	5	7
COMB. No. TAXA	16			16			8			6			8			9		
ASPT	6.29	6.20	5.85	6.08	6.18	6.75	4.50	3.00	3.40	3.25	4.00	3.75	3.80	3.75	4.00	5.00	5.00	4.71
COMB. ASPT	6.13			6.25			4.63			4.17			4.50			5.33		

A30 OKEHAMPTON BYPASS SCHEME    MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS.  
EAST OKEMENT - JUNE 13th 1988 (BS=BOX SAMPLE)  
ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME	SITE NAME											
	U/S BYPASS SITE E7			D/S BYPASS SITE E8			BALL HILL SITE E9			GRAMMAR SCHOOL SITE E10		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
<b>TRICLADIDA (FLATWORMS)</b>												
Planariidae												
Polycelis felina	2	0	0	0	2	0	0	0	0	0	2	0
Phagocata vitta	1	0	0	0	0	0	1	0	0	0	0	0
Dendrocoelidae												
Dendrocoelum lacteum	0	0	0	0	0	0	0	1	0	0	0	0
<b>GASTROPODA (SNAILS)</b>												
Hydrobiidae												
Potamopyrgus jenkinsi	0	0	0	1	0	0	1	0	0	0	0	0
<b>NEMATODA (NEMATODES)</b>												
	0	0	0	0	1	0	0	0	1	1	0	0
<b>OLIGOCHAETA (TRUE WORMS)</b>												
	280	112	176	68	304	168	220	352	94	56	102	204
<b>ARACHNIDA (SPIDERS &amp; MITES)</b>												
Hydracarina												
	0	0	2	1	0	0	0	2	0	1	0	0
<b>EPHEMEROPTERA (MAYFLIES)</b>												
Baetidae												
Baetis sp.	2	4	1	0	0	8	6	20	4	2	6	0
Baetis scabus	14	30	18	72	74	28	106	147	80	68	72	96
Baetis rhodani	18	3	5	5	86	44	32	93	4	2	0	0
Heptageniidae												
Rhithrogena semicolorata	0	1	0	0	0	0	0	0	0	0	0	0
Heptagenia lateralis	2	3	2	1	0	0	1	0	0	0	1	0
Ecdyonurus sp.	1	0	0	0	0	0	0	0	0	0	0	0
Ecdyonurus venosus	0	0	0	0	0	0	3	2	0	0	0	0
Leptophlebiidae												
Habrophlebia fusca	0	0	0	1	0	0	0	0	0	0	0	0
Ephemerellidae												
Ephemerella ignita	7	4	4	16	13	3	14	29	11	6	7	6
<b>PLECOPTERA (STONEFLIES)</b>												
Nemouridae												
Protonemura meyeri	5	0	0	0	0	0	0	0	0	0	0	0
Amphineura sulcicollis	6	0	0	0	0	0	0	0	0	0	0	0
Leuctridae												
Leuctra sp.	20	0	0	0	0	0	0	0	0	0	0	0
Leuctra inereis	9	0	4	0	0	0	1	0	0	0	0	0
Leuctra fusca	25	15	34	1	3	0	0	2	1	0	0	0
Perlodidae												
Isoperla grammica	0	1	0	1	0	0	0	0	0	0	0	0
Chloroperlidae												
Chloroperla sp.	0	0	0	0	0	1	0	0	0	0	0	2
Chloroperla torrentium	20	18	13	0	1	0	0	0	0	0	0	0
Chloroperla tripunctata	5	0	4	0	0	0	0	0	0	0	0	0

Cont.



A30 OKHAMPTON BYPASS SCHEME    MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS.  
EAST OKEMENT - JUNE 13th 1988 (BS=BOX SAMPLE)  
ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME	SITE NAME											
	U/S BYPASS SITE E7			D/S BYPASS SITE E8			BALL HILL SITE E9			GRAMMAR SCHOOL SITE E10		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
<b>COLEOPTERA (BEETLES)</b>												
Hydrophilidae												
Hydraena gracilis	1	2	0	0	0	0	0	0	0	0	0	0
Helophorus brevipalpis	0	1	0	0	0	0	0	0	0	0	0	0
Dytiscidae												
Oreodytes sannaarkii	0	0	0	0	0	0	2	0	2	3	0	0
Elmidae												
Elmis aenea	1	2	0	0	4	2	2	3	1	0	0	0
Esolus parallelipipedus	0	0	0	0	0	0	1	1	1	2	0	6
Limnius volckeari	1	2	0	1	0	2	1	3	8	10	3	1
Oulienius sp.	0	0	0	1	0	0	2	0	3	1	1	4
<b>TRICHOPTERA (CADDISFLIES)</b>												
Rhyacophilidae												
Rhyacophila sp.	2	1	2	0	2	1	1	0	0	0	0	0
Rhyacophila dorsalis	3	1	1	4	3	3	1	3	1	0	0	0
Polycentropodidae												
Plectrocnemia geniculata	1	0	0	0	0	0	0	0	0	0	0	0
Polycentropus sp.	0	0	0	0	0	0	0	0	2	0	0	0
Polycentropus flavoaculatus	0	6	5	0	0	0	0	0	0	0	0	0
Polycentropus kingi	0	4	5	2	1	1	5	3	10	6	7	11
Hydropsychidae												
Hydropsyche siltalai	20	2	2	0	0	1	0	0	0	0	0	0
Linnephilidae												
Potamophylax cingulatus	0	0	1	0	0	0	0	0	0	0	0	0
Odontoceridae												
Odontocerum albicorne	0	1	0	0	0	0	0	0	0	0	0	0
Goeridae												
Silo pallipes	0	1	0	0	0	0	0	0	0	0	0	0
Lepidostomatidae												
Lepidostoma hirtum	0	0	3	0	0	0	0	0	0	0	0	0
Sericoxetidae												
Sericoxeta personatus	5	9	1	0	3	0	0	4	2	0	1	1
Tipulidae												
Eloeophila sp.	1	0	0	2	3	3	0	2	0	0	1	0
Dicranota sp.	13	0	1	0	0	0	0	0	0	0	0	0
Simuliidae												
Simulium sp.	0	0	0	0	1	0	0	0	0	0	0	0
Simulium cryophilus	1	1	0	0	0	0	0	2	0	0	0	0
Simulium vernus group	2	8	0	0	0	0	3	2	0	0	0	0
Simulium ornatus group	0	0	0	0	0	2	1	2	0	0	0	0
Simulium variegatum group	2	0	1	1	2	2	2	0	0	0	0	0
Chironomidae												
Epididae	0	1	2	0	3	1	1	2	1	1	2	2
Chelifera group	0	0	0	0	0	0	0	0	0	0	0	1
Hemerodromia group	1	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia group	1	0	0	0	3	0	0	2	0	0	0	1
Dolichopodidae												
Rhagionidae	0	0	0	0	0	0	0	0	1	0	0	0
Atherix marginata	1	0	0	1	4	0	0	2	1	0	1	0

## Appendix 5.

A30 OKEHAMPTON BYPASS SCHEME    MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS,  
EAST OKEMENT - JUNE 13th 1988 (BS=BOX SAMPLE)  
FAMILY ABUNDANCES

TAXON NAME (BMWP SCORE)	SITE NAME											
	U/S BYPASS			D/S BYPASS			BALL HILL			GRAMMAR SCHOOL		
	SITE E7			SITE E8			SITE E9			SITE E10		
	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3	BS1	BS2	BS3
Planariidae (5)	3	0	0	0	2	0	1	0	0	0	2	0
Dendrocoelidae (5)	0	0	0	0	0	0	0	1	0	0	0	0
Hydrobiidae (3)	0	0	0	1	0	0	1	0	0	0	0	0
OLIGOCHAETA (1)	280	112	176	68	304	168	220	352	94	56	102	204
Hydracarina (/)	0	0	2	1	0	0	0	2	0	1	0	0
Baetidae (4)	34	37	24	77	160	80	144	260	88	72	78	96
Heptageniidae (10)	3	4	2	1	0	1	4	2	0	0	1	0
Leptophlebiidae (10)	0	0	0	1	0	0	0	0	0	0	0	0
Ephemereilidae (10)	7	4	4	16	13	3	14	29	11	6	7	6
Neaouridae (7)	11	0	0	0	0	0	0	0	0	0	0	0
Leuctridae (10)	54	15	38	1	3	0	0	3	1	0	0	0
Perlodidae (10)	0	1	0	1	0	0	0	0	0	0	0	0
Chloroperlidae (10)	25	18	17	0	1	1	0	0	0	0	0	2
Dytiscidae (5)	0	0	0	0	0	0	2	0	2	3	0	0
Hydrophilidae (5)	1	3	0	0	0	0	0	0	0	0	0	0
Elmidae (5)	2	4	0	2	4	4	6	7	13	13	4	11
Rhyacophilidae (7)	5	2	3	4	5	4	2	3	1	0	0	0
Polycentropodidae (7)	2	12	12	3	1	1	6	5	12	8	8	11
Hydropsychidae (5)	20	2	2	0	0	1	0	0	0	0	0	0
Limnephilidae (7)	0	0	1	0	0	0	0	0	0	0	0	0
Odontoceridae (10)	0	1	0	0	0	0	0	0	0	0	0	0
Goeridae (10)	0	1	0	0	0	0	0	0	0	0	0	0
Lepidostomatidae (10)	0	0	3	0	0	0	0	0	0	0	0	0
Sericostomatidae (10)	5	9	1	0	3	0	0	4	2	0	1	1
Tipulidae (5)	14	0	1	2	3	3	0	2	0	0	1	0
Simuliidae (5)	5	9	1	1	3	4	6	6	0	0	0	0
Chironomidae (2)	64	94	74	93	200	72	124	180	92	136	88	100
Epididae (/)	2	1	2	0	6	1	1	4	1	1	2	4
Dolichopodidae (/)	0	0	0	0	0	0	0	0	1	0	0	0
Rhaqionidae (/)	1	0	0	1	4	0	0	2	1	0	1	0

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMWP) SCORE FOR THE FAMILY.  
 (/)=NON-SCORING TAXON.

Appendix 6.

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS.  
EAST OKEMENT - JUNE 13th 1988 (BS=BOX SAMPLE)  
BIOLOGICAL MONITORING WORKING PARTY (BMWP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

<u>INDEX</u>	<u>SITE NAME</u>											
	<u>U/B BYPASS</u>			<u>D/B BYPASS</u>			<u>BALL HILL</u>			<u>BRANMAR SCHOOL</u>		
	<u>SITE E7</u>			<u>SITE E8</u>			<u>SITE E9</u>			<u>SITE E10</u>		
	<u>B91</u>	<u>B92</u>	<u>B93</u>	<u>B91</u>	<u>B92</u>	<u>B93</u>	<u>B91</u>	<u>B92</u>	<u>B93</u>	<u>B91</u>	<u>B92</u>	<u>B93</u>
BMWP SCORE	108	121	103	89	81	71	64	81	61	34	59	49
COMB. SCORE		155			119			94			74	
No. TAXA	17	17	15	14	13	12	12	13	10	7	10	8
COMB. No. TAXA		22			18			16			18	
ASPT	6.35	7.12	6.87	6.36	6.23	5.92	5.33	6.23	6.10	4.86	5.90	6.13
COMB. ASPT		7.05			6.61			5.88			6.17	



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