ENVIRONMENTAL DEPARTMENT
CORNWALL AREA

NRA

FINAL DRAFT REPORT

RIVER CAMEL EC DANGEROUS SUBSTANCE DIRECTIVE FAILURE - 1993

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RIVER CAMEL

ST. LAWRENCE STREAM INVESTIGATION

EC Dangerous Substance Failure (1993)

AN ASSESSMENT OF RIVER WATER QUALITY IN THE ST: LAWRENCE STREAM SUB-CATCHMENT FOLLOWING AN EC DANGEROUS SUBSTANCE FAILURE IN THE RIVER CAMEL IN 1993.

INV/95/002

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1 INTRODUCTION

1.1 Background

The River Camel at R25B019 failed the EC Dangerous Substance Standards for total Zinc and dissolved Copper in 1993.

Total Zinc concentrations increased by 4.0 µg/l between WSTW1517FE and R25B019, causing exceedence of the 8.0 µg/l standard at R25B019. The St. Lawrence Stream was estimated to have contributed to 50% of this increase (calculated from theoretical flows).

Dissolved Copper concentrations increased by 0.4 µg/l between WSTW1517FE and R25B019, causing exceedence of the 1.0 µg/l standard at R25B019. The St. Lawrence Stream being estimated to have contributed to 100% of this increase (again calculated from theoretical flows).

No metals data were collected for Bodmin (Nanstallon) STW discharge (WSTW151FE) in 1993. Therefore the contribution of the discharge to EC dangerous substance directive failure at R25B019 cannot be estimated.

1.2 Objectives

To identify all significant sources of Zinc and Copper contamination in the St. Lawrence Stream sub-catchment, and the River Camel downstream of WSTW1517A; with a view to determining the cause of the failure at R25B0019, the downstream site for Bodmin (Nanstallon) STW discharge.

2 METHODS

The following methods were adopted to firstly isolate and then evaluate all possible metal sources in the sub-catchment.

- Review of archive data for all relevant sample sites.
- Preliminary survey of the St. Lawrence Stream sub-catchment using *in situ* methods of assessment; primarily the use of water quality monitors and the identification of aquatic macroinvertebrate indicators of metal pollution; (Figure 1).
- Extensive chemical sampling survey of all identified possible sources within the St. Lawrence Stream sub-catchment and of the relevant section of the main River Camel; (Figure 2).
- Follow-up chemical sampling to investigate issues raised by first phase chemical survey; (Figure 3.).

3 RESULTS

A summary of the water quality monitor results, the macroinvertebrate biological assessment and water chemistry data is contained in Table 1.
The water chemistry data are illustrated in Figures 4 and 5.

4 DISCUSSION

The preliminary survey highlighted two sources of high conductivity in the St. Lawrence Stream sub-catchment; leachate from an abandoned mining area, at Tretoil, towards the west of Tregullon Moor, and a drainage ditch within the Halgavor Moor area.

The chemical survey confirmed that reasonably high concentrations of Copper and Zinc were present in the water discharging from both of these areas and, in addition, confirmed that both Bodmin (Scarlet's Well) STW and Bodmin (Nanstallon) STW were also notable sources.

Additional chemical sampling, conducted to isolate further the various sources identified in the first phase chemical survey, confirmed that the major sources of both Copper and Zinc in this sub-catchment were the Bodmin (Walker Lines) S.S.O. on Halgavor Moor and the abandoned mine workings in and around the Tregullon Moor area.

5 CONCLUSIONS

5.1 Four significant sources of Copper and Zinc contamination were identified in the investigation:
The abandoned Tretoil mining area, in and around Tregullon Moor; Bodmin (Walker Lines) SSO; Bodmin (Scarlet's Well) STW and Bodmin (Nanstallon STW).

5.2 The Tregullon Moor area was considered to be the major source of Copper and Zinc contamination in the St. Lawrence Stream catchment.

6 RECOMMENDATIONS

6.1 As amelioration of the waters discharging from Tregullon Moor would be an unrealistic objective; due consideration should be given to the nature and condition of the St. Lawrence Stream catchment when determining the Copper and Zinc standards imposed on the River Camel at site R25B019.

6.2 Further investigation should be undertaken into the nature of the discharge from Bodmin (Walker Lines) SSO.

6.3 Further work should be carried out on the discharges from Bodmin (Scarlet's Well) STW and Bodmin (Nanstallon) STW, to more accurately quantify their impact on the River Camel.

Table 1. Summary of Water Quality Monitor, Biological & Chemical Data.

	SITE	Preliminary Survey: Water Quality Monitor D.O. %	pH	Cond. us	Turbid. NTU	Biology B.M.W.P.	A.S.P.T.	A.S.P.T. / B.M.W.P.	First Phase Chemical Survey: Cu (Total) mg/l	Cu (Diss) mg/l	Zn (Total) mg/l	Zn (Diss) mg/l	Second Phase Chemical Survey: Cu (Total) mg/l	Cu (Diss) mg/l	Zn (Total) mg/l	Zn (Diss) mg/l
1	R.Camel;D/S Conf. St.Lawrence Stream								0.003	0.004	0.008	0.009				
2	Bodmin (Nanstallon) STW								0.010	0.005	0.041	0.028				
3	R.Camel; U/S Nanstallon STW								0.001	0.002	0.003	0.003				
4	Bodmin (Scarlet's Well) STW								0.011	0.013	0.079	0.074				
5	R.Camel; U/S Scarlet's Well STW								0.001	0.002	0.004	0.004				
6	St.Lawrence Str.; U/S R.Camel	88	7.10	239	6	88	5.50	0.063	0.005	0.005	0.021	0.022	0.005	0.003	0.022	0.019
7	St.Law.Str.; U/S STW entrance	90	7.15	239	6	82	5.13	0.063	0.005	0.004	0.023	0.022				
8	St.Law.Str.;U/S Blowinghouse Bridge	91	7.15	260	6	96	5.05	0.053	0.006	0.005	0.026	0.026	0.003	0.003	0.027	0.025
9	St.Law.Str.South; U/S Conf. N branch								0.008	0.008	0.038	0.048	0.012	0.007	0.080	0.070
15	Tributary from Treliggon	90	7.20	233	8	103	6.06	0.059	0.004	0.003	0.008	0.006				
10	St.Law.Str.South; U/S Treliggon Trib.	91	7.20	226	5	74	5.69	0.077	0.012	0.011	0.076	0.073				
16	Small trib. from Tretoil mine area	94	7.20	201	15	25	5.00	0.200	0.032	0.021	0.189	0.183				
11	St.Law.Str.South; U/S Tretoil trib.								0.005	0.005	0.039	0.037				
17	Small trib. from Tregullon Moor								0.029	0.024	0.150	0.150				
12	St.Law.Str.South; U/S Tregullon trib.	93	7.20	199	11	124	5.91	0.048	0.003	0.004	0.037	0.034	0.001	0.001	0.021	0.019
13	St.Law.Str.South; U/S Golf Club P.S.												0.001	0.001	0.035	0.036
14	St.Law.Str.South; U/S at source												0.001	0.002	0.010	0.010
18	St.Law.Str.North; U/S Conf. S branch								0.003	0.004	0.014	0.017	0.006	0.002	0.011	0.012
19	St.Law.Str.North; Little Kirland	92	6.90	310	22	81	5.06	0.063								
20	St.Law.Str.North; D/S Halgavor Farm	93	7.00	340	19	60	5.00	0.083	0.006	0.006	0.028	0.028	0.002	0.002	0.014	0.012
21	St.Law.Str.North; D/S Halgavor Farm trib.															
29	Trib. at Halgavor Farm								0.017	0.011	0.015	0.008				
22	St.Law.Str.North; U/S Halgavor Farm trib.								0.009	0.005	0.029	0.029				
30	Drainage ditch from Halgavor Moor	91	6.85	610	11				0.008	0.009	0.036	0.050				
23	Drainage pipe from Halgavor Moor area	25	5.50	450	12				0.016	0.011	0.135	0.141				
24	St.Law.Str.North; U/S drainage ditch & pipe	87	6.70	193	13				0.003	0.003	0.020	0.019				
31	Halgavor drainage ditch; D/S unknown pipe								0.007	0.007	0.035	0.036				
32	Halgavor drainage ditch; unknown pipe	42	5.60	1100	2				0.003	0.003	0.017	0.018				
33	Halgavor drainage ditch; U/S unknown pipe	81	6.55	270	23				0.014	0.021	0.069	0.079				
34	S.S.O. at source of Halgavor drainage ditch												0.110	0.092	0.240	0.218
25	Unknown Pipe Discharge	80	6.15	300	10											
26	St.Law.Str.North; D/S storm drainage channel	92	7.05	158	*210*	44	4.89	0.111	0.003	0.002	0.012	0.013				
35	Storm drainage channel								0.006	0.006	0.024	0.025				
27	St.Law.Str.North; U/S storm drainage channel	91	6.90	173	33				0.002	0.002	0.011	0.013				
28	St.Law.Str.North; U/S B3268 (Lostwithiel Rd)	90	6.55	176	10	98	6.13	0.063					0.002	0.002	0.015	0.011
36	Storm drainage channel; Lostwithiel Rd Culvert	65	7.10	249	*710*				0.002	0.002	0.012	0.011				

KEY:

Italics High Turbidity result due to pollution event here at time of sampling.	Indicates a result of particular interest or relevance.	Indication of the presence of tolerant macroinvertebrate species.

Figure 1. St. Lawrence Stream Water Quality Investigation 19-20/09/94

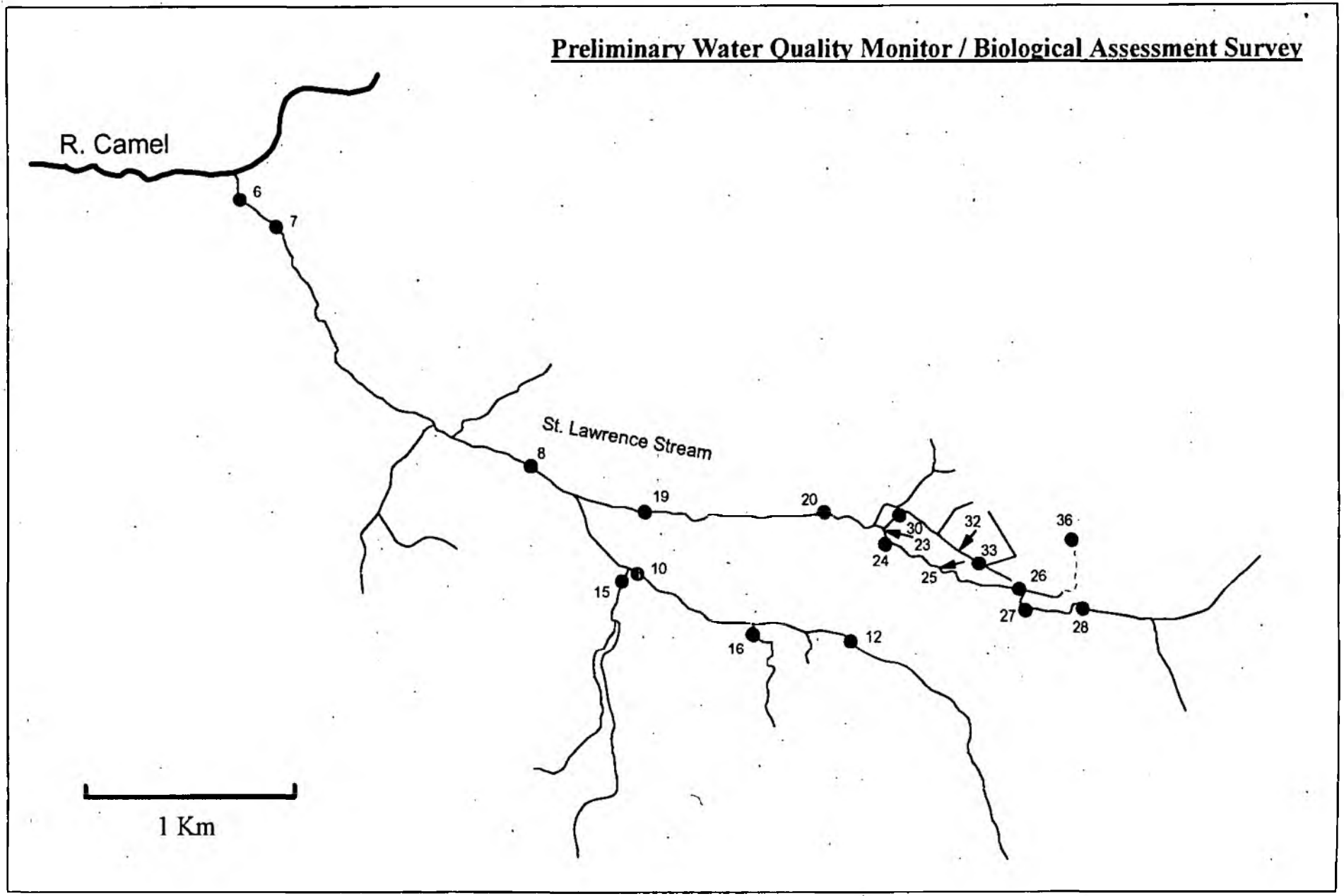


Figure 2. St. Lawrence Stream Water Quality Investigation 28/09/94

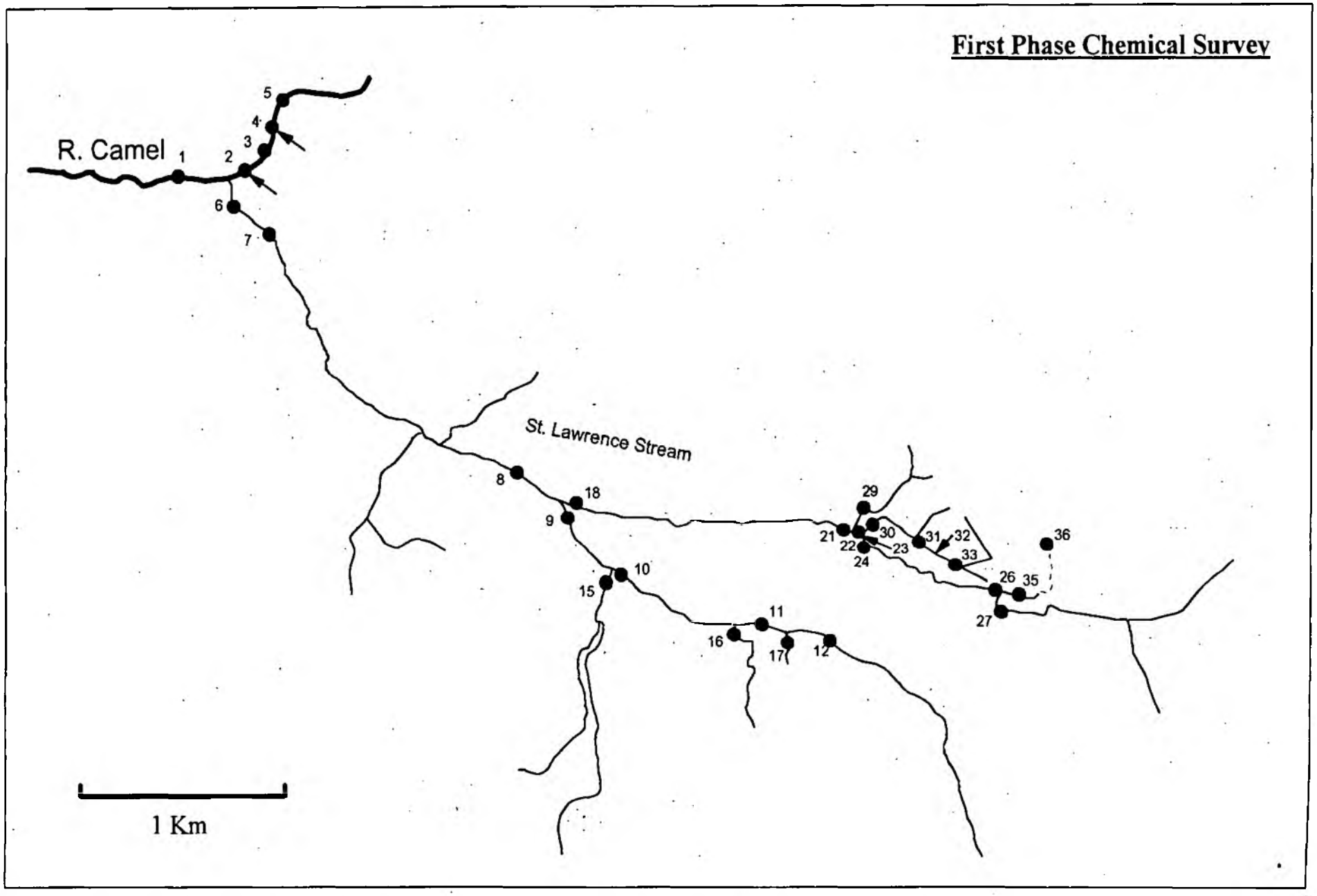


Figure 3. St. Lawrence Stream Water Quality Investigation 14/10/94

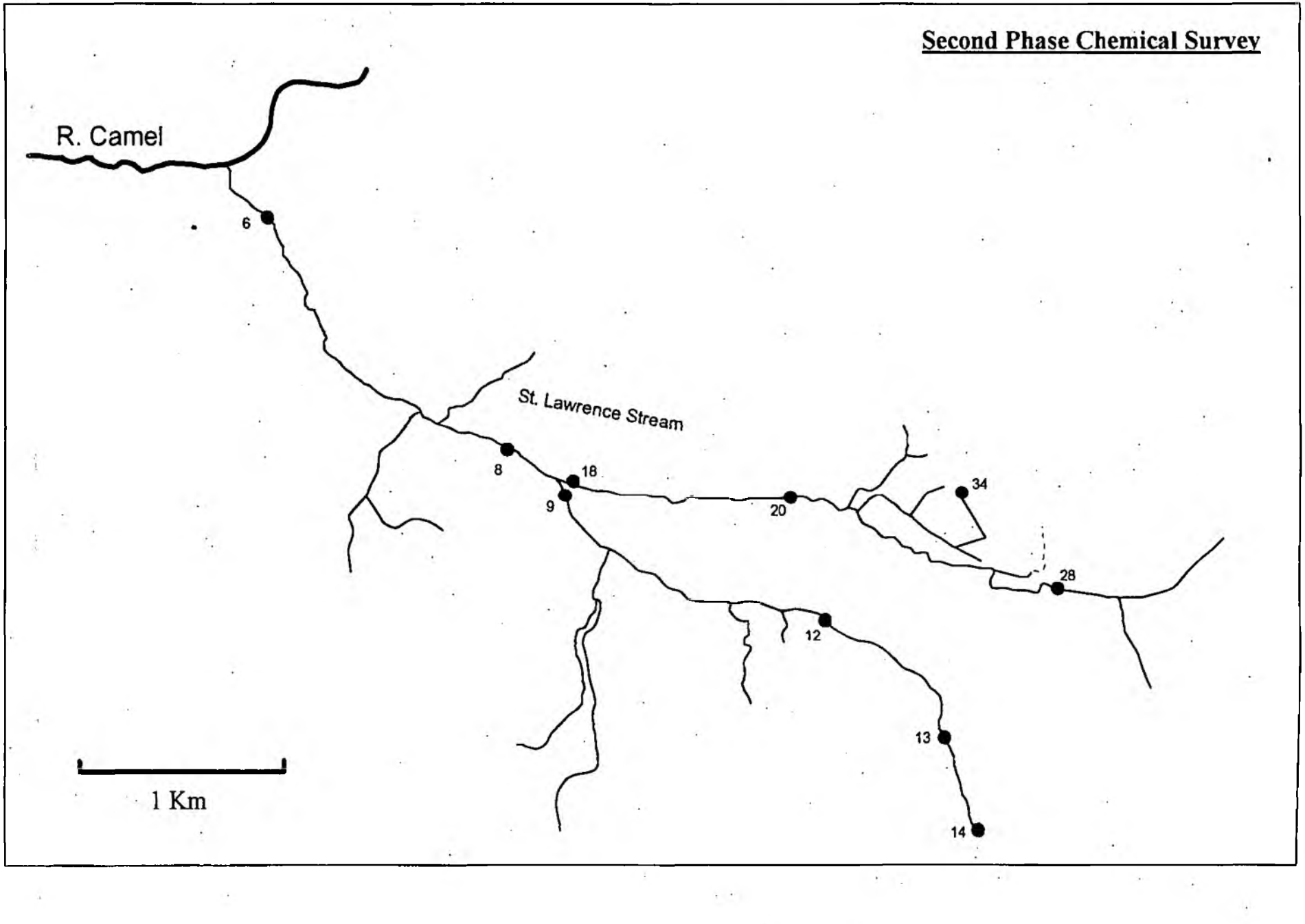
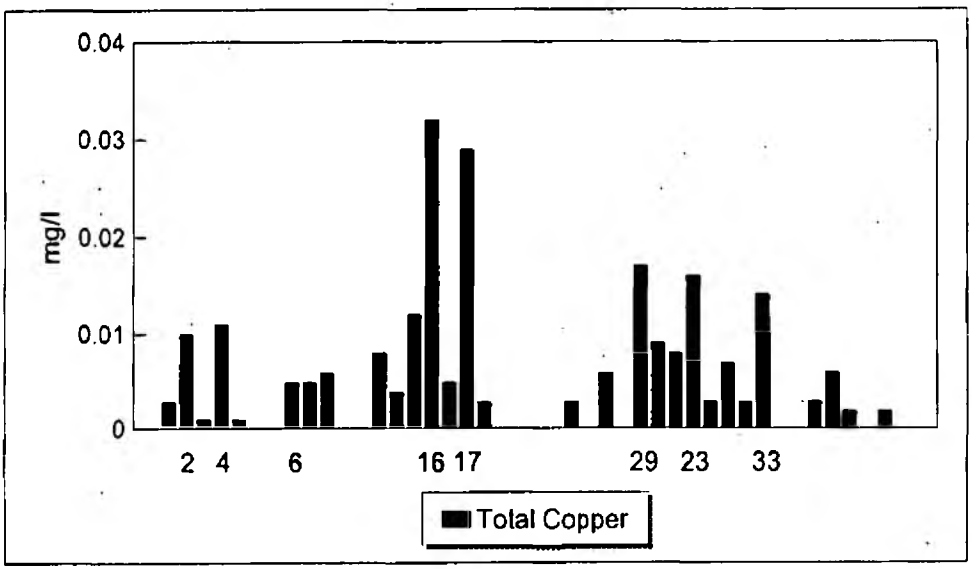
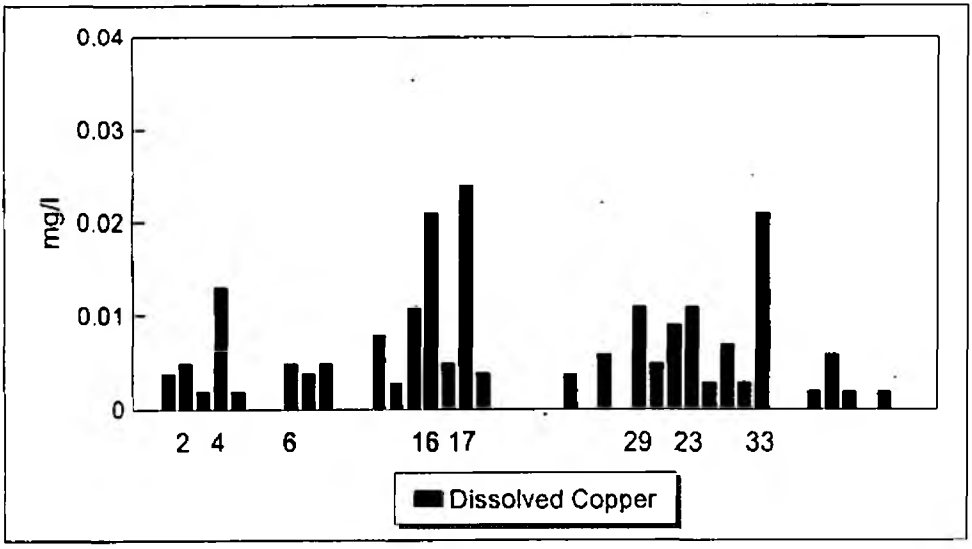
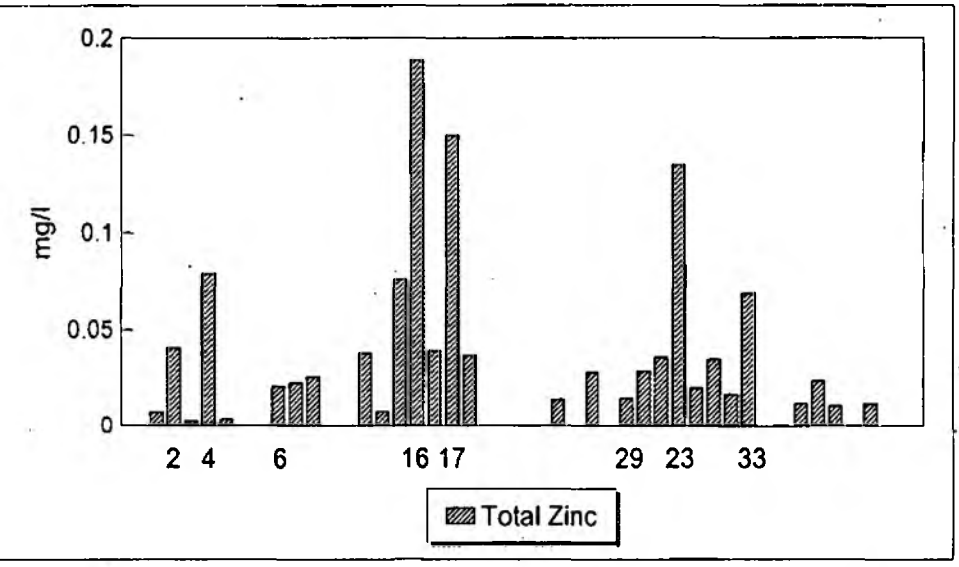


Figure 4. Results of First Phase Chemical Survey






0.2
0.15
0.1
0.05
0
mg/l
2 4 6 16 17 29 23 33
Total Zinc

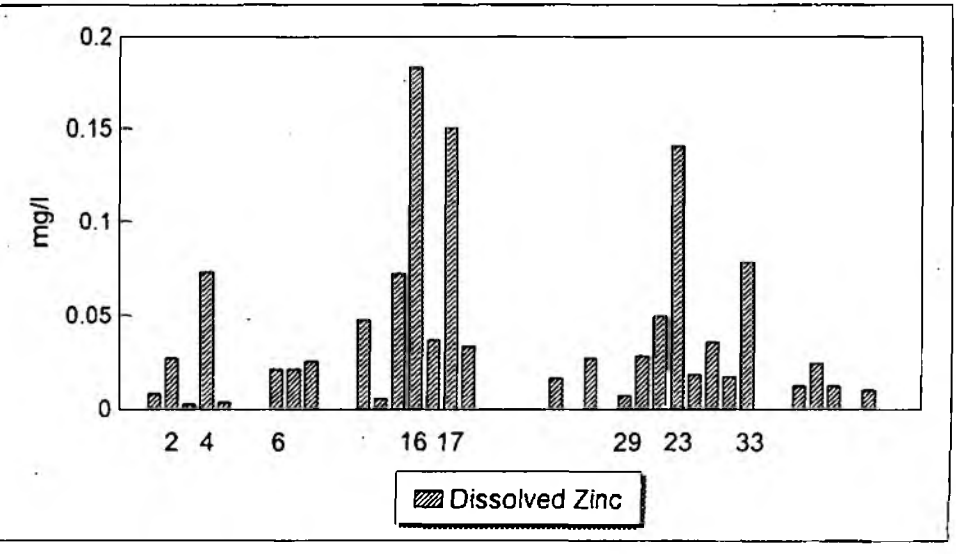
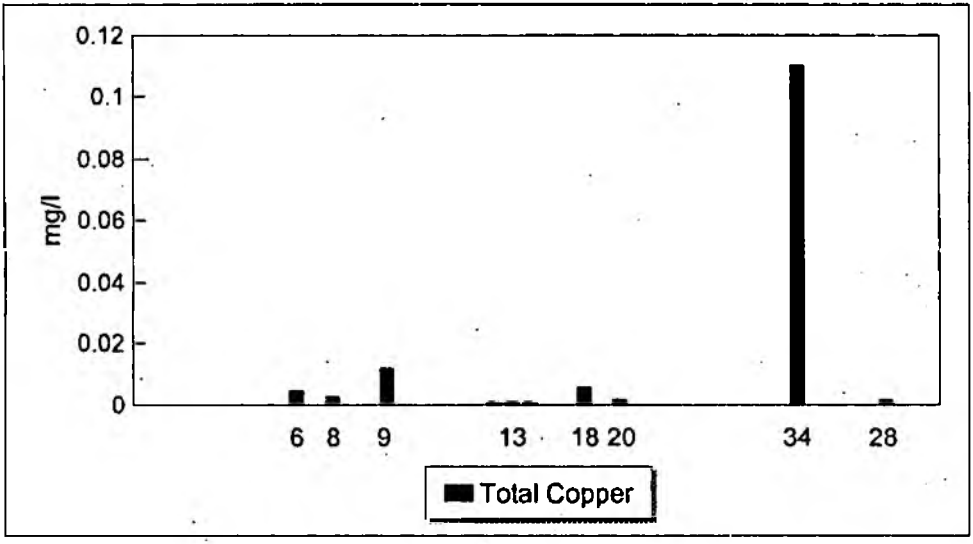
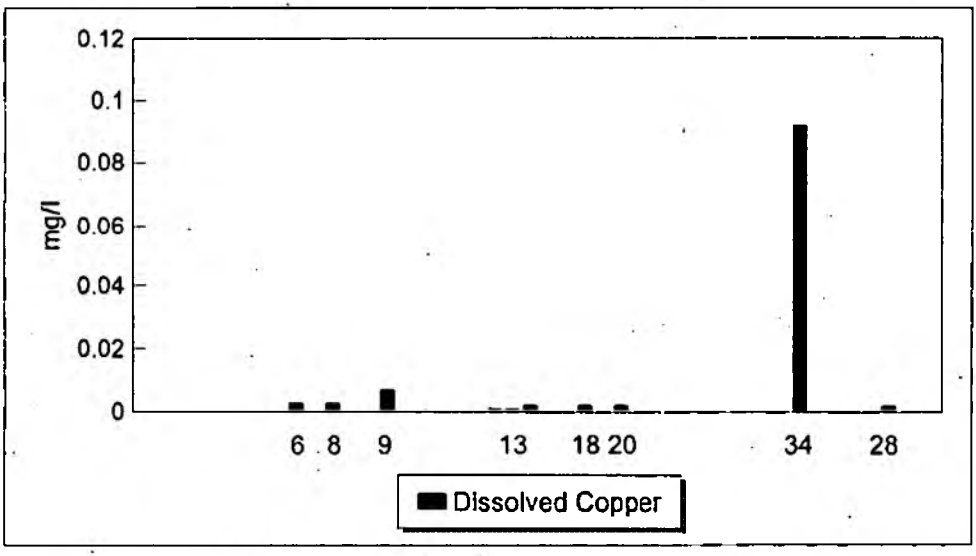
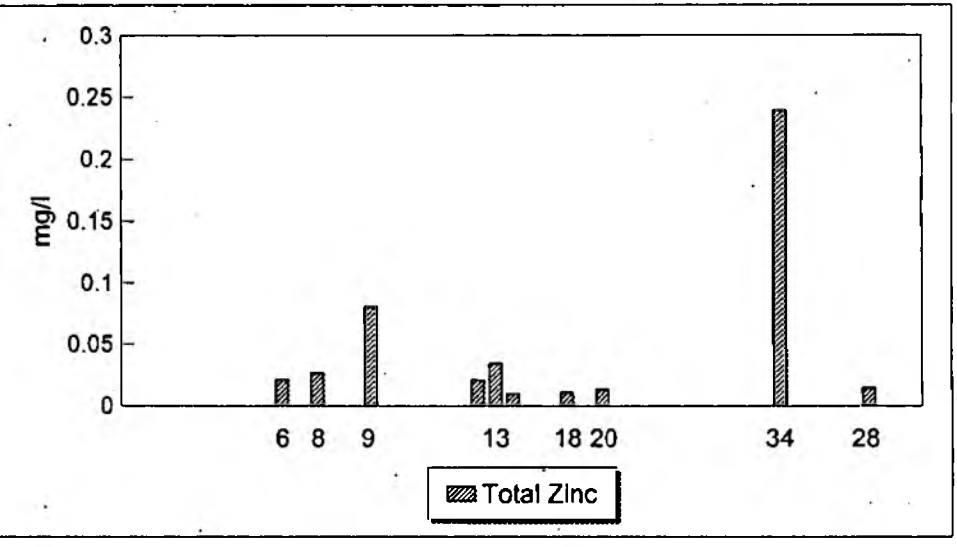
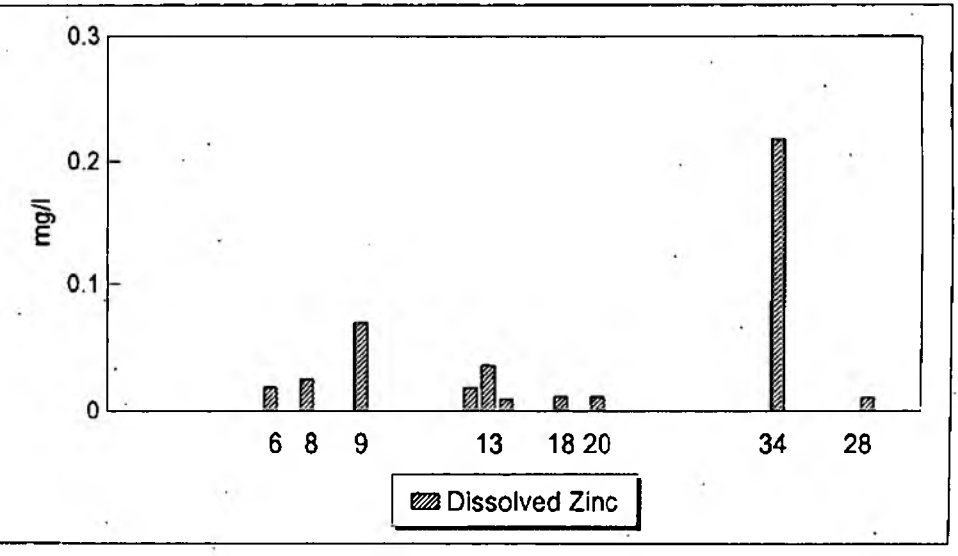

0.2
0.15
0.1
0.05
0
mg/l
2 4 6 16 17 29 23 33
Dissolved Zinc

Figure 5. Results of Second Phase Chemical Survey






0.3
0.25
0.2
0.15
0.1
0.05
0
mg/l
6 8 9 13 18 20 34 28
Total Zinc


0.3
0.2
0.1
0
mg/l
6 8 9 13 18 20 34 28
Dissolved Zinc