# WATER QUALITY SECTION CORNWALL AREA

# FINAL DRAFT REPORT

RED RIVER (R23A003) EC DANGEROUS SUBSTANCE DIRECTIVE FAILURE 1994

> May 1996 COR/96/004 Author: Tim Geatches Investigations Officer

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# RED RIVER (R23A003) EC DANGEROUS SUBSTANCE DIRECTIVE FAILURE 1994

#### 1. INTRODUCTION

#### 1.1. Background

The Red River at R23A003 failed for total zinc and dissolved copper in 1994. This site is the designated downstream monitoring point for South Crofty discharge (P23A/P/7) under EC dangerous substance directive monitoring. R23A104 is immediately downstream of South Crofty discharge but this site has been dropped from the routine monitoring programme and was never used for EC dangerous substance directive monitoring. These sites and associated routine monitoring sites are shown in figure 1. South Crofty discharge is consented for total zinc and total copper.

## 1.2. Objectives

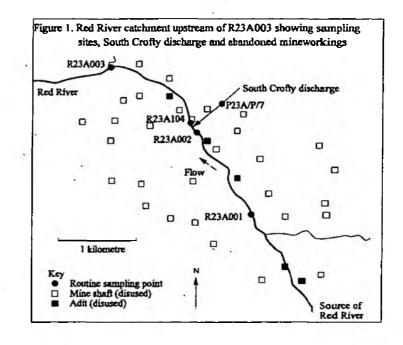
To identify the causes of EC dangerous substance directive failure at R23A003.

#### 2. METHODS

i) Review water quality and background data.

#### 3. RESULTS

A summary of 1994 water quality data is shown in appendix 1. Abandoned mining areas are shown in figure 1.



## 4. DISCUSSION

Total zinc and dissolved copper standards are exceeded at all Red River sites upstream of R23A003. Abandoned mine workings are thought to be the main source of metals at the two most upstream sites (R23A001 and R23A002). These are upstream of South Crofty discharge and are shown in figure 1.

There is a significant input of total zinc from South Crofty discharge that causes a fourfold increase immediately downstream of the discharge (R23A104) compared with upstream. However, the discharge is well within the consent for total zinc mainly due to the very high maximum allowable concentration. The consent would not appear to be set to achieve the standard required by the EC dangerous substances directive. However, because of the abandoned mining throughout the catchment the achievement of this standard would be impossible in the short term.

There is no data for dissolved copper although comparison with the upstream site and the downstream site at R23A003 shows a decrease in dissolved copper concentrations. Therefore,



abandoned mining upstream of South Crofty discharge can be assumed to be the major source contributing to failure at R23A003.

#### 5. CONCLUSIONS

- i) Total zinc non-compliance at R23A003 was due to South Crofty discharge and abandoned mineworkings.
- ii) Dissolved copper non-compliance at R23A003 was due to abandoned mineworkings.
- iii) All routine sites upstream of South Crofty discharge exceeded total zinc and dissolved copper standards due to abandoned mineworkings.

#### 6. **RECOMMENDATIONS**

i) The Red River at R23A003 should be derogated for total zinc and dissolved copper due to inputs from abandoned mineworkings.

Action - Rosanne Broome

Red River upstream Bre	a Tin Works - R23A001					
Date	Hardness (mg/l)	Total zinc (µg/l)	Dissolved copper (µg/l)		Suspended solids (mg/l)	
18/01/94		108	160		5	· 205
16/02/94		28	10		3	170
14/03/94		116	210			192
20/04/94		29	11	6.7	<2	
09/05/94		31	12	7.0	<2	167
22/06/94		23	12	7.0	2	160
19/07/94		20	10		2	151
11/08/94		22	16	6.9	3	157
14/09/94		22	13	7.1	12	135
04/10/94		18	6		5	145
16/11/94		23		6.8	8	152
08/12/94	41.8	67	11	7.0	96	148
				1		
Mean or range	42.4	42	40	6.7 to 7.2		
Standard 8 1 6 to 9						
Red River upstream Sou	uth Crofty - R23A002					
Date	Hardness (mg/l)	Total zinc (µg/l)	Dissolved copper (µg/l)	pH	Suspended solids (mg/l)	
18/01/94		117	172	7.4	_ 5	209
16/02/94		109	160	7.3	<2	
14/03/94		119	170	7.6	2	195
20/04/94		126	180	7.5	<2	
09/05/94		117	135	7.7	2	198
22/06/94		111	120	7.6	<2	
19/07/94	55.9	107	72	7.7	<2	
11/08/94		75	68	7.6	2	182
14/09/94		96	62	7.6	30	164
04/10/94		77	41	7.6	2	178
16/11/94		111	170	7.4	2	187
08/12/94		100	105	7.4	22	179
Mean or range	55.3	105	121	7.3 to 7.6		
Standard		50	6	6 to 9		
	13.8 = 3°					
South Crofty discharge -	- P23A/P/7					
Date	Hardness (mg/l)	Total zinc (µg/l)	Dissolved copper (µg/l)	рН	Suspended solids (mg/l)	Conductivity (µS/cm)
18/01/94	No data	1300	No data		78	No data
16/02/94	No data	1100	No data	6.4	40	No data
14/03/94	No data	1500	No data	6.4	16	No data
20/04/94	No data	900	No data	6.5	34	No data
09/05/94	No data	1500	No data	6.9	11	No data
22/06/94	No data		No data	6.4	55	No data
19/07/94	No data	1000	No data	6.3	27	No data
11/08/94	No data	8000	No data	6.4	28	No data
			, nu uata	U.7		
			No data		51	No data
14/09/94	No data	800 900		6.4		
14/09/94 04/10/94	No dala No dala	800 900	No data	6.4 6.4	_ 51	No data No data
14/09/94 04/10/94 16/11/94	No data No data No data	800 900 1110	No data No data	6.4 6.4	51 46	No data No data No data
14/09/94 04/10/94	No dala No dala	800 900 1110	No data No data No data	6.4 6.4 6.2	51 46 39	No data No data
14/09/94 04/10/94 16/11/94 08/12/94	No data No data No data	800 900 1110	No data No data No data	6.4 6.4 6.2	51 46 39 36	No dala No dala No dala
14/09/94 04/10/94 16/11/94	No data No data No data	800 900 1110 1000	No data No data No data	6.4 6.4 6.2 6.3	51 46 39 36	No dala No dala No dala
14/09/94 04/10/94 16/11/94 08/12/94	No data No data No data	800 900 1110 1000	No data No data No data	6.4 6.4 6.2 6.3	51 46 39 36	No dala No dala No dala
14/09/94 04/10/94 16/11/94 08/12/94 Mean or range Consent Red River downstream of	No data No data No data No data	800 900 1110 1000 1676 35000	No data No data No data No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0	51 46 39 36 38 250	No data No data No data No data
14/09/94 04/10/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of Date	No data	800 900 1110 1000 1676 35000 4 Total zinc (µg/l)	No data No data No data No data No data No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0	51 46 39 36 38 250 Suspended solids (mg/l)	No data No data No data No data Conductivity (µS/cm)
14/09/94 04/10/94 16/11/94 08/12/94 Mean or range Consent Red River downstream of Date	No data	800 900 1110 1000 1676 35000 4 Total zinc (µg/t)	No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0	51 46 39 36 38 250 Suspended solids (mg/l)	No data No data No data No data Conductivity (µS/cm) 659
14/09/94 04/10/94 16/11/94 08/12/94 Mean or range Consent Red River downstream of Date 18/01/94	No data 16 South Crofty - R23A10 Hardness (mg/l) 169.0	800 900 1110 1000 1676 35000 4 Total zinc (µg/t)	No data  Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0	51 46 39 36 38 250 Suspended solids (mg/l)	No data No data No data No data Conductivity (µS/cm) 659 1270
14/09/94 04/10/94 16/11/94 08/12/94 Mean or range Consent Red River downstream of Date 18/01/94 16/02/94	No data 16 South Crofty - R23A10 Hardness (mq/l) 286.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620	No data No data No data No data No data No data  Dissolved copper (µg/l) No data No data No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0 PH 7.3 7.1 7.0	51 46 39 36 38 250 Suspended solids (mg/l) 14 13	No data No data No data No data No data Conductivity (µS/cm) 659 1270 1140
14/09/94 04/10/94 16/11/94 16/11/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94	No data Aliantic Research 1 South Crofty - R23A10 Hardness (mq/l) 169.0 285.0 285.0 433.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550	No data No data No data No data No data No data  Dissolved copper (µg/l) No data No data No data No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0 PH 7.3 7.1 7.0 6.9	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9	No data 100 data No data No data 1140 1830
14/09/94 04/10/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94	No data	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130	No data No data No data No data No data No data Dissolved copper (µg/l) No data No data No data No data No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0 PH 7.3 7.1 7.0 6.9 7.7	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17	No data 1270 1140 1830 203
14/09/94 04/10/94 16/11/94 08/12/94 Mean or range Consent Red River downstream of Date 18/01/94 16/02/94 14/03/94 20/04/94 09/05/94	No data No data No data No data No data No data Of South Crofty - R23A10 Hardness (mg/l) 285.0 285.0 433.0 58.8 484.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540	No data No data No data No data No data No data Dissolved copper (µg/i) No data No data No data No data No data No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0 PH 7.3 7.1 7.0 6.9 7.7 6.8	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2	No data 1270 1140 1830 203
14/09/94 04/10/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 22/06/94 19/07/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830	No data No data No data No data No data No data  Dissolved copper (µg/i) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0 7.3 7.1 7.0 6.9 7.7 6.8 6.4	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31	No data 1270 1140 1830 2033 2090 3820
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 09/05/94 22/06/94 19/07/94	No data 169.0 286.0 286.0 286.0 286.0 433.0 58.8 484.0 1010.0 1120.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830 700	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29	No data African Afric
14/09/94 04/10/94 16/11/94 16/11/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 22/06/94 19/07/94 11/08/94 14/09/94	No data 169.0 286.0 286.0 433.0 58.8 484.0 1010.0 1120.0 734.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680	Dissolved copper (µg/l) No data No data No data  Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29	No data 2030 1140 1830 2033 2090 3820 4170 2620
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 09/05/94 22/06/94 11/08/94 14/09/94	No data 169.0 286.0 433.0 58.8 484.0 1010.0 1120.0 734.0 670.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480	No data No data No data No data No data No data Dissolved copper (µg/l) No data	6.4 6.4 6.3 6.3 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46	No data 203 1270 1140 1830 203 2090 3820 4170 2620 2620
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  IMean of range Consent  Red River downstream of 16/02/94 14/03/94 20/04/94 20/04/94 22/06/94 11/08/94 11/08/94 14/09/94 04/10/94	No data 169.0 285.0 285.0 285.0 285.0 484.0 1010.0 1120.0 734.0 670.0 180.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8	No data 2699 1270 1140 1830 2033 2090 3820 4170 2620 2620 725
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 09/05/94 22/06/94 11/08/94 14/09/94	No data 169.0 285.0 285.0 285.0 285.0 484.0 1010.0 1120.0 734.0 670.0 180.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480	No data No data No data No data No data No data Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46	No data 203 1270 1140 1830 203 2090 3820 4170 2620 2620
14/09/94 04/10/94 16/11/94 16/11/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 16/02/94 16/02/94 19/07/94 19/07/94 11/08/94 04/10/94 08/12/94	No data 169.0 286.0 286.0 433.0 58.8 484.0 1010.0 1120.0 734.0 670.0 180.0	800 900 1110 1000 1676 35000 4 Total zinc (µg/t) 290 350 620 550 130 540 830 700 680 480 240 230	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8	No data 1270 1270 1270 1270 1270 1270 1280 1290 1290 1290 1290 1290 1290 1290 129
14/09/94 04/10/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 22/06/94 19/07/94 11/08/94 14/09/94 04/10/94 08/12/94  Mean or range	No data 169.0 285.0 285.0 285.0 285.0 484.0 1010.0 1120.0 734.0 670.0 180.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830 700 680 480 240 230	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.7 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.0	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8	No data 1270 1270 1270 1270 1270 1270 1280 1290 1290 1290 1290 1290 1290 1290 129
14/09/94 04/10/94 16/11/94 16/11/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 16/02/94 16/02/94 19/07/94 19/07/94 11/08/94 04/10/94 08/12/94	No data 169.0 286.0 286.0 433.0 58.8 484.0 1010.0 1120.0 734.0 670.0 180.0	800 900 1110 1000 1676 35000 4 Total zinc (µg/t) 290 350 620 550 130 540 830 700 680 480 240 230	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8	No data 2090 1140 1830 2033 2090 3820 4170 2620 2620 2620 725
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 19/07/94 11/08/94 14/09/94 16/11/94 08/12/94  Mean or range Standard	No data 169.0 285.0 285.0 285.0 285.0 433.0 58.8 484.0 1010.0 1120.0 734.0 670.0 180.0 175.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830 700 680 480 240 230	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.7 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.0	51 46 39 36 38 250 Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8	No data 1270 1270 1270 1270 1270 1270 1280 1290 1290 1290 1290 1290 1290 1290 129
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 22/06/94 19/07/94 11/08/94 14/09/94 16/11/99 16/11/94 Mean or range Standard  Red River at Roscrogga	No data 169.0 286.0 286.0 286.0 433.0 58.8 484.0 1010.0 1120.0 734.0 670.0 180.0 175.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830 700 680 480 240 230 470 125	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.7 6.9 7.7 6.8 6.5 6.5 6.5 6.7 7.0 7.0 7.0 6.9	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25	No data
14/09/94 04/10/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 22/06/94 19/07/94 11/08/94 14/09/94 04/10/94 16/11/94 Mean or range Standard  Red River at Roscrogga	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240 230 Total zinc (μg/l)	Dissolved copper (µg/l)  Dissolved copper (µg/l)  No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0 PH  7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.2	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l)	No data Conductivity (µS/cm) 659 1270 1140 1830 2033 2090 3820 4170 2620 2620 725 774
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 19/07/94 11/08/94 14/09/94 16/11/94 08/12/94  Mean or range Standard  Red River at Roscroggal Date	No data 169.0 286.0 433.0 58.8 484.0 1010.0 734.0 670.0 1120.0 734.0 677.0 467.2  n - R23A003 Hardness (mg/l)	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240 230 470 125	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.0 7.0 7.0 6.7 7.0 7.0 7.0 7.0 7.0 7.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <22 31 25 29 46 30 8 25 21	No data  203 1270 1140 1830 203 2090 3820 4170 2620 2620 725 774
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 22/06/94 19/07/94 11/08/94 11/08/94 14/09/94 16/11/94 08/12/94  Mean or range Standard  Red River at Roscroggal Date 18/01/94	No data 169.0 286.0 286.0 433.0 58.8 484.0 1010.0 1120.0 734.0 670.0 180.0 175.0 467.2  n - R23A003 Hardness (mg/l) 66.7 333.0	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830 700 680 480 240 230 470 125	No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.2 6.7 to 7.7 6 to 9	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <22 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7	No data No da
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 22/06/94 19/07/94 11/08/94 14/09/94 04/10/94 04/10/94 08/12/94  IMean or range Standard  Red River at Roscroggal Date 18/01/94 16/02/94 16/02/94	No data No dat	800 900 1110 1000 1676 35000  4  Total zinc (μg/l) 350 620 550 130 540 830 700 680 480 240 230  470 125	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 7.7 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.0 7.0 7.0 6.9	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <22 31 25 29 46 30 8 8 25 21  Suspended solids (mg/l) 7 17	No data
14/09/94 04/10/94 16/11/94 16/11/94 16/11/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 16/02/94 16/02/94 19/07/94 11/08/94 14/09/94 04/10/94 16/11/94 16/11/94 Red River at Roscrogga Date 18/01/94 16/02/94 16/02/94 16/02/94 16/02/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 2430 230 470 125	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.3 6.2 to 6.9 5.5 to 9.0 PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <22 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 17 17	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 19/07/94 11/08/94 14/09/94 16/11/94 16/11/94 16/11/94 16/02/94  Red River at Roscrogga Date 18/01/94 16/02/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 230 470 125	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.8 6.4 6.5 6.6 6.7 7.0 7.2 6.7 to 7.7 6 to 9	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 3 26 56 <2	No data
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 19/07/94 11/08/94 14/09/94 16/11/94 08/12/94  Mean or range Standard  Red River at Roscroggal Date 18/01/94 16/02/94 14/03/94 20/04/94 09/05/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240 230 470 125 Total zinc (μg/l) 175 450 155 505 146 119	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.8 6.4 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 7.0 7.6	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 3 26 <22 3	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 11/08/94 11/08/94 11/08/94 11/08/94 11/08/94 11/08/11/94 08/11/94  Red River at Roscrogga Date 18/01/94 16/02/94 16/02/94 19/07/94	No data No dat	800 900 1110 1110 1000  1676 35000  4  Total zinc (μg/t) 290 350 620 550 130 540 830 700 680 480 240 230  470 125  Total zinc (μg/t) 175 450 155 508 146 119 700	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.2  PH 7.5 7.1 7.7 6.8 6.7 7.7 6.8 6.7 7.7 6.8 6.7 7.7 6.8 6.7	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <22 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 3 26 <22 3 3 8	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 16/02/94 16/02/94 16/02/94 19/07/94 11/08/94 14/09/94 14/09/94 14/09/94 16/11/94  Mean or range Standard  Red River at Roscrogga Date 18/01/94 16/02/94 16/02/94 16/03/94 16/03/94 11/03/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 2430 230  470 125  Total zinc (μg/l) 175 450 155 505 146 119 7000 590	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <22 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 27 29 20 31 31 30 46 30 46 30 85 25 31 46 30 85 25 31 46 30 85 25 31 46 30 85 25 31 46 30 85 25 31 46 30 85 25 31 85 32 32 32 38 88 88	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 22/06/94 11/08/94 14/09/94 15/11/94 Mean or range Standard  Red River at Roscrogga Date 18/01/94 16/02/94 16/02/94 16/02/94 16/02/94 19/07/94 11/08/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/t) 290 350 620 550 130 540 830 700 680 480 240 230  470 125  Total zinc (μg/l) 175 450 155 505 146 119 700 590 173	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 7.6 6.8 6.7 7.7 6.8 6.7 7.7 6.8 6.7 7.7 6.8 6.7 7.0 7.0 7.2	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 21 31 30 8 25 31 31 326 42 33 8 25 8	No data
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 19/07/94 11/08/94 14/03/94 08/12/94  Mean or range Standard  Red River at Roscrogga Date 18/01/94 16/02/94 11/08/94 14/03/94 19/07/94 11/08/94 11/08/94 11/08/94	No data No dat	800 900 1110 1000 1676 35000 4  Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240 230 470 125  Total zinc (μg/l) 175 450 155 505 146 119 700 590 173 665	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.8 6.4 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 7.6 6.7 7.0 7.5 6.7 7.0 7.5 6.7 7.0 7.5 6.7 7.5 6.8	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 3 26 52 31 8 25 8 25	No data No dat
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 19/07/94 11/08/94 Mean or range Standard  Red River at Roscroggal Date 18/01/94 16/02/94 16/02/94 19/07/94 11/08/94 14/03/94 14/03/94 14/03/94 16/02/94 19/07/94 11/08/94 11/08/94 11/08/94	No data No dat	800 900 1110 1110 1100 1676 35000  4  Total zinc (μg/t) 290 350 620 550 130 640 830 700 680 240 230  470 125  Total zinc (μg/t) 175 450 156 505 146 119 700 590 173 5655 390	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.2  PH 7.5 6.7 6.7 6.8 6.7 6.7 7.0 7.5 6.7 6.8 6.8 6.7 7.0 7.5 7.6 6.7 6.8 6.8 6.9	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 7 7 7 3 26 <2 3 8 25 8 25 8 23 17	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 19/07/94 11/08/94 14/03/94 08/12/94  Mean or range Standard  Red River at Roscrogga Date 18/01/94 16/02/94 11/08/94 14/03/94 19/07/94 11/08/94 11/08/94 11/08/94	No data No dat	800 900 1110 1000 1676 35000 4  Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240 230 470 125  Total zinc (μg/l) 175 450 155 505 146 119 700 590 173 665	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.8 6.4 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 7.6 6.7 7.0 7.5 6.7 7.0 7.5 6.7 7.0 7.5 6.7 7.5 6.8	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 17 3 26 52 31 8 25 8 25	No data No da
14/09/94 04/10/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 20/04/94 19/07/94 11/08/94 Mean or range Standard  Red River at Roscroggal Date 18/01/94 16/02/94 16/02/94 19/07/94 11/08/94 14/03/94 14/03/94 14/03/94 16/02/94 19/07/94 11/08/94 11/08/94 11/08/94	No data No dat	800 900 1110 1000 1676 35000 4  Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 2430 230  470 125  Total zinc (μg/l) 175 450 155 505 146 119 700 590 173 5665 390 342	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.9 7.7 6.8 6.4 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 6.8 6.7 6.7 7.1 7.6 6.7 7.7 7.6 6.8 6.7 7.7 7.1 7.6 6.8 6.7 7.7 7.6 6.8 6.7 7.7 7.1 7.6 6.8 6.7 7.7 7.1 7.1	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25  21  Suspended solids (mg/l) 7 17 17 3 3 26 <22 3 8 8 25 8 23 17 35	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 08/12/94  Mean or range Consent  Red River downstream of 18/01/94 16/02/94 14/03/94 20/04/94 22/06/94 11/08/94 14/09/94 04/10/94 16/11/94 16/02/94 Mean or range Standard  Red River at Roscrogga Date 18/01/94 16/02/94 16/02/94 11/08/94 14/09/94 14/09/94 14/09/94 15/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94 16/11/94	No data No dat	800 900 1110 1000 1676 35000 4 Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 240 230 470 125  Total zinc (μg/l) 175 450 155 508 146 119 700 590 173 565 390 342	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.8 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 7.6 6.8 6.7 7.0 7.5 6.7 7.1 7.7 7.6 6.8 6.7 7.1 7.7 7.6 6.8 6.7 7.1 7.7 7.1 7.5 7.1 7.7 7.6 6.8 6.7 7.1 7.7 7.1 7.1 7.7 7.6 6.8 6.9 7.1	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25 21  Suspended solids (mg/l) 7 7 7 7 3 26 <2 3 8 25 8 25 8 23 17	No data No da
14/09/94 04/10/94 16/11/94 16/11/94 16/11/94 08/12/94  IMean or range Consent  Red River downstream of 16/02/94 16/02/94 16/02/94 19/07/94 11/08/94 14/09/94 14/09/94 16/11/94  Red River at Roscrogga Date 18/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/01/94 16/11/94	No data No dat	800 900 1110 1000 1676 35000 4  Total zinc (μg/l) 290 350 620 550 130 540 830 700 680 480 2430 230  470 125  Total zinc (μg/l) 175 450 155 505 146 119 700 590 173 5665 390 342	Dissolved copper (µg/l) No data	6.4 6.4 6.2 6.3 6.2 to 6.9 5.5 to 9.0  PH 7.3 7.1 7.0 6.8 6.5 6.6 6.7 7.0 7.2  6.7 to 7.7 6 to 9  PH 7.5 7.1 7.7 7.6 6.8 6.7 7.0 7.5 6.7 7.1 7.7 7.6 6.8 6.7 7.1 7.7 7.6 6.8 6.7 7.1 7.7 7.1 7.5 7.1 7.7 7.6 6.8 6.7 7.1 7.7 7.1 7.1 7.7 7.6 6.8 6.9 7.1	51 46 39 36 38 250  Suspended solids (mg/l) 14 13 9 17 <2 31 25 29 46 30 8 25  21  Suspended solids (mg/l) 7 17 17 3 3 26 <22 3 8 8 25 8 23 17 35	No data No da