NRA

ENVIRONMENTAL DEPARTMENT
CORNWALL AREA

FINAL DRAFT REPORT

RIVER TAMAR EC DANGEROUS SUBSTANCE DIRECTIVE FAILURE - 1993

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1. INTRODUCTION

1.1. Background

The River Tamar downstream of Hingston Quarry discharge (R12E042) failed for dissolved copper (standard = six µg/l annual average) in 1993. Routine monitoring sites and dissolved copper concentrations are shown in appendix 1.

In 1993 dissolved copper concentrations steadily increased from Horsebridge (R12E002) to Gunnislake Bridge (R12E003). The lower reaches of the River Tamar passes through an area of historic mining. Drainage from adits and mine spoil heaps contributes substantially to dissolved copper concentrations in the River Tamar.

The annual average dissolved copper concentration upstream of Hingston Quarry discharge (R12E043) was equal to the EC directive standard for 1993. Downstream of Hingston Quarry discharge (R12E042) seven of the twelve samples exceeded the EC directive standard in 1993. Hingston Quarry discharge was known to have been operating on two occasions, not operating on two occasions and no record was available on the other three occasions.

Chilsworthy STW and highway drainage also discharge via the Hingston Quarry discharge point. Metals samples were not taken for Chilsworthy STW or highway drainage in 1993.

1.2 Hingston Quarry discharge (P12E/P/12) - 1993 consent compliance

The consent for Hingston Quarry is for surface water generated from within the quarry. This water is collected in a sump and pumped intermittently to the River Tamar. Pumping occurs mainly during wet weather. A sample for consent purposes can be obtained from within the quarry at the sump.

Eleven samples were taken in 1993. On four occasions the discharge was being pumped to the River Tamar, on three occasions no discharge was made and on the remaining four occasions no data was available.

On the four occasions pumping was undertaken Hingston Quarry discharge complied with its consent for copper.

1.3 Objectives

To determine the cause of EC dangerous substance directive failure in the River Tamar at R12E042.

To assess the environmental impact of Hingston Quarry discharge and provide data for assisting in a consent review.

2. METHODS

Following a site visit to Hingston Quarry and discussions with Quarry Managers and NRA Water Quality Officers the following steps were agreed:

* Identification and chemical impact assessment of pollution sources within the River Tamar reach from Gunnislake Gauging Station (SX 427 725) to level upstream of Hingston Quarry discharge (SX 417 727). The reach extended to below R12E042 as this site was considered well within the mixing zone of Hingston Quarry discharge. It was estimated that Gunnislake Gauging Station would be below the mixing zone of Hingston Quarry discharge and drainage from the Clitters Mine area. Spot samples of Chilsworthy STW and Hingston Down Quarry sump were also taken. Samples were taken on 4 and 18 October 1994.

* Using information from above, a chemical survey before, during and after operation of Hingston Quarry discharge. The survey was carried out on 1 December 1994 with the pumps switched on from 0900 to 1100.

* A spot chemical survey in wet weather to assess environmental impact of mine spoil surface run off and Hingston Quarry discharge under normal operating conditions. The survey was carried out on 17 January 1995.

3. RESULTS

A summary of the chemical spot surveys is contained in figure 1 and table 1. Flow data for the River Tamar at Gunnislake gauging station is presented in appendix 2.

4. DISCUSSION

Data from 1993 suggests no clear link between failure with dissolved copper at R12E042 and operation of Hingston Quarry discharge. On only two out of seven occasions, when R12E042 exceeded the standard, was Hingston Quarry discharge operating.

The location of R12E042 was considered well within the mixing zone for Hingston Quarry discharge (see figure 1). This would have led to elevated dissolved copper results at R12E042 when Hingston Quarry discharge was operating.

Investigation of the reach from Gunnislake Gauging Station to the old level upstream of Hingston Quarry discharge identified several significant sources of dissolved copper to the River Tamar. In dry weather Clitters Adit was estimated to contribute over 40% of the dissolved copper loading to the River Tamar reach investigated. Hingston Quarry discharge contributed only 2%. Most of the remainder was thought to originate from the mine spoil heaps. Immediately upstream of Clitters Adit elevated dissolved copper was identified on several occasions although no point source was identified. Diffuse inputs from the mine spoil was suspected.

In wet weather additional point sources, via runoff from the mine spoil heaps, were identified. All were high in dissolved copper far exceeding Hingston Quarry discharge. The greater dilution capacity of the River Tamar (see appendix 2) minimised the impact.

5. CONCLUSIONS

1. The failure of R12E042 for dissolved copper in 1993 cannot be attributed solely to Hingston Quarry discharge.

2. The location of R12E042 was considered within the mixing zone of Hingston Quarry discharge.

3. Significant point and diffuse sources of dissolved copper were identified from the abandoned mineworkings adjacent to Hingston Quarry discharge.

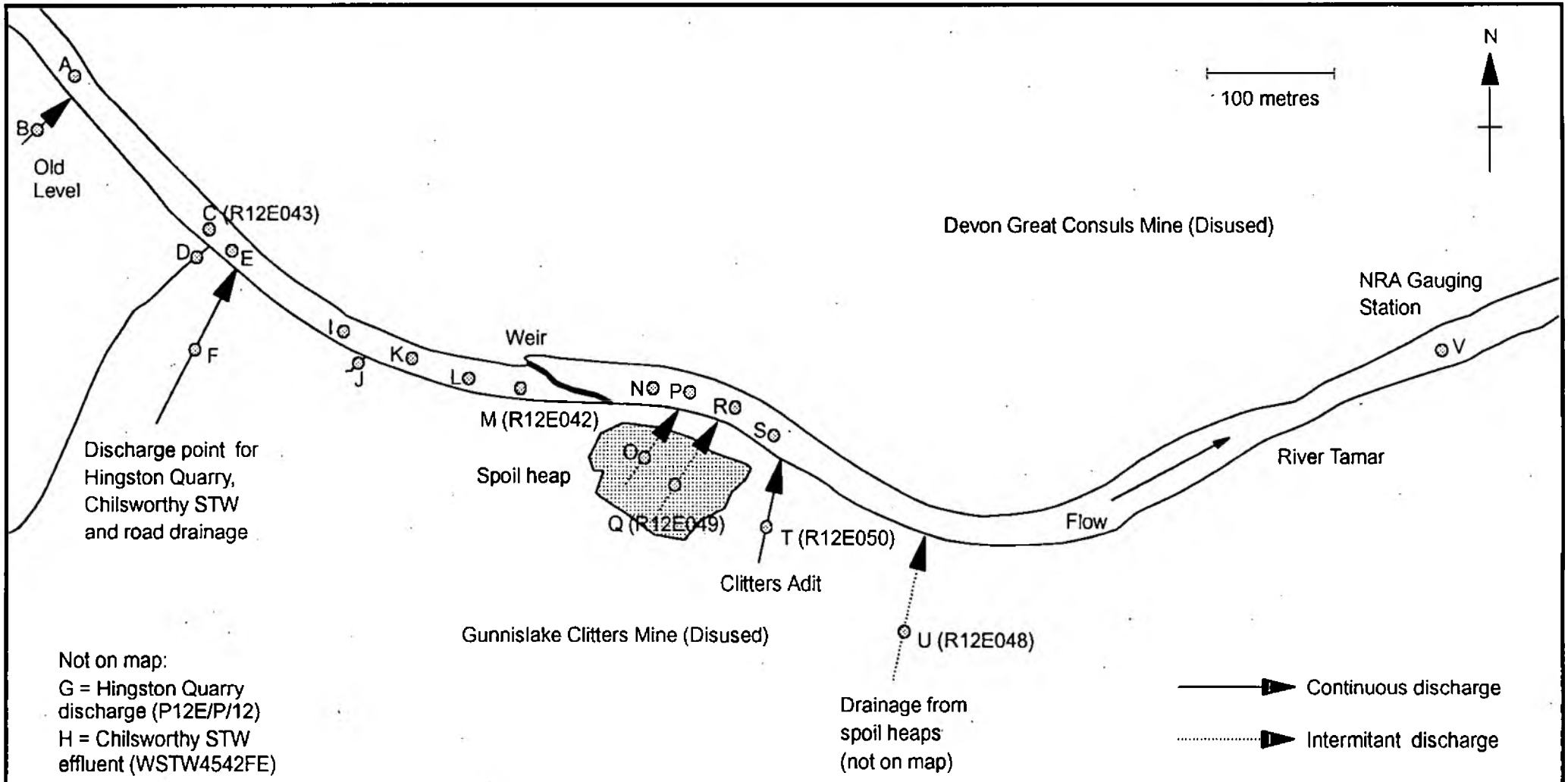
6. ACTIONS

1. R12E042 to be relocated to Gunnislake Gauging Station (SX 4265 7250) to ensure full mixing of Hingston Quarry discharge.

   Action - Principal Officer (Water Quality Planning)

APPENDIX

Figure 1. Location of sampling sites and summary of dissolved copper concentrations of spot surveys



Dissolved copper concentrations (µg/l)

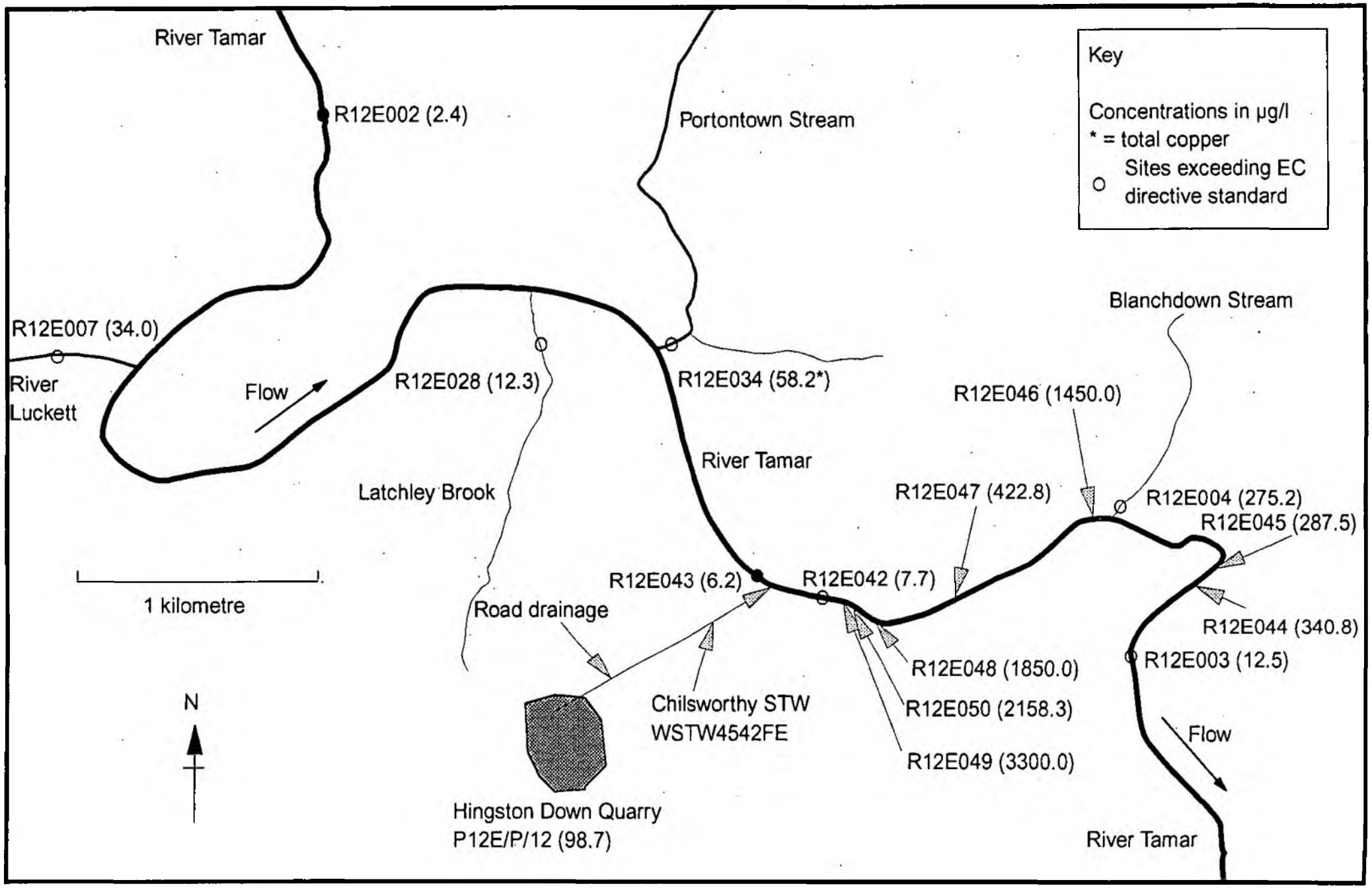
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
4 October 1994	5	100	4	6	3	38	155	21	5	33									24	1550		5
18 October 1994									3	34	3	4	3	3		6		4	5			
17 January 1995	6	42	5	30		20	11	32					8		7000		4100		9	2100	1550	7

Table 1. Dissolved copper (µg/l) results for controlled release of Hingston Quarry discharge - 1 December 1994

	A	B	C	F	G	M	S	T	V
08:00	5	68	3	82		4	8	2100	6
09:00	3	54	4	35	31	4	6	2050	6
09:30					29				
10:00	4	50	3	31	28	3	8	2050	6
10:30					29				
11:00					28			2100	6
12:00	6	66	3	76		3	7	2300	6
13:00	3	66	3	56		4	39	2200	6
14:00	3	70	3	52		4	27	2300	7
15:00	2	74	3	54		3	22	2300	6
16:00	3	58	3	44		3	20	2000	7
17:00	3	60	4	46		3	31	2000	7

	A	B	C	F	G	M	S	T	V
Mean dissolved copper concentration (µg/l)	3.6	62.9	3.2	52.9	29.0	3.4	18.7	2155.6	6.3
Mean flow (litres/second)		7			20			7	13082
Loading (µg/second)		440			580			15089	
Predicted increase in River Tamar (µg/l)		0.03			0.04			1.15	
Relative contribution (%) - site A to site V		1			2			42	

Appendix 1. Lower reach of River Tamar showing monitoring sites and annual average dissolved copper concentrations for 1993



Appendix 2. River Tamar flow at Gunnislake gauging station (site V)