ENVIRONMENTAL PROTECTION

NRA

National Rivers Authority

South West Region

Red River, Portreath, Bolingey and Perranporth Catchment River Water Quality Classification 1990

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RIVER WATER QUALITY IN THE RED RIVER, PORTREATH, BOLINGEY AND PERRANPORTH CATCHMENT

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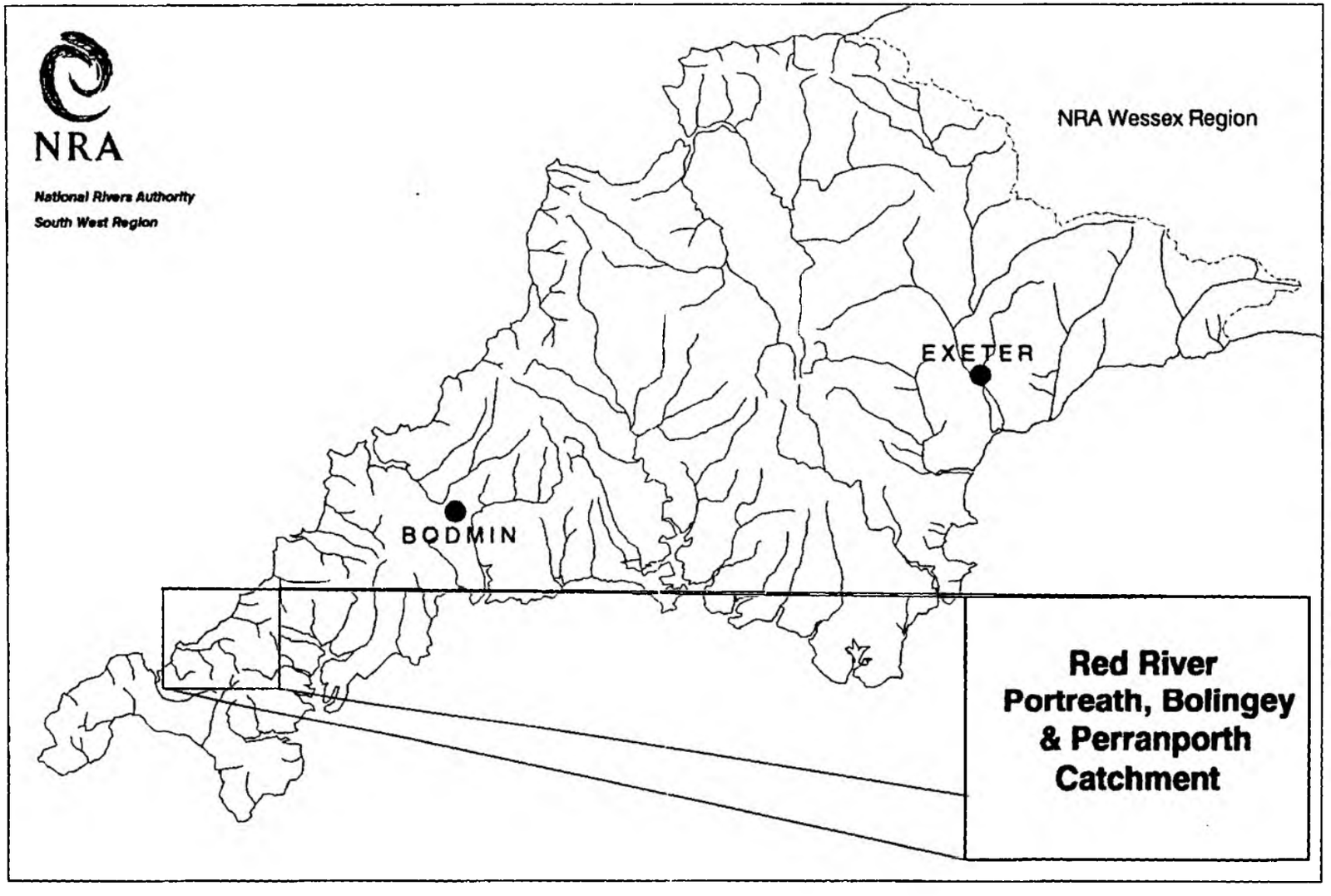
National Rivers Authority
South West Region



Red River, Portreath, Bolingey & Perranporth Catchment

1. INTRODUCTION

Monitoring to assess the quality of river waters is undertaken in thirty-two catchments within the region. As part of this monitoring programme samples are collected routinely from selected monitoring points at a pre-determined frequency per year, usually twelve spaced at monthly intervals. Each monitoring point provides data for the water quality of a river reach (in kilometres) upstream of the monitoring point.

River lengths have been re-measured and variations exist over those recorded previously.

Each water sample collected from each monitoring point is analysed for a range of chemical and physical constituents or properties known as determinands. The analytical results for each sample are entered into a computer database called the Water Quality Archive.

Selected data are accessed from the Archive so that the quality of each river reach can be determined based on a River Classification System developed by the National Water Council (NWC), (9.1).

This report presents the river water quality classification for 1990 for monitored river reaches in the Red River, Portreath, Bolingey and Perranporth catchments.

2. RED RIVER, PORTREATH, BOLINGEY AND PERRANPORTH CATCHMENT

The Red River flows over a distance of 13.1 km from its source to the tidal limit, (Appendix 10.1). Water quality was monitored at five locations on the main river. Four of these sites were sampled at approximately monthly intervals and the site at Gwithian Towans, which is a National Water Quality monitoring site, was sampled fortnightly.

The Portreath Stream and the St. Agnes Stream flow over a distance of 8.4 km and 2.2 km respectively from their source to the tidal limit, (Appendix 10.1) and were each monitored at one site at approximately monthly intervals.

The Porthtowan Stream flows over a distance of 4.1 km from its source to the tidal limit, (Appendix 10.1) and was monitored at two sites. The site at Porthtowan Bridge was sampled at approximately monthly intervals and the site at Menagissey Bridge was sampled on twenty occasions during 1990 because of no recent water quality data.

Perrenporth Stream flows over a distance of 7.5 km from its source to the tidal limit, (Appendix 10.1) and was monitored at three sites at approximately monthly intervals.

The Trevellas Stream and Porth Joke Stream flow over a distance of 4.6 km and 5.3 km respectively from their source to the tidal limits, (Appendix 10.1) and were both monitored at one site on twenty occasions during 1990 because of no recent water quality data.

Bolingey Stream flows over a distance of 8.3 km from its source to the tidal limit, (Appendix 10.1) and was monitored at two sites at approximately monthly intervals.

The Holywell Stream flows over a distance of 9.2 km from its source to the tidal limit, (Appendix 10.1) and was monitored at two locations. The site at Holywell Bay Bridge was sampled at approximately monthly intervals and the site at Trelaske was sampled on fifteen occasions during 1990 because of no recent water quality data.

Throughout the Red River, Portreath, Bolingey and Perranporth catchment two secondary tributaries and two tertiary tributaries of the Red River, one secondary tributary of the Portreath Stream and one secondary tributary of the Porthtowan Stream were monitored. In addition Cargenwen No. 1 Reservoir was monitored at one site at approximately monthly intervals.

2.1 SECONDARY TRIBUTARIES

The Roseworthy Stream flows over a distance of 9.2 km from its source to the confluence with the Red River, (Appendix 10.1) and was monitored at three locations at approximately monthly intervals. Monitoring points are located in the lower reaches.

The Tehidy Stream flows over a distance of 7.1 km from its source to the confluence with the Red River, (Appendix 10.1) and was monitored at three locations at approximately monthly intervals.

The Redruth Stream flows over a distance of 5.5 km from its source to the confluence with the Portreath Stream, (Appendix 10.1) and was monitored at one site at approximately monthly intervals.

The Menagissey Stream flows over a distance of 2.3 km from its source to the confluence with Porthtowan Stream, (Appendix 10.1) and was monitored at one site at approximately monthly intervals.

2.2 TERTIARY TRIBUTARIES

The Praze River and Reen Stream flow over a distance of 6.7 km and 4.2 km respectively from their source to the confluence with the Roseworthy Stream, (Appendix 10.1). The Praze River was monitored at two locations, one site was sampled at approximately monthly intervals and the site at Praze was sampled on twenty occasions during 1990 because of no recent water quality data. Reen Stream was monitored at one site at approximately monthly intervals. Monitoring points are located in the lower reaches.

Each sample was analysed for a minimum number of determinands (Appendix 10.2) plus additional determinands based on local knowledge of the catchment. In addition, at selected sites, certain metal analyses were carried out.

The analytical results from all of these samples have been entered into the Water Quality Archive and can be accessed through the Water Act Register, (9.2).

3. NATIONAL WATER COUNCIL'S RIVER CLASSIFICATION SYSTEM

3.1 River Quality Objectives

In 1978 river quality objectives (RQOs) were assigned to all river lengths that were part of the routine monitoring network and to those additional watercourses, which were not part of the routine network, but which received discharges of effluents.

For the majority of watercourses long term objectives were identified based on existing and assumed adequate quality for the long term protection of the watercourse. In a few instances short term objectives were identified but no timetable for the achievement of the associated long term objective was set.

The RQOs currently in use in the Red River, Portreath, Bolingey and Perranporth catchments are identified in Appendix 10.1.

3.2 River Quality Classification

River water quality is classified using the National Water Council's (NWC) River Classification System (see Appendix 10.3), which identifies river water quality as being one of five quality classes as shown in Table 1 below:

Table 1 - National Water Council - River Classification System

Class	Description
1A	Good quality
1B	Lesser good quality
2	Fair quality
3	Poor quality
4	Bad quality

Using the NWC system, the classification of river water quality is based on the values of certain determinands as arithmetic means or as 95 percentiles (5 percentiles are used for pH and dissolved oxygen) as indicated in Appendices 10.4.1 and 10.4.2.

The quality classification system incorporates some of the European Inland Fisheries Advisory Commission (EIFAC) criteria (Appendix 10.3) recommended for use by the NWC system.

4. 1990 RIVER WATER QUALITY SURVEY

The 1990 regional classification of river water quality also includes the requirements of the Department of the Environment quinquennial national river quality survey. The objectives for the Department of the Environment 1990 River Quality Survey are given below:

1) To carry out a National Classification Survey based on procedures used in the 1985 National Classification Survey, including all regional differences.

2) To classify all rivers and canals included in the 1985 National Classification Survey.

3) To compare the 1990 Classification with those obtained in 1985.

In addition, those watercourses, which were not part of the 1985 Survey and have been monitored since that date, are included in the 1990 regional classification of river water quality.

5. 1990 RIVER WATER QUALITY CLASSIFICATION

Analytical data collected from monitoring during 1988, 1989 and 1990 were processed through a computerised river water quality classification programme. This resulted in a quality class being assigned to each monitored river reach as indicated in Appendix 10.5.

The quality class for 1990 can be compared against the appropriate River Quality Objective and previous annual quality classes (1985-1989) also based on three years combined data, for each river reach in Appendix 10.5.

The river water classification system used to classify each river length is identical to the system used in 1985 for the Department of the Environment's 1985 River Quality Survey. The determinand classification criteria used to determine the annual quality classes in 1985, subsequent years and for 1990 are indicated in Appendices 10.4 and 10.4.1.

Improvements to this classification system could have been made, particularly in the use of a different suspended solids standard for Class 2 waters. As the National Rivers Authority will be proposing new classification systems to the Secretary of State in the near future, it was decided to classify river lengths in 1990 with the classification used for the 1985-1989 classification period.

The adoption of the revised criteria for suspended solids in Class 2 waters would not have affected the classification of river reaches.

The river quality classes for 1990 of monitored river reaches in the catchment are shown in map form in Appendix 10.6.

The calculated determinand statistics for pH, temperature, dissolved oxygen, biochemical oxygen demand (BOD), total ammonia, un-ionised ammonia, suspended solids, copper and zinc from which the quality class was determined for each river reach, are indicated in Appendix 10.7.

6. NON-COMPLIANCE WITH QUALITY OBJECTIVES

Those monitored river reaches within the catchment, which do not comply with their assigned (RQO), are shown in map form in Appendix 10.8.

Appendix 10.9 indicates the number of samples analysed for each determinand over the period 1988 to 1990 and the number of sample results per determinand, which exceed the determinand quality standard.

For those non-compliant river reaches in the catchment, the extent of exceedance of the calculated determinand statistic with relevant quality standard (represented as a percentage), is indicated in Appendix 10.10.

7. CAUSES OF NON-COMPLIANCE

For those river reaches, which did not comply with their assigned RQOs, the cause of non-compliance (where possible to identify) is indicated in Appendix 10.11.

8. GLOSSARY OF TERMS

RIVER REACH	A segment of water, upstream from sampling point to the next sampling point.
RIVER LENGTH	River distance in kilometres.
RIVER QUALITY OBJECTIVE	That NWC class,which protects the most sensitive use of the water.
95 percentiles	Maximum limits, which must be met for at least 95% of the time.
5 percentiles	Minimum limits, which must be met for at least 95% of the time.
BIOLOGICAL OXYGEN DEMAND (5 day carbonaceous ATU)	A standard test measuring the microbial uptake of oxygen - an estimate of organic pollution.
pH	A scale of acid to alkali.
UN-IONISED AMMONIA	Fraction of ammonia poisonous to fish, NH^3.
SUSPENDED SOLIDS	Solids removed by filtration or centrifuge under specific conditions.
USER REFERENCE NUMBER	Reference number allocated to a sampling point.
INFERRED STRETCH	Segment of water, which is not monitored and whose water quality classification is assigned from the monitored reach upstream.

9. REFERENCES

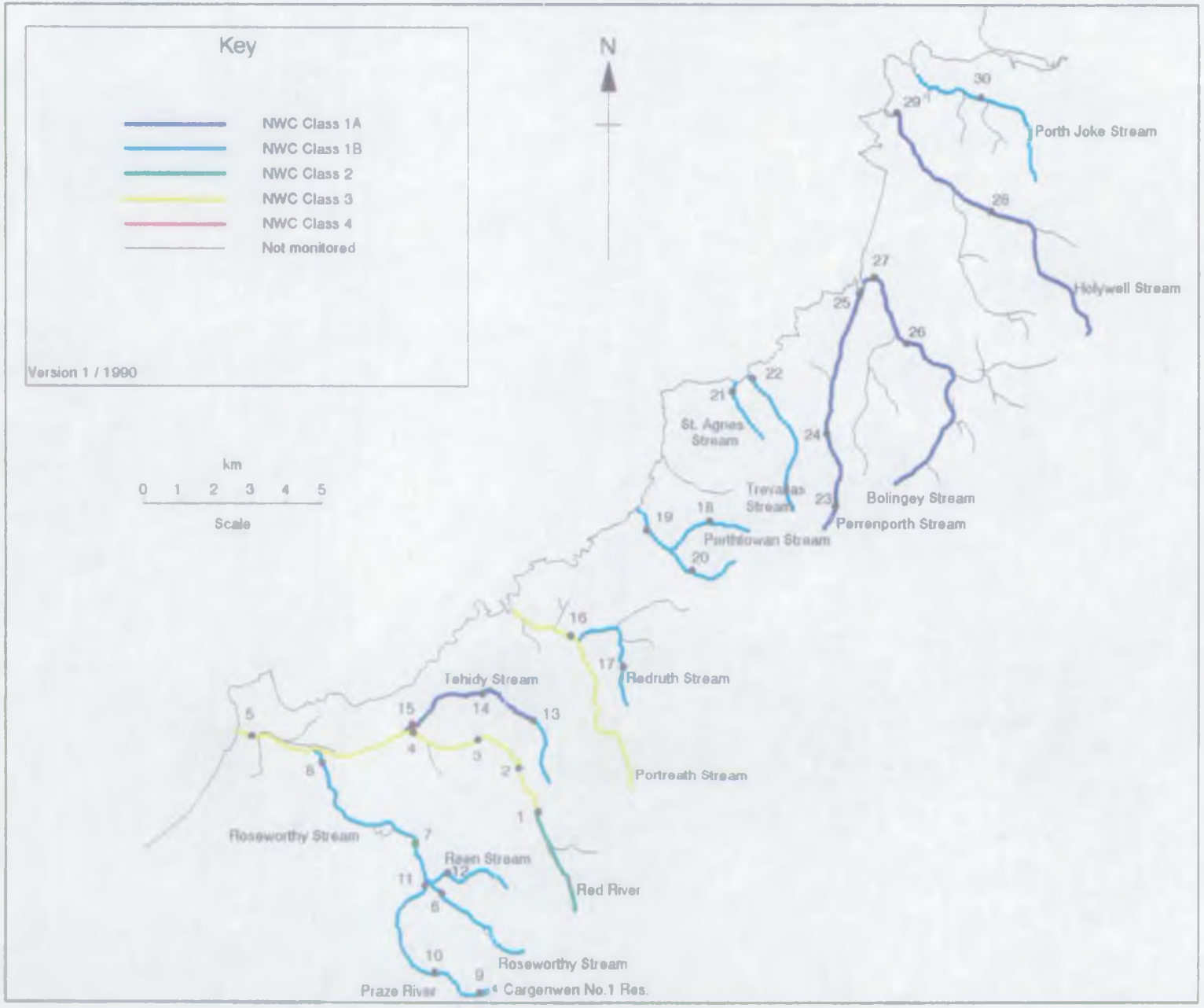
Reference

9.1 National Water Council (1977). River Water Quality: The Next Stage. Review of Discharge Consent Conditions. London.

9.2 Water Act 1989 Section 117

9.3 Alabaster J. S. and Lloyd R. Water Quality Criteria for Freshwater Fish, 2nd edition, 1982. Butterworths.

Red River, Portreath, Bolingey & Perranporth Catchments
River Quality Objectives



Appendix 10.1

BASIC DETERMINAND ANALYTICAL SUITE FOR ALL CLASSIFIED RIVER SITES

pH as pH Units

Conductivity at 20 C as uS/cm

Water temperature (Cel)

Oxygen dissolved % saturation

Oxygen dissolved as mg/l O

Biochemical oxygen demand (5 day total ATU) as mg/l O

Total organic carbon as mg/l C

Nitrogen ammoniacal as mg/l N

Ammonia un-ionised as mg/l N

Nitrate as mg/l N

Nitrite as mg/l N

Suspended solids at 105 C as mg/l

Total hardness as mg/l CaCO3

Chloride as mg/l Cl

Orthophosphate (total) as mg/l P

Silicate reactive dissolved as mg/l SiO2

Sulphate (dissolved) as mg/l SO4

Sodium (total) as mg/l Na

Potassium (total) as mg/l K

Magnesium (total) as mg/l Mg

Calcium (total) as mg/l Ca

Alkalinity as pH 4.5 as mg/l CaCO3

NWC RIVER QUALITY CLASSIFICATION SYSTEM

River Class	Quality criteria	Remarks	Current potential uses
	Class limiting criteria (95 percentile)		
1A Good Quality	(i) Dissolved oxygen saturation greater than 80% (ii) Biochemical oxygen demand not greater than 3 mg/l (iii) Ammonia not greater than 0.4 mg/l (iv) Where the water is abstracted for drinking water, it complies with requirements for A2* water (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 1.5 mg/l (ii) Visible evidence of pollution should be absent	(i) Water of high quality suitable for potable suppl abstractions and for all abstractions (ii) Game or other high class fisheries (iii) High amenity value
1B Good Quality	(i) DO greater than 60% saturation (ii) BOD not greater than 5 mg/l (iii) Ammonia not greater than 0.9 mg/l (iv) Where water is abstracted for drinking water, it complies with the requirements for A2* water (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 2 mg/l (ii) Average ammonia probably not greater than 0.5 mg/l (iii) Visible evidence of pollution should be absent (iv) Waters of high quality which cannot be placed in Class 1A because of the high proportion of high quality effluent present or because of the effect of physical factors such as canalisation, low gradient or eutrophication (v) Class 1A and Class 1B together are essentially the Class 1 of the River Pollution Survey (RPS)	Water of less high quality than Class 1A but usable fo substantially the same purposes
2 Fair Quality	(i) DO greater than 40% saturation (ii) BOD not greater than 9 mg/l (iii) Where water is abstracted for drinking water it complies with the requirements for A3* water (iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 5 mg/l (ii) Similar to Class 2 of RPS (iii) Water not showing physical signs of pollution other than humic colouration and a little foaming below weirs	(i) Waters suitable for potable supply after advanced treatment (ii) Supporting reasonably good coarse fisheries (iii) Moderate amenity value

3 Poor Quality	(i) DO greater than 10% saturation (ii) Not likely to be anaerobic (iii) BOD not greater than 17 mg/l. This may not apply if there is a high degree of re-aeration	Similar to Class 3 of RPS	Waters which are polluted to an extent that fish are absent only sporadically present. May be used for low grade industrial abstraction purposes. Considerable potential for further use if cleaned up
4 Bad Quality	Waters which are inferior to Class 3 in terms of dissolved oxygen and likely to be anaerobic at times	Similar to Class 4 of RPS	Waters which are grossly polluted and are likely to cause nuisance
X	DO greater than 10% saturation		Insignificant watercourses and ditches not usable, where the objective is simply to prevent nuisance developing

Notes (a) Under extreme weather conditions (eg flood, drought, freeze-up), or when dominated by plant growth, or by aquatic plant decay, rivers usually in Class 1, 2, and 3 may have BODs and dissolved oxygen levels, or ammonia content outside the stated levels for those Classes. When this occurs the cause should be stated along with analytical results.

(b) The BOD determinations refer to 5 day carbonaceous BOD (ATU). Ammonia figures are expressed as NH_4. **

(c) In most instances the chemical classification given above will be suitable. However, the basis of the classification is restricted to a finite number of chemical determinands and there may be a few cases where the presence of a chemical substance other than those used in the classification markedly reduces the quality of the water. In such cases, the quality classification of the water should be down-graded on the basis of biota actually present, and the reasons stated.

(d) EIFAC (European Inland Fisheries Advisory Commission) limits should be expressed as 95 percentile limits.

* EEC category A2 and A3 requirements are those specified in the EEC Council directive of 16 June 1975 concerning the Quality of Surface Water intended for Abstraction of Drinking Water in the Member State.

** Ammonia Conversion Factors

($mg\ NH_4/l$ to $mg\ N/l$)

Class 1A 0.4 $mg\ NH_4/l$ = 0.31 $mg\ N/l$
Class 1B 0.9 $mg\ NH_4/l$ = 0.70 $mg\ N/l$
0.5 $mg\ NH_4/l$ = 0.39 $mg\ N/l$

NWC RIVER CLASSIFICATION SYSTEM

CRITERIA USED BY NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION FOR NON-METALLIC DETERMINANDS

River Class	Quality Criteria
1A	Dissolved oxygen % saturation greater than 80% BOD (ATU) not greater than 3 mg/l O Total ammonia not greater than 0.31 mg/l N Non-ionised ammonia not greater than 0.021 mg/l N Temperature not greater than 21.5 C pH greater than 5.0 and less than 9.0 Suspended solids not greater than 25 mg/l
1B	Dissolved oxygen % saturation greater than 60% BOD (ATU) not greater than 5 mg/l O Total ammonia not greater than 0.70 mg/l N Non-ionised ammonia not greater than 0.021 mg/l N Temperature not greater than 21.5 C pH greater than 5.0 and less than 9.0 Suspended solids not greater than 25 mg/l
2	Dissolved oxygen & saturation greater than 40% BOD (ATU) not greater than 9 mg/l O Total ammonia not greater than 1.56 mg/l N Non-ionised ammonia not greater than 0.021 mg/l N Temperature not greater than 28 C pH greater than 5.0 and less than 9.0 Suspended solids not greater than 25 mg/l
3	Dissolved oxygen % saturation greater than 10% BOD (ATU) not greater than 17 mg/l O
4	Dissolved oxygen % saturation not greater than 10% BOD (ATU) greater than 17 mg/l O

STATISTICS USED BY NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION

Determinand	Statistic
Dissolved oxygen	5 percentile
BOD (ATU)	95 percentile
Total ammonia	95 percentile
Non-ionised ammonia	95 percentile
Temperature	95 percentile
pH	5 percentile 95 percentile
Suspended solids	arithmetic mean

NWC RIVER CLASSIFICATION SYSTEM

CRITERIA USED BY NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION FOR METALLIC DETERMINANDS

SOLUBLE COPPER

Total Hardness (mean) mg/l CaCO3	Statistic	Soluble Copper* ug/l Cu Class 1	Class 2
0 - 10	95 percentile	< = 5	> 5
10 - 50	95 percentile	< = 22	> 22
50 - 100	95 percentile	< = 40	> 40
100 - 300	95 percentile	< = 112	> 112

* Total copper is used for classification until sufficient data on soluble copper can be obtained.

TOTAL ZINC

Total Hardness (mean) mg/l CaCO3	Statistic	Total Zinc ug/l Zn Class 1	Class 2	Class 3
0 - 10	95 percentile	< = 30	< = 300	> 300
10 - 50	95 percentile	< = 200	< = 700	> 700
50 - 100	95 percentile	< = 300	< = 1000	> 1000
100 - 300	95 percentile	< = 500	< = 2000	> 2000

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
CATCHMENT: RED (25)

1990 Map Position Number	River	Reach upstream of	User Reference Number	National Grid Reference	Reach Length (km)	Distance from source (km)	River Quality Objective	85 NWC Class	86 NWC Class	87 NWC Class	88 NWC Class	89 NWC Class	90 NWC Class
1	RED RIVER	ABOVE BREA TIN WORKS	R23A001	SW 6683 3952	2.0	2.0	2	1B	1B	2	2	2	2
2	RED RIVER	ABOVE SOUTH CROFTY MINE	R23A002	SW 6613 4090	1.9	3.9	3	4	4	3	2	2	2
3	RED RIVER	ROSCROGGAN BRIDGE	R23A003	SW 6502 4201	1.7	5.6	3	4	4	3	2	3	3
4	RED RIVER	KIEVE BRIDGE	R23A005	SW 6293 4230	2.3	7.9	3	4	4	3	2	3	3
5	RED RIVER	GWITHIAN TOWANS	R23A006	SW 5825 4222	5.2	13.1	3	4	4	3	2	3	3
6	ROSEWORTHY STREAM	BOTETOE BRIDGE	R23A038	SW 6373 3774	3.0	3.0	1B	1A	2	2	2	2	2
7	ROSEWORTHY STREAM	PENPONDS	R23A008	SW 6302 3908	1.8	4.8	1B	1B	2	2	2	2	2
8	ROSEWORTHY STREAM	HANCEMELLIN	R23A009	SW 6062 4107	3.8	8.6	1B	1B	2	2	2	2	1A
	ROSEWORTHY STREAM	RED R. CONFLUENCE (INFERRED STRETCH)			0.6	9.2	1B	1B	2	2	2	2	1A
	PRAZE RIVER	INFLOW, CARGENWEN RES. (UNMON. STRETCH)			0.4	0.4	1B	1B					
9	PRAZE RIVER	CARGENWEN NO.1 RESERVOIR	R23A050	SW 6508 3521	0.3	0.7	1B	1B					1B
10	PRAZE RIVER	PRAZE	R23A045	SW 6400 3563	1.3	2.0	1B	1B					2
11	PRAZE RIVER	BARRIPPER	R23A037	SW 6330 3819	3.8	5.8	1B	1B					1B
	PRAZE RIVER	ROSEWORTHY STREAM CONFL. (INF. STRETCH)			0.9	6.7	1B	1B					1B
12	REEN STREAM	RAMSGATE	R23A007	SW 6416 3849	3.4	3.4	1B	2	2	2	2	2	2
	REEN STREAM	ROSEWORTHY STREAM CONFL. (INF. STRETCH)			0.8	4.2	1B	2	2	2	2	2	2
13	TEHIDY STREAM	TOLVADDON BRIDGE	R23A042	SW 6637 4217	2.8	2.8	1B	1B	1B	1B	1A	1A	3
14	TEHIDY STREAM	OLD MERROSE	R23A041	SW 6510 4327	1.8	4.6	1A	1B	1B	1B	1A	1A	1B
15	TEHIDY STREAM	COOMBE	R23A017	SW 6299 4240	2.4	7.0	1A	1B	1B	1B	1A	1A	1A
	TEHIDY STREAM	RED R. CONFLUENCE (INFERRED STRETCH)			0.1	7.1	1A	1B	1B	1B	1A	1A	1A
16	PORTREATH STREAM	BRIDGE BELOW CAMBROSE	R23A015	SW 6739 4485	6.2	6.2	3	3	3	2	2	2	2
	PORTREATH STREAM	MEAN HIGH WATER (INFERRED STRETCH)			2.2	8.4	3	3	3	2	2	2	2
17	REDRUTH STREAM	NORTH COUNTRY BRIDGE	R23A014	SW 6896 4386	3.1	3.1	1B	3	3	2	2	3	3
	REDRUTH STREAM	PORTREATH STREAM CONFL. (INF. STRETCH)			2.4	5.5	1B	3	3	2	2	3	3
18	PORTHTOWAN STREAM	MOUNT HAMKE	R23A043	SW 7142 4795	0.8	0.8	1B	3	3			4	1B
19	PORTHTOWAN STREAM	PORTHTOWAN BRIDGE	R23A013	SW 6950 4747	2.6	3.4	1B	3	3			4	3
	PORTHTOWAN STREAM	NORMAL TIDAL LIMIT (INFERRED STRETCH)			0.7	4.1	1B	3	3			4	3
20	MENAGISSEY STREAM	MENAGISSEY BRIDGE	R21A052	SW 7101 4626	1.0	1.0	1B						3
	MENAGISSEY STREAM	PORTHTOWAN STREAM CONFL. (INF. STRETCH)			1.3	2.3	1B						3
21	ST AGNES STREAM	PRIOR TO CULVERT ST AGNES	R21A016	SW 7217 5138	2.0	2.0	1B	1B	1B			1A	4
	ST AGNES STREAM	MEAN HIGH WATER (INFERRED STRETCH)			0.2	2.2	1B	1B	1B			1A	4
22	TREVELLAS STREAM	ABOVE TREVAUNANCE COVE	R23A051	SW 7280 5172	4.3	4.3	1B	3					2
	TREVELLAS STREAM	MEAN HIGH WATER (INFERRED STRETCH)			0.3	4.6	1B	3					2
23	PERRANPORTH STREAM	SILVERMELL	R23A046	SW 7473 4775	0.3	0.3	1A	1B	2	2	2	3	X

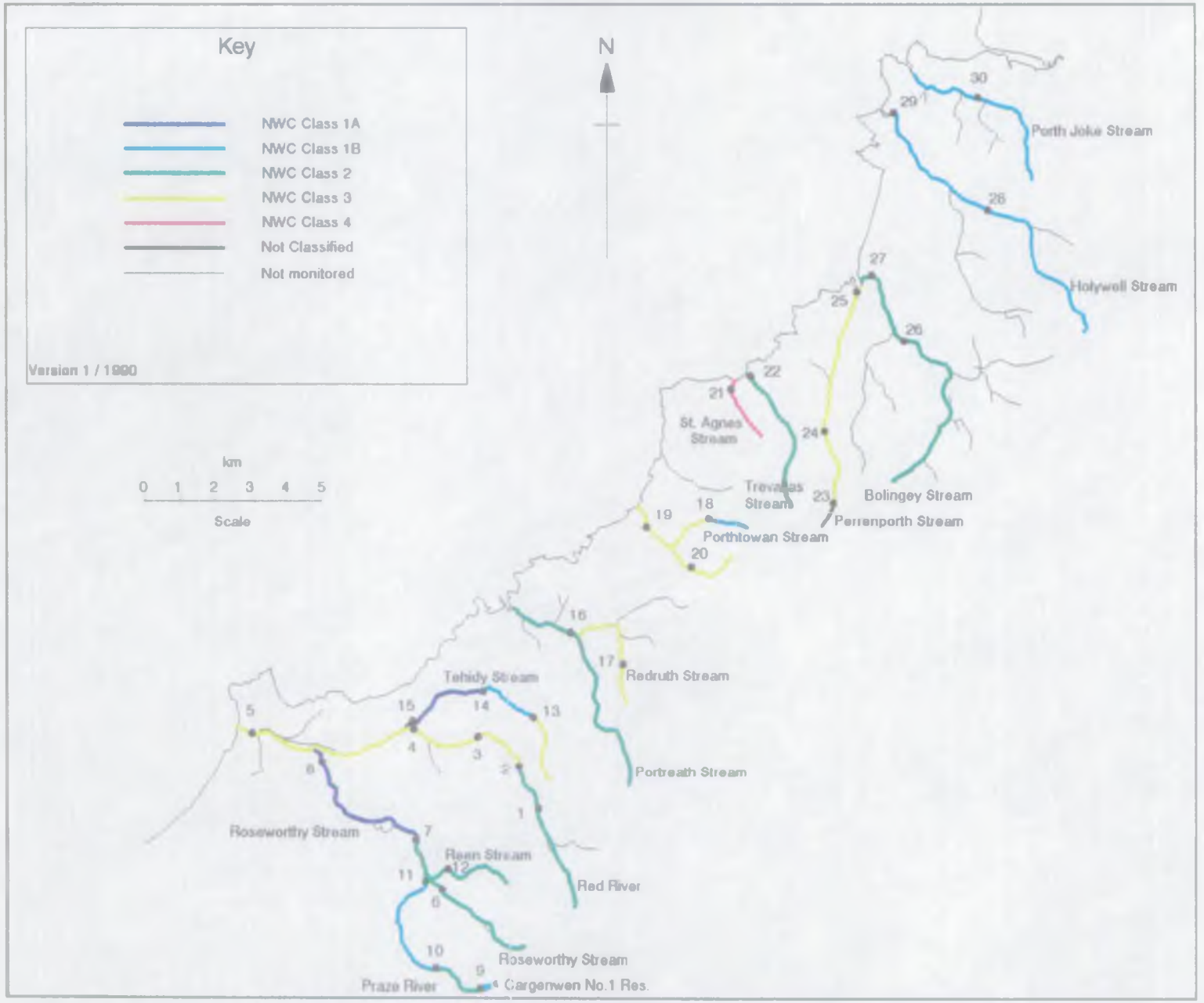
Appendix 10.5

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
CATCHMENT: RED (25)

1990 Map Position Number	River	Reach upstream of	User Reference Number	National Grid Reference	Reach Length (km)	Distance from source (km)	River Quality Objective	85 NWC Class	86 NWC Class	87 NWC Class	88 NWC Class	89 NWC Class	90 NWC Class
24	PERRANPORTH STREAM	MITHIAN	R23A047	SW 7467 5060	3.1	3.4	1A	1B	2	2	2	3	3
25	PERRANPORTH STREAM	PLEASURE GARDENS PERRANPORTH	R23A012	SW 7560 5407	3.8	7.2	1A	1B	2	2	2	3	3
	PERRANPORTH STREAM	NORMAL TIDAL LIMIT (INFERRED STRETCH)			0.3	7.5	1A	1B	2	2	2	3	3
26	BOLINGEY STREAM	PERRANWELL	R23A048	SW 7685 5286	6.0	6.0	1A	2	2			2	2
27	BOLINGEY STREAM	PONSMERE BRIDGE	R23A011	SW 7602 5443	1.9	7.9	1A	2	2			2	2
	BOLINGEY STREAM	NORMAL TIDAL LIMIT (INFERRED STRETCH)			0.4	8.3	1A	2	2			2	2
28	HOLYWELL STREAM	TRELASKE	R23A049	SW 7893 5681	5.5	5.5	1A	1B	1A	1B	1B	2	1B
29	HOLYWELL STREAM	HOLYWELL BAY BRIDGE	R23A010	SW 7673 5885	3.4	8.9	1A	1B	1A	1B	1B	2	1B
	HOLYWELL STREAM	NORMAL TIDAL LIMIT (INFERRED STRETCH)			0.3	9.2	1A	1B	1A	1B	1B	2	1B
30	PORTH JOKE STREAM	TREVORGAN	R24A014	SW 7908 5966	3.1	3.1	1B	1B					1B
	PORTH JOKE STREAM	NORMAL TIDAL LIMIT (INFERRED STRETCH)			2.2	5.3	1B	1B					1B

Appendix 10.5

Red River, Portreath, Bolingey & Perranporth Catchments
Water Quality - 1990



Appendix 10.6

NATIONAL RIVERS AUTHORITY – SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
CALCULATED DETERMINAND STATISTICS USED FOR QUALITY ASSESSMENT
CATCHMENT: RED (25)

River	Reach upstream of	User Ref. Number	90 RMC Class	Calculated Determinand Statistics used for Quality Assessment																			
				pH Lower		pH Upper		Temperature		DO (%)		BOD (ATU)		Total Ammonia		Union. Ammonia		S.Solids		Total Copper		Total Zinc	
				Class	5%ile	Class	95%ile	Class	95%ile	Class	5%ile	Class	95%ile	Class	95%ile	Class	95%ile	Class	Mean	Class	95%ile	Class	95%ile
RED RIVER	ABOVE ENEA TIN WORKS	RD3A001	2	1A	5.8	1A	7.2	1A	17.1	1B	77.0	1A	3.0	1A	0.135	1A	0.010	1A	5.6	2	41.3	1A	74.3
RED RIVER	ABOVE SOUTH CROFTY MINE	RD3A002	2	1A	6.6	1A	7.5	1A	19.0	1A	83.1	1A	2.1	1A	0.080	1A	0.010	1A	5.7	2	162.6	1A	113.2
RED RIVER	ROSCROGGAN BRIDGE	RD3A003	3	1A	6.7	3	9.1	1A	21.0	1B	79.2	3	10.2	3	2.329	3	0.064	3	65.8	2	909.5	3	11194.5
RED RIVER	KIEVE BRIDGE	RD3A005	3	1A	6.9	1A	7.6	1A	18.7	1B	73.4	3	9.2	2	1.205	1A	0.010	1A	21.9	2	313.0	3	3387.5
RED RIVER	GRETHEDA TOWANS	RD3A006	3	1A	6.8	1A	8.0	1A	17.9	1B	78.2	1B	4.2	1A	0.293	–	–	1A	19.0	2	142.4	3	2229.0
ROSEMORRY STREAM	RUNNOR BRIDGE	RD3A038	2	1A	6.6	1A	7.3	1A	17.0	1B	76.5	1A	2.0	1A	0.048	1A	0.010	1A	4.2	2	264.0	2	357.0
ROSEMORRY STREAM	PENFOLDS	RD3A008	2	1A	6.9	1A	7.8	1A	17.2	1A	80.3	1A	2.4	1A	0.208	1A	0.010	1A	8.1	2	59.8	1A	188.8
ROSEMORRY STREAM	PRACHELLIN	RD3A009	1A	1A	7.1	1A	7.8	1A	16.7	1A	80.9	1A	2.2	1A	0.145	1A	0.010	1A	11.0	1A	51.7	1A	240.0
BRAZE RIVER	CARGENWEN NO.1 RESERVOIR	RD3A050	1B	1A	6.9	1A	8.3	1A	21.0	1B	67.0	1A	2.9	1A	0.250	1A	0.010	1A	2.9	–	–	–	–
BRAZE RIVER	BRAZE	RD3A045	2	1A	6.4	1A	7.4	1A	17.5	1B	66.0	2	6.5	1B	0.440	1A	0.010	1A	8.2	1A	16.0	1A	48.0
BRAZE RIVER	BRAZEPPER	RD3A037	1B	1A	6.7	1A	7.4	1A	17.7	1B	73.0	1B	3.6	1B	0.600	1A	0.010	1A	4.4	2	42.0	1A	150.0
REEN STREAM	BRAGGAN	RD3A007	2	1A	6.7	1A	7.6	1A	17.2	1A	81.2	1B	3.8	1A	0.118	1A	0.010	1A	2.0	2	74.8	1A	244.0
TEHIDY STREAM	TOLVADDON BRIDGE	RD3A042	3	1A	6.8	1A	7.7	1A	17.9	1B	78.2	3	16.5	2	1.042	1A	0.010	1A	12.6	2	51.0	1A	93.0
TEHIDY STREAM	OLD MEDROSE	RD3A041	1B	1A	6.9	1A	7.5	1A	18.7	1B	72.5	1A	2.7	1A	0.082	1A	0.010	1A	9.7	1A	49.0	1A	150.0
TEHIDY STREAM	COOMBE	RD3A017	1A	1A	7.4	1A	7.9	1A	17.2	1A	81.6	1A	2.2	1A	0.113	1A	0.010	1A	4.6	1A	41.7	1A	71.8
FORTHERTH STREAM	BRIDGE BELOW CARBORE	RD3A015	2	1A	7.1	1A	7.8	1A	15.7	1A	82.0	1B	3.2	1A	0.265	1A	0.010	1A	10.9	2	339.0	2	728.5
REDRUTH STREAM	NORTH COUNTRY BRIDGE	RD3A014	3	1A	6.7	1A	7.5	1A	14.6	1B	78.4	1B	4.2	1A	0.085	1A	0.010	1A	8.0	2	343.9	3	1518.0
FORTHCOMB STREAM	MOUNT HAWKE	RD3A043	1B	1A	6.8	1A	7.8	1A	17.0	1A	85.0	1B	3.4	1B	0.412	1A	0.010	1A	8.7	1A	30.0	1A	374.0
FORTHCOMB STREAM	FORTHCOMB BRIDGE	RD3A013	3	1A	5.9	1A	7.5	1A	16.0	3	34.3	3	15.9	3	3.870	1A	0.010	1A	6.2	2	696.5	3	3462.0
HEAD OF FORTHCOMB STREAM	PENGERSICK BRIDGE	RD3A052	3	1A	6.1	1A	7.8	1A	16.9	3	36.1	1A	2.9	1B	0.684	1A	0.010	1A	5.0	2	552.0	3	2600.0
ST AGNES STREAM	BRIDGE TO CLIFFSIDE ST AGNES	RD3A016	4	1A	7.0	1A	8.7	1A	16.4	1B	76.2	4	18.8	1B	0.355	1A	0.010	1A	8.5	1A	32.9	1A	244.6
TREVELLAS STREAM	ABOVE TREVAUNANCE COVE	RD3A051	2	1A	6.9	1A	8.0	1A	16.3	1B	72.4	1A	2.5	1A	0.138	1A	0.010	1A	3.4	1A	38.0	2	730.0
PERRANPORTH STREAM	MITHIAN	RD3A047	3	1A	6.6	1A	7.9	1A	15.9	1B	79.3	1A	2.6	1A	0.197	1A	0.010	1A	5.6	2	583.4	3	3260.0
PERRANPORTH STREAM	PLEASURE GARDENS PERRANPORTH	RD3A012	3	1A	7.1	3	9.5	1A	16.9	1B	75.5	1B	4.4	1A	0.208	1A	0.020	1A	12.3	1A	46.2	2	751.9
HOLMBUSH STREAM	PERRANWELL	RD3A048	2	1A	6.6	1A	7.5	1A	15.2	2	48.4	1B	3.1	2	1.316	1A	0.010	1A	10.2	1A	85.8	2	1477.5
HOLMBUSH STREAM	FORDMORE BRIDGE	RD3A011	2	1A	7.0	1A	7.7	1A	15.9	2	42.3	1B	3.1	2	0.923	1A	0.010	1A	6.4	1A	16.6	2	1146.0
HOLYWELL STREAM	TREASE	RD3A049	1B	1A	7.3	1A	8.0	1A	15.2	1B	76.2	1B	4.0	1A	0.130	1A	0.010	1A	16.3	1A	96.0	1A	500.0
HOLYWELL STREAM	HOLYWELL BAY BRIDGE	RD3A010	1B	1A	7.2	1A	8.1	1A	14.7	1B	74.7	1B	4.7	1A	0.162	1A	0.010	1A	12.3	1A	7.0	1A	218.0
PORTH JOKE STREAM	TREVONNE	RD4A014	1B	1A	7.8	1A	8.3	1A	16.0	1B	77.0	1B	3.3	1A	0.138	1A	0.010	1A	10.4	1A	6.0	1A	17.0

Appendix 10.7

Red River, Portreath, Bolingey & Perranporth Catchments
Compliance - 1990

NATIONAL RIVERS AUTHORITY – SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
NUMBER OF SAMPLES (N) AND NUMBER OF SAMPLES EXCEEDING QUALITY STANDARD (F)
CATCHMENT: RED (25)

River	Reach upstream of	User Ref. Number	pH Lower		pH Upper		Temperature		DO (%)		BOD (ATU)		Total Ammonia		Union. Ammonia		S.Solids		Total Copper		Total Zinc	
			N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F
RED RIVER	ABOVE BREA TIN WORKS	R23A001	34	–	34	–	34	–	34	–	34	–	34	–	34	–	34	1	34	–	34	–
RED RIVER	ABOVE SOUTH CROFTY MINE	R23A002	37	–	37	–	37	–	36	–	37	–	37	–	35	–	37	–	37	–	37	–
RED RIVER	ROSCROGGAN BRIDGE	R23A003	36	–	36	–	36	–	23	–	36	–	36	–	21	–	35	–	36	–	36	–
RED RIVER	KIEVE BRIDGE	R23A005	36	–	36	–	36	–	23	–	36	–	36	–	23	–	35	–	36	–	36	–
RED RIVER	GWITHIAN TOWANS	R23A006	54	–	54	–	54	–	40	–	54	1	54	–	6	–	53	–	53	–	53	–
ROSEWORTHY STREAM	BOSKEDE BRIDGE	R23A038	23	–	23	–	22	–	22	–	23	–	23	–	20	–	23	–	23	3	23	3
ROSEWORTHY STREAM	PENPONDS	R23A008	32	–	32	–	32	–	32	–	32	–	32	–	31	–	32	2	31	8	31	–
ROSEWORTHY STREAM	NANCEMELLIN	R23A009	29	–	29	–	30	–	30	–	29	–	29	–	28	–	29	3	30	–	30	–
PRAZE RIVER	CARNEWEN NO.1 RESERVOIR	R23A050	13	–	13	–	13	–	13	–	13	–	13	–	13	–	13	–	13	–	13	–
PRAZE RIVER	PRAZE	R23A045	36	–	36	–	36	–	36	–	36	2	36	–	36	–	36	2	22	–	22	–
PRAZE RIVER	BARRIPPER	R23A037	19	–	19	–	19	–	19	–	19	–	19	–	19	–	19	–	18	1	18	–
REEN STREAM	RAMSGRIE	R23A007	23	–	23	–	23	–	23	–	23	–	23	–	20	–	23	–	23	13	23	–
TEHIDY STREAM	TOLVADDON BRIDGE	R23A042	42	–	42	–	42	–	42	–	42	10	42	2	40	–	42	8	24	4	24	–
TEHIDY STREAM	OLD MERROSE	R23A041	42	–	42	–	42	–	42	4	42	–	42	–	38	–	42	6	24	–	24	–
TEHIDY STREAM	COOMBE	R23A017	30	–	30	–	30	–	30	–	30	–	30	–	26	–	30	1	22	–	22	–
PORTREATH STREAM	BRIDGE BELOW CAMBROSE	R23A015	29	–	29	–	26	–	26	–	29	–	29	–	26	–	29	–	29	–	29	–
REDRUTH STREAM	NORTH COUNTRY BRIDGE	R23A014	29	–	29	–	28	–	28	–	29	–	29	–	25	–	29	2	28	28	28	21
PORTHTOWAN STREAM	MOUNT HAWKE	R23A043	40	–	40	–	33	–	38	–	40	–	40	–	38	–	40	2	24	–	22	–
PORTHTOWAN STREAM	PORTHTOWAN BRIDGE	R23A013	24	–	24	–	24	–	24	4	24	1	24	6	23	–	24	1	22	20	21	17
TRIB OF PORTHTOWAN STREAM	MENHENISSEY BRIDGE	R23A052	40	–	40	–	40	–	40	2	40	–	40	–	40	–	40	–	24	2	22	6
ST AGNES STREAM	PRIOR TO CULVERT ST AGNES	R23A016	25	–	25	–	25	–	25	–	25	3	25	–	24	–	25	2	22	–	21	–
TREVELLAS STREAM	ABOVE TREVAUNANCE COVE	R23A051	42	–	42	–	42	–	42	–	42	–	42	–	40	–	42	–	24	–	22	22
PERRANPORTH STREAM	MITHIAN	R23A047	22	–	22	–	22	–	22	1	22	–	22	–	21	–	22	1	22	1	21	9
PERRANPORTH STREAM	PLEASURE GARDENS PERRANPORTH	R23A012	31	–	31	6	29	–	29	2	31	7	31	1	28	–	31	3	23	–	22	1
HOLYWELL STREAM	PERRANWELL	R23A048	23	–	23	–	23	–	23	9	23	1	23	7	23	–	23	1	23	–	22	22
HOLYWELL STREAM	PENHERIC BRIDGE	R23A011	24	–	24	–	24	–	24	13	24	1	24	2	24	–	24	1	22	–	21	19
HOLYWELL STREAM	TRELASKE	R23A049	20	–	20	–	20	–	20	1	20	1	20	–	20	–	20	3	17	–	16	–
HOLYWELL STREAM	HOLYWELL BAY BRIDGE	R23A010	27	–	27	–	26	–	26	5	27	1	27	–	25	–	27	2	20	–	19	–
PORTH JOKE STREAM	TREVONAH	R24A014	40	–	40	–	40	–	40	–	40	–	40	–	40	–	40	4	22	–	22	–

Appendix 10.9

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
PERCENTAGE EXCEEDENCE OF DETERMINAND STATISTICS FROM QUALITY STANDARDS
CATCHMENT: RED (25)

River	Reach upstream of	User Ref. Number	PERCENTAGE EXCEEDENCE OF STATISTIC FROM QUALITY STANDARD									
			pH Lower	pH Upper	Temperature	DO (%)	BOD (ATU)	Total Ammonia	Un-ionised Ammonia	Suspended Solids	Total Copper	Total Zinc
RED RIVER	ABOVE BREA TIN WORKS	R23A001	-	-	-	-	-	-	-	-	-	-
RED RIVER	ABOVE SOUTH CROFTY MINE	R23A002	-	-	-	-	-	-	-	-	-	-
RED RIVER	ROSCROGGAN BRIDGE	R23A003	-	-	-	-	-	-	-	-	-	-
RED RIVER	KIEVE BRIDGE	R23A005	-	-	-	-	-	-	-	-	-	-
RED RIVER	GWITHIAN TOWANS	R23A006	-	-	-	-	-	-	-	-	-	-
ROSEWORTHY STREAM	BOTETOE BRIDGE	R23A038	-	-	-	-	-	-	-	-	560	19
ROSEWORTHY STREAM	PENPONDS	R23A008	-	-	-	-	-	-	-	-	50	-
ROSEWORTHY STREAM	NANCEMELLIN	R23A009	-	-	-	-	-	-	-	-	-	-
PRAZE RIVER	CARGENWEN NO.1 RESERVOIR	R23A050	-	-	-	-	-	-	-	-	-	-
PRAZE RIVER	PRAZE	R23A045	-	-	-	-	30	-	-	-	-	-
PRAZE RIVER	BARRIPPER	R23A037	-	-	-	-	-	-	-	-	5	-
REEN STREAM	RAMSGATE	R23A007	-	-	-	-	-	-	-	-	87	-
TEHIDY STREAM	TOLVADDON BRIDGE	R23A042	-	-	-	-	230	49	-	-	28	-
TEHIDY STREAM	OLD MERROSE	R23A041	-	-	-	9	-	-	-	-	-	-
TEHIDY STREAM	COOMBE	R23A017	-	-	-	-	-	-	-	-	-	-
PORTREATH STREAM	BRIDGE BELOW CAMBROSE	R23A015	-	-	-	-	-	-	-	-	-	-
REDRUTH STREAM	NORTH COUNTRY BRIDGE	R23A014	-	-	-	-	-	-	-	-	760	406
PORTHTOWAN STREAM	MOUNT HAWKE	R23A043	-	-	-	-	-	-	-	-	-	-
PORTHTOWAN STREAM	PORTHTOWAN BRIDGE	R23A013	-	-	-	43	217	453	-	-	1641	1054
TRIB OF PORTHTOWAN STREAM	MENAGISSEY BRIDGE	R23A052	-	-	-	40	-	-	-	-	1280	767
ST AGNES STREAM	PRIOR TO CULVERT ST AGNES	R23A016	-	-	-	-	277	-	-	-	-	-
TREVELLAS STREAM	ABOVE TREVAUNANCE COVE	R23A051	-	-	-	-	-	-	-	-	-	143
PERRANPORTH STREAM	MITHIAN	R23A047	-	-	-	1	-	-	-	-	1358	987
PERRANPORTH STREAM	PLEASURE GARDENS PERRANPORTH	R23A012	-	6	-	6	47	-	-	-	-	50
BOLINGEY STREAM	PERRANWELL	R23A048	-	-	-	39	3	325	-	-	-	196
BOLINGEY STREAM	PONSMERE BRIDGE	R23A011	-	-	-	47	4	198	-	-	-	129
HOLYWELL STREAM	TRELASKE	R23A049	-	-	-	5	34	-	-	-	-	-
HOLYWELL STREAM	HOLYWELL BAY BRIDGE	R23A010	-	-	-	7	55	-	-	-	-	-
PORTH JOKE STREAM	TREVOWAH	R24A014	-	-	-	-	-	-	-	-	-	-

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
IDENTIFICATION OF POSSIBLE CAUSES OF NON-COMPLIANCE WITH RQO
CATCHMENT: RED (25)

* = WORK ALREADY IN HAND

1990 Map Position Number	River	Reach upstream of	User Reference Number	Reach Length (km)	Possible causes of non-compliance
6	ROSEWORTHY STREAM	BOTETOE BRIDGE	R23A038	3.0	MINING, CATCHMENT GEOLOGY, BLUE-GREEN ALGAE
7	ROSEWORTHY STREAM	PENPONDS	R23A008	1.8	MINING, CATCHMENT GEOLOGY
10	PRAZE RIVER	PRAZE	R23A045	1.3	LAND RUN-OFF
12	REEN STREAM	RAMSGATE	R23A007	3.4	CANALISATION, MINING, ABSTRACTION
13	TEHIDY STREAM	TOLVADDON BRIDGE	R23A042	2.8	LAND RUN-OFF, STORM OVERFLOW, MINING, CATCHMENT GEOLOGY
14	TEHIDY STREAM	OLD MERROSE	R23A041	1.8	
17	REDRUTH STREAM	NORTH COUNTRY BRIDGE	R23A014	3.1	MINING, CANALISATION, CATCHMENT GEOLOGY, SEWAGE TREATMENT WORKS
19	PORTHTOWAN STREAM	PORTHTOWAN BRIDGE	R23A013	2.6	MINING, CATCHMENT GEOLOGY
20	MENAGISSEY STREAM	MENAGISSEY BRIDGE	R23A052	1.0	
21	ST AGNES STREAM	PRIOR TO CULVERT ST AGNES	R23A016	2.0	
22	TREVELLAS STREAM	ABOVE TREVAUNANCE COVE	R23A051	4.3	MINING, CATCHMENT GEOLOGY
24	PERRANPORTH STREAM	MITHIAN	R23A047	3.1	MINING
25	PERRANPORTH STREAM	PLEASURE GARDENS PERRANPORTH	R23A012	3.8	MINING, EUTROPHICATION
26	BOLINGEY STREAM	PERRANWELL	R23A048	6.0	MINING, CATCHMENT GEOLOGY, LAND RUN-OFF, DROUGHT, SEWAGE TREATMENT WORKS
27	BOLINGEY STREAM	* PONSMERE BRIDGE	R23A011	1.9	MINING, CATCHMENT GEOLOGY, LAND RUN-OFF, DROUGHT, OLD TIP UP-STREAM
28	HOLYWELL STREAM	TRELASKE	R23A049	5.5	LAND RUN-OFF
29	HOLYWELL STREAM	HOLYWELL BAY BRIDGE	R23A010	3.4	LAND RUN-OFF

Appendix 10.11