



DEPARTMENT of
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Water Quality of Rivers in the Inglis – Flowerdale Catchment

PART 3iii

Authors:

Christopher Bobbi
David Andrews &
Mark Bantich

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Hydro Tasmania
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Hydro Tasmania
the renewable energy business

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The Department of Primary Industries, Water and Environment

The Department of Primary Industries, Water and Environment provides leadership in the sustainable management and development of Tasmania's resources. The Mission of the Department is to advance Tasmania's prosperity through the sustainable development of our natural resources and the conservation of our natural and cultural heritage for the future.

The Water Resources Division provides a focus for water management and water development in Tasmania through a diverse range of functions including the design of policy and regulatory frameworks to ensure sustainable use of the surface water and groundwater resources; monitoring, assessment and reporting on the condition of the State's freshwater resources; facilitation of infrastructure development projects to ensure the efficient and sustainable supply of water; and implementation of the *Water Management Act 1999*, related legislation and the State Water Development Plan.

3.5.4 Catchment Surveys - Metals

Samples taken during snapshot surveys were analysed for some of the main metals commonly found in environmental waters that may pose some risk to aquatic organisms or to human health. Due to budget limitation, only total metal concentrations were determined, although it is often the dissolved form that poses most threat to the environment. The detection limits for those metals that were analysed are listed below.

<i>Metal</i>	<i>Limit of Detection</i>
Aluminium	5µg/L
Arsenic	5µg/L
Cadmium	1µg/L
Copper	1µg/L
Lead	5µg/L
Zinc	1µg/L

As is the case for many other parameters commonly tested for in surface waters, metals can be present in various forms. Trace amounts of some metals are naturally present in surface waters as a consequence of the weathering of rocks and soil. Metals can be present attached to suspended matter, colloids, or complex organic compounds. The relative toxicity of metals is dependant upon the degree of oxidation of the metal ion together with the environmental conditions in which it is found (UNESCO, 1992). Acidic conditions tend to increase the toxicity of most metals, whilst for others high concentrations of hardness can reduce their toxicity (ANZECC, 1992).

The new National trigger values for toxicants (ANZECC, 2000) were derived using a statistical distribution method calculated to give 4 different levels of protection. In the majority of cases the 95% protection level should be used for ecosystems which can be classified as ‘slightly’ to ‘moderately’ disturbed and is suggested here as the default value (Table 3.3).

Table 3.3: Trigger values for observed metals at alternate levels of protection. Values in the grey shaded areas are the trigger values applying to typical slightly to moderately disturbed ecosystems (ANZECC, 2000). *ID – insufficient data to determine reliable trigger value.

Metals	Trigger Values for freshwater (µg/L ⁻¹)			
	Level of Protection (% species)			
	99%	95%	90%	80%
Aluminium pH > 6.5	27	55	80	150
Aluminium pH < 6.5	ID	ID	ID	ID
Arsenic (As III)	1	24	94	360
Arsenic (As V)	0.8	13	42	140
Cadmium (H)	0.06	0.2	0.4	0.8
Copper (H)	1.0	1.4	1.8	2.5
Lead (H)	1.0	3.4	5.6	9.4
Zinc (H)	2.4	8.0	15	31

In Table 3.3, ‘H’ represents those metals for which values have been calculated using a hardness of 30 mg/L CaCO₃, as the toxicity of these decreases with increasing hardness. In the Inglis-Flowerdale catchment, hardness is generally between 15-30 mg/L, therefore the trigger values presented above may be broadly applicable.

No significant concentrations of cadmium or arsenic were recorded during either the summer or the winter survey. Lead was below detection limits at most sites during both of the surveys, however an elevated reading of 9 µg/L was recorded at IF21 (Hardmans Creek) during the summer survey. It is not clear what may have caused this, although elevated concentrations of aluminium and zinc were also found at the time.

Copper concentration at most sites during the summer survey were only marginally above the 1 µg/L detection limit for this analysis. During the winter survey, many of the sites sampled showed similar concentrations, with the notable exceptions of sites IF25 (Seabrook Creek at Nunn's Rd) and IF26 (lower Camp Creek), which had concentrations of 5 µg/L. At IF26, this was also associated with an elevated zinc concentration (12 µg/L), and may indicate some type of contamination.

A very high copper value was also recorded at IF10 (Inglis River u/s Calder River) during the winter survey, where concentration was found to be 16 µg/L. A concentration of this magnitude is likely to represent a significant environmental threat, and while the source of this is not clear, a quarry is located 200m from the river about 800m upstream of the site and may be an intermittent source of contamination. Further investigation of this may be required.

Of all the heavy metals that were tested, aluminium was most widely detected at concentrations of any magnitude. The data from the summer and winter surveys (Figures 3.32 and 3.33) shows that concentrations in excess of 100 µg/L were common, with concentration at some sites higher than 500 µg/L. During the summer survey, 23 of the 27 sites tested showed total aluminium concentrations in excess of the 55 µg/L ANZECC (2000) trigger level. During the winter survey, this ratio was even higher, with a maximum concentration of 1.58 µg/L being measured at IF24 (Seabrook Creek u/s Bass Hwy).

These high aluminium concentrations are likely to be caused by the characteristics of the soils and the geology of the catchment. Aluminium is a major component of the main minerals contributing to sands and clays, and soils therefore naturally contain significant levels of aluminium. Solutes such as aluminium tend to be associated most closely with waters moving through the upper soil layers (Neal, *et. al.*, 1997) and concentrations tend to increase with increasing flow through this horizon. Land-use activities that increase the flow of water through this area therefore have the potential to raise concentrations in streams and rivers, and this may be one factor leading to the elevated aluminium concentrations found during this study.

This aluminium is likely to be relatively insoluble and un-reactive, and thus harmless to living species. However under some conditions aluminium can become soluble. This may happen when environments become acidified or when there are high levels of organic matter in the soil. This is likely to explain the very high concentration measured during the winter survey at IF23 (Hebe River), when the aluminium concentration was measured at 1.58 mg/L. As discussed in earlier sections, the influence of the buttongrass swamp in the headwaters of this river has resulted in very low pH and a high organic load, and this is likely to have led to increased leaching of aluminium from the soil profile. Further investigation of this issue may be warranted to determine the environmental consequences of such high aluminium concentration in this river.

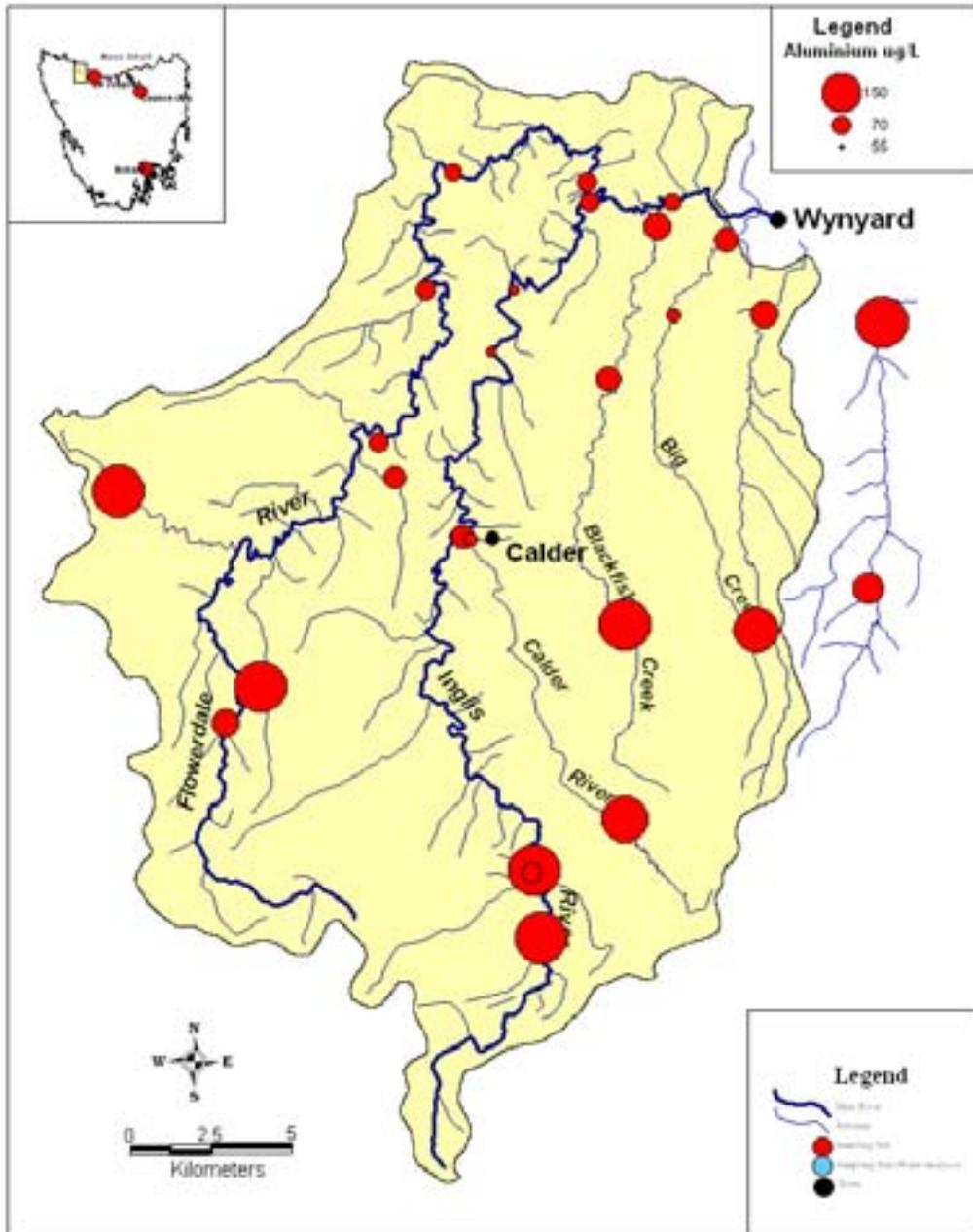


Figure 3.32 : Snapshot of total aluminium concentrations recorded in the Inglis-Flowerdale catchment on 22 March 2000.

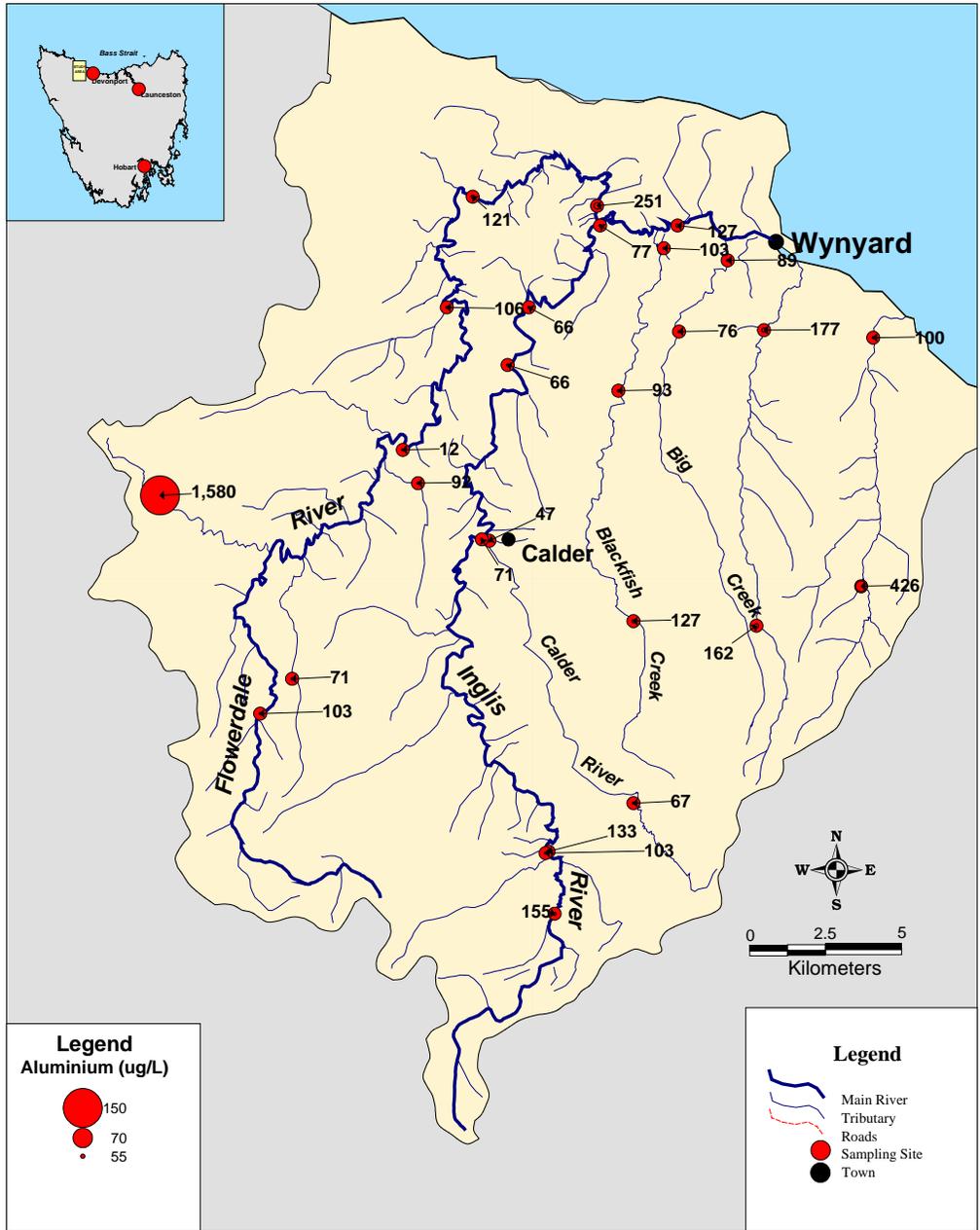


Figure 3.33 : Snapshot of total aluminium concentrations recorded in the Inglis-Flowerdale catchment on 29 August 2000