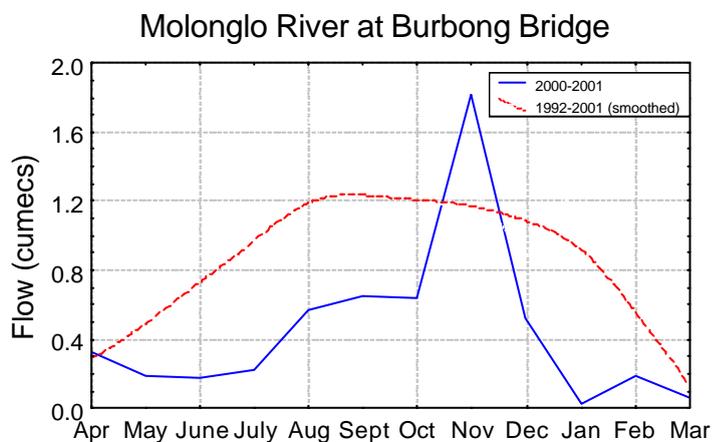
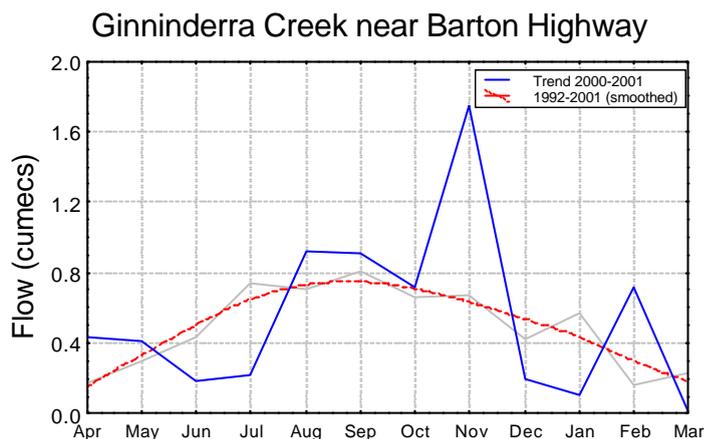
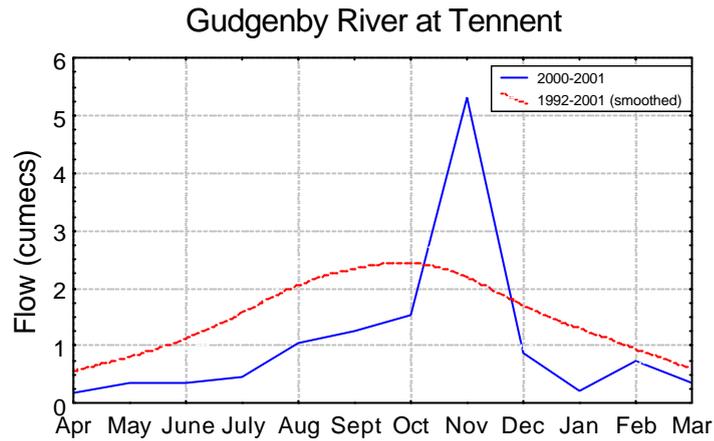


## APPENDIX 1 – CHARTS ILLUSTRATING RIVER FLOW IN THREE CLIMATIC REGIONS

The charts below illustrate the flow from three different climatic regions. Within each chart is the mean monthly flow for the reporting year and the mean monthly flow for the nine year period 1992-2001 for the sampling station.





## APPENDIX 2 – ASSESSMENT METHODOLOGY

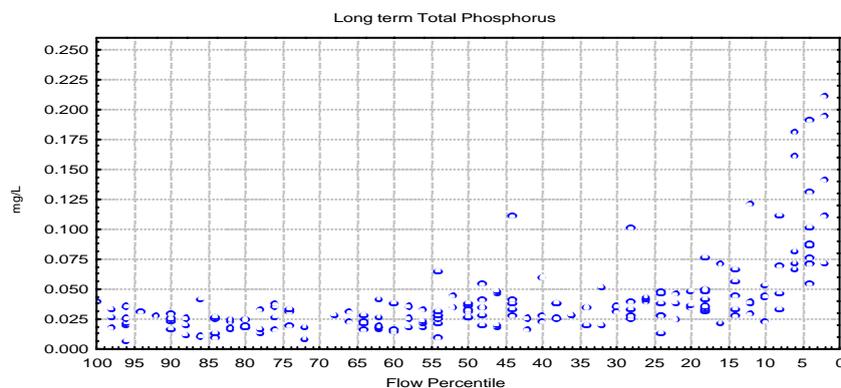
The methods for determining the exceedances of the standard and the presence and magnitude of a trend in the long term data are as follows:

### Exceedences of the Standard

Some water quality indicators such as suspended solids, turbidity, total phosphorus and total nitrogen normally vary in direct proportion with streamflow. The following method has been used to compare current year levels of these indicators with past trends corrected for different flows.

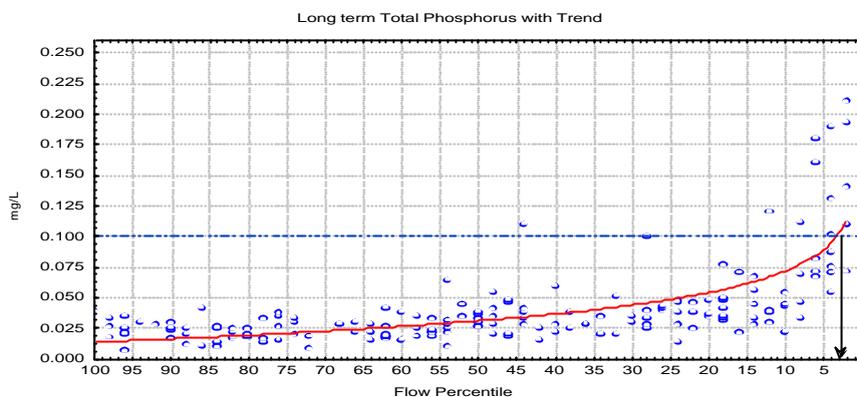
Determining the proportion of time an indicator would appear to exceed the standard is a three-step process.

The first step involves plotting the long term indicator value against the flow percentile at the time of sampling.



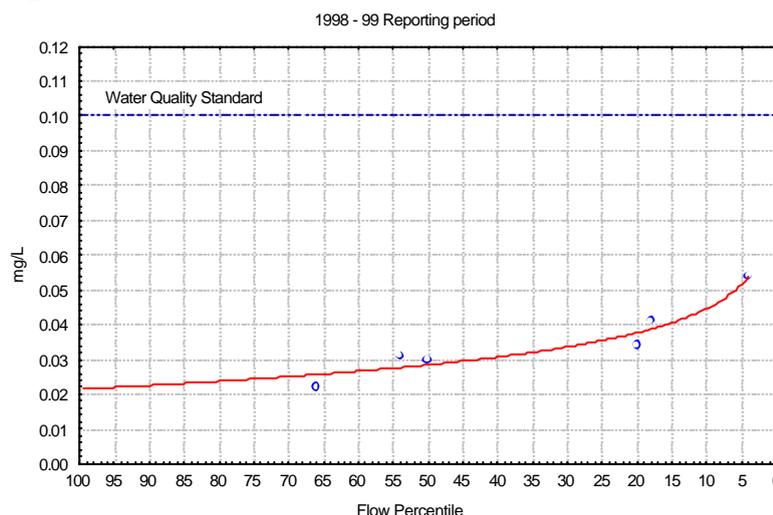
The scatter plot shows a general trend that as flow increases (lower flow percentile number) the concentration of the indicator, in this case total phosphorus, increases.

When we fit a curve to this trend we can then see at what point the line crosses the water quality standard (step two). This may be logarithmic, exponential or linear.



With this particular example, the line of fit crosses the standard at a flow percentile of three. Generalising, we can say that for total phosphorus at this site, the standard is only exceeded when the flow gets above the third percentile i.e. the flow that is exceeded only three percent of the time (very high flow).

The third step involves looking at the previous 12 months data and fitting a similar curve. The flow exceedance for the indicator can again be determined by looking at where the line crosses the standard. In this example the line does not cross the standard so we would say that based on the samples taken during the period, the standard would not be exceeded at any part of the flow regime.



## Long Term Trend

Trend analysis for flow dependent indicators was conducted by using the multiple regression function in Statistica to determine the presence of a significant trend of concentration and the independent variables time, flow and seasonality.

The criteria for a long term trend are as follows:

- the Beta for time must be significant; and
- the P significance is < 0.05.

Beta is a function of the B weighting, adjusted to reflect the influence of the variable in question with respect to its magnitude. If the Beta for time is significant and the Beta for flow, seasonality or both is not, these variables are removed from the regression.

The value for  $R^2$  is also important when interpreting the graph and is used as an indication of how well the model is predicting the concentration. As  $R^2$  approaches 1 the trend has a higher correlation with the data points. In the sites monitored this number typically below 0.5, as there is a relatively large variation.

Once it has been determined that a trend is present with relation to date, the B weighting values for the regression are extracted as well as the Y intercept, they form the following equation.

$$C = B_{Date}X_{Date} + B_{Flow}X_{Flow} + B_{Seas}X_{Seas} + I$$

Where:

C = Concentration of parameter

I = Y Intercept

$B_{Date}$  = B weight for Date

$B_{Flow}$  = B weight for Flow

$B_{Seas}$  = B weight for Seasonality

$X_{Date}$  = Variable Date

$X_{Flow}$  = Variable Flow

$X_{Seas}$  = Variable Seasonality

The median for flow and seasonality is then substituted into the equation to result in a 2 dimensional trend of concentration verses time, which is represented on the scatter plot. See Appendix 4. For further information on method, please contact Environment ACT.

## APPENDIX 3 – BIOLOGICAL MONITORING RESULTS

The Macroinvertebrate monitoring results for the Spring 2000 and Autumn 2001 sessions are as follows:

Site	O/E Site Band	
	Autumn 2001	Spring 2000
<b>Test Sites</b>		
20	A	A
53	B	B
58	B	D
64	B	D
189	C	C
195	B	D
196	B	D
235	B	B
242	B	B
246	B	B
<b>Reference Sites</b>		
10	A	A
15	A	A
40	B	B

## APPENDIX 4 – RESULTS FROM SAMPLING SITES

This section contains the scatterplots of data for all sites sampled and the indicators discussed in this report.