# Summary of QA/QC results: Autumn 2016

Upper Murrumbidgee Waterwatch has recently changed the QC process associated with water quality testing to improve the feedback loop to ensure ongoing improvements to accuracy and precision of volunteer collected water quality data. This process now involves increased rigour regarding the checking of results collected from mystery solution testing, and trouble-shooting methodologies and equipment to rectify any issues seen during mystery solution testing.

The datasheets submitted by volunteers at the May 2016 QC day are analysed and the results presented here. For each mystery solution (two, for each of pH, EC, TP, N and three for Turbidity) are presented, as the average result recorded across all volunteers, and the standard deviation (a measure of variance) around that mean, shown as the error bars. The red line indicates the true mystery solution value.

The overall goal is to see the mean value (blue dot) as close to the red line as possible, and the error bars as small as possible. This is how we can assess accuracy and precision.

1. pH. This mystery solutions were 6.25 and 7.75. Volunteers performed admirably, with average pH scores for mystery solutions being 6.34 and 7.6. Variance around this value was very low, with all volunteers reporting within 0.25 of the true value. This is a vast improvement over the digital pH probes that were previously in use. Ensuring that pH strips are regularly replaced, and kept clean and dry is paramount to good results. Sample size N = 26 for both samples.
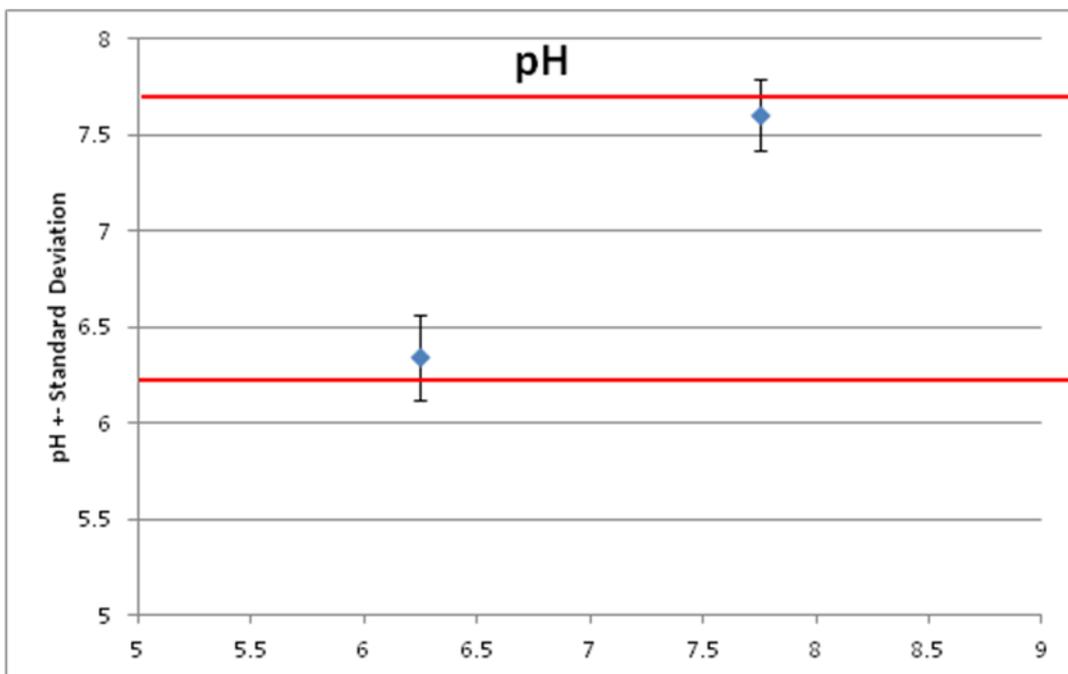
2. Electrical conductivity. This parameter has generally been good, as the probes are accurate and robust to the rigours of life. The mystery solution true values were 20 and 800uS. Volunteers produced good results, averaging 23 and 822uS respectively. A few minor issues were identified and corrected by replacing batteries and recalibrating. Remember to calibrate your probe before each session in the field, and replenish your calibration solutions regularly. Sample size N = 26 for both samples.
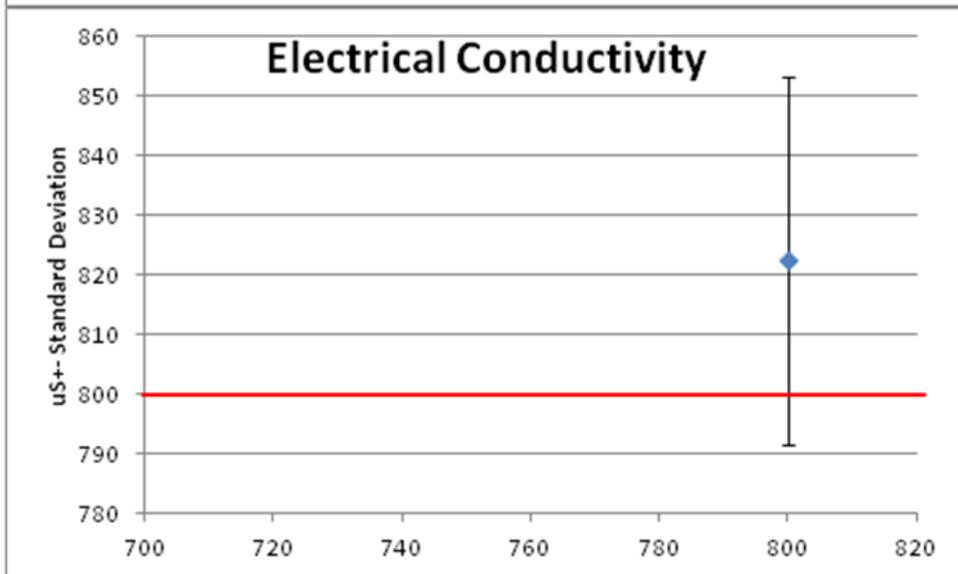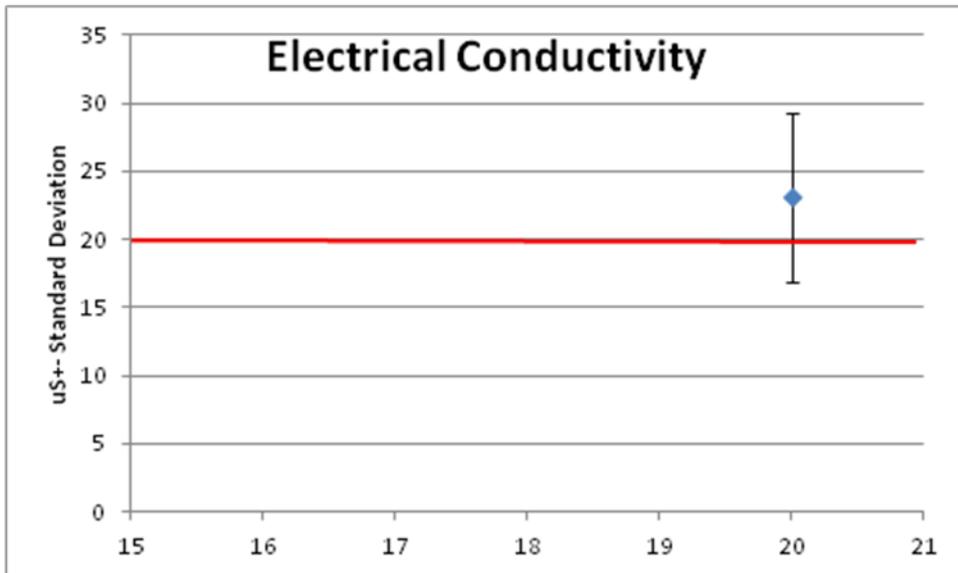
3. Total phosphorus. Previously TP has been problematic, with high variance around estimates. Recently we have moved to a process of increased turnover of kits, including replacing reagents and colour wheels where necessary. Changing out reagents when discoloured, damp or old is vital to accurate results. The true mystery solution values were 0.02 and 0.07 mg/L. Volunteers performed very well, with few major discrepancies. Most discrepancies were rectified by replacing old reagents. If you have old reagents (older than 2014), ask your co-ordinator to replace them. Sample size N = 26 for both samples.
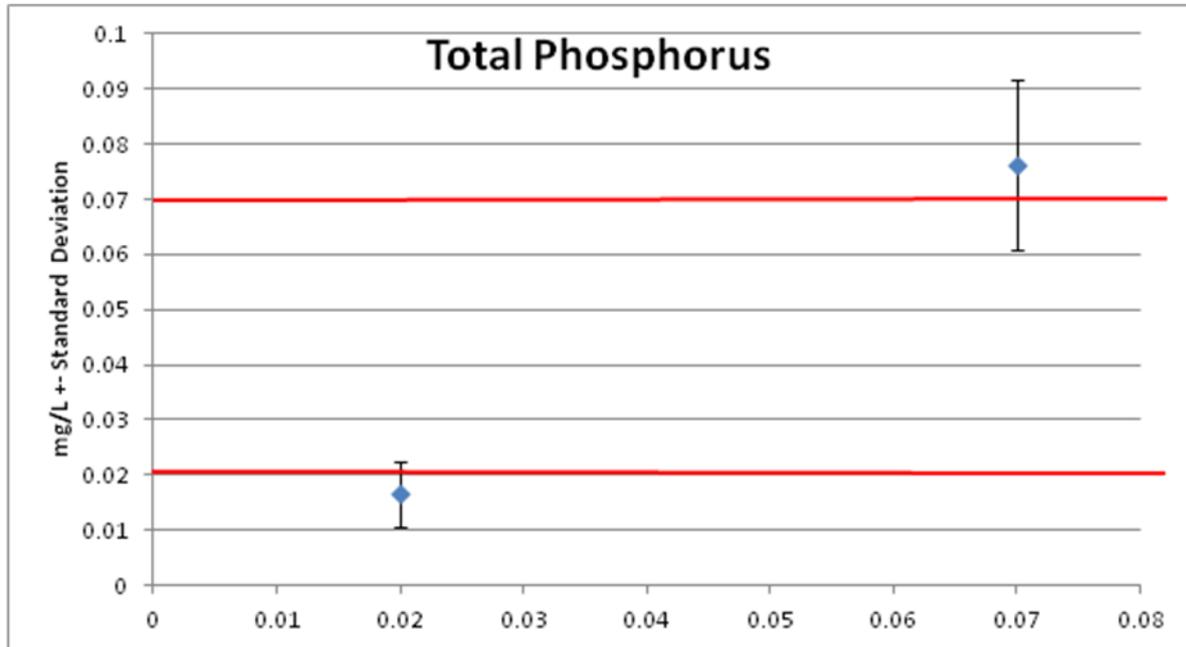
4. Nitrates. Similar to TP, results for Nitrates have been more variable than desirable in the past. Again, much of this has been due to using old reagents in poor condition. The true mystery solution values were 0.66 and 4mg/L. These ones required estimating between two points on the colour chart, making this a tough test for volunteers, but reflects the realities of field testing. Volunteers performed very well again, accurately measuring these solutions. Again, erroneous measurements were rectified by replacing kits. Sample size N = 26 for both samples.
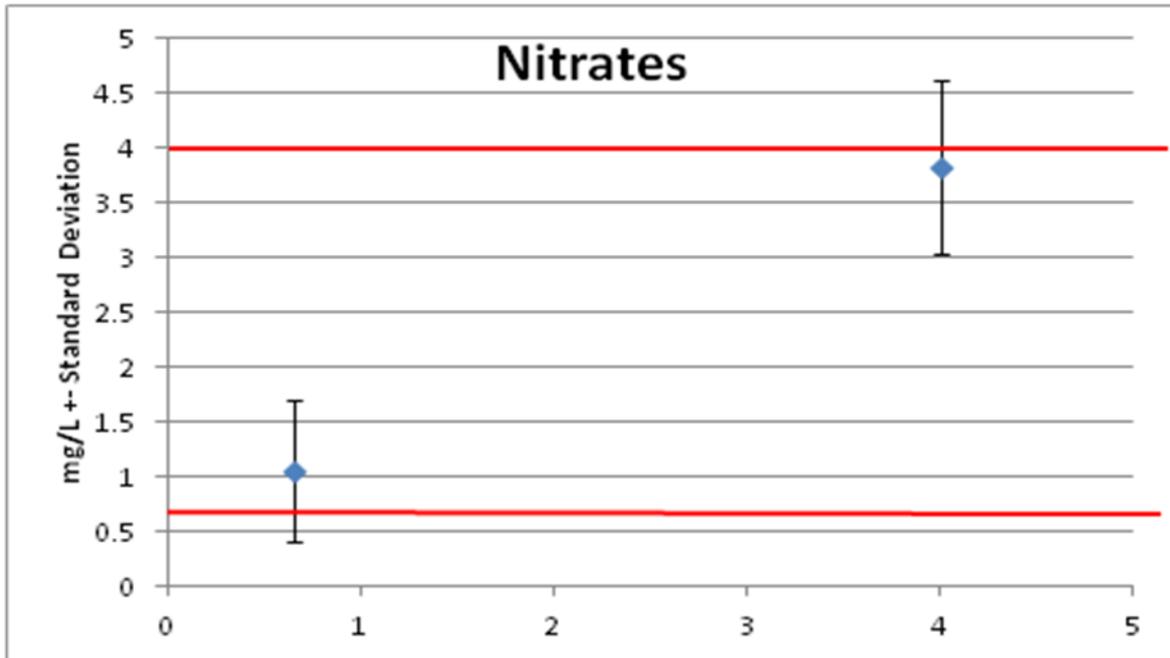
5. Turbidity. We have never previously investigated the accuracy and precision of turbidity measurements by volunteers. This new procedure was primarily aimed at examining technique, rather than measuring accuracy and precision. Future QC events may include a more rigorous test of Turbidity accuracy and precision. These results suggest that volunteers are able to discriminate between clear water (NTU~10) and turbid (NTU >20) samples. Actual accuracy is unknown, but requires further examination to determine if a bias is present, possibly due to eyesight-related issues. Sample sizes N = 19, 10, and 19 for the 10NTU, 20NTU and 30NTU samples, respectively.