



Corangamite Waterwatch Community Water Quality Monitoring Program



DATA CONFIDENCE PLAN

Revision 2009



Acknowledgements

The Corangamite Waterwatch Data Confidence Plan was developed by Michelle Anderson and Deirdre Murphy in 2004-5.

To keep up to date with changes in practices and equipment the Data Confidence Plan was revised 2009 by Deirdre Murphy.

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1. Summary

The Data Confidence Plan (DCP) has been introduced to measure the credibility of the data collected by monitors in the Corangamite region. The essential components of the DCP are the training of facilitators and monitors, equipment maintenance and the quality assurance program.

The aim of the DCP has been to provide a reference document for Waterwatch personnel inside and outside of the Corangamite region. It has been written for data users who need to know the methods and equipment used in the gathering of Waterwatch information. In addition, the document provides a useful and informative reference for those people who generate the data (monitors) and those community members who have an interest in the health of our waterways.

The Data Confidence Plan has been a key part of the Data Confidence System. The system comprises documents that guide Waterwatch monitors, record their competencies, and log their equipment and the data that they generate.

The Corangamite Waterwatch monitoring program has been enhanced by the implementation of the Data Confidence System, and data generated by the region's monitors will be of a known quality according to the standards we have set in the Data Confidence Plan.

2. Overview of the Waterwatch Monitoring Program

Waterwatch has been active in the Corangamite region since 1993. Originally hosted by Barwon Water, the program was initiated to highlight to the community, that the quality of water in the Barwon River in Geelong was a reflection of all upstream management practices. The program now covers the entire Corangamite region (as defined by the Corangamite Catchment Management Authority) and operates regional programs from Corangamite Catchment Management Authority (CCMA) offices in Geelong and Colac. Three staff members (2.5 FTE) are currently employed to implement the Waterwatch program in Corangamite.

The Corangamite region covers 13,340 square kilometres that include the Barwon, Moorabool, Lake Corangamite and Otway Coast basins. Approximately 330,000 people live in this catchment.

Corangamite Waterwatch encourages and supports community involvement in water quality monitoring, raises awareness of water quality issues and fosters a sense of ownership of waterways. There are currently more than 170 people from 46 groups who regularly monitor water quality at 148 sites on local waterways. The groups involved include schools, 'friends of' and Landcare groups, as well as interested individuals.

The information collected by volunteer Waterwatch monitors includes stream habitat assessments, measurements of physical and chemical parameters, and macro-invertebrate surveys. Other information recorded includes water and land use, location of drains and the presence of litter. Information is collected from various rivers, creeks, streams, wetlands, lakes, drains and estuaries throughout the Corangamite region. Long-term data sets exist for several monitoring sites that have been monitored by various Waterwatch volunteers since the program's inception in 1993.

Volunteers are motivated to collect this information for a variety of reasons relating to their interest in the environment. For some, it is to assess the water quality of the waterway on their land. For others, it is to assess the impact of development on a local waterway, to measure the effectiveness of management activities and the impacts of human activity. School groups in particular, are interested in education about ecosystems, waterways and riparian zones.

Apart from the monitors themselves, others interested in the data collected include the Corangamite Catchment Management Authority, local governments and environmental consultants. Waterwatch information can be collected from waterways with public and private land frontage. The data gathered by Corangamite Waterwatch helps to 'fill information gaps' in the Corangamite River Health Strategy. Water quality data is available on request from the Waterwatch regional database. With the implementation of the Corangamite Data Confidence system, Waterwatch will be submitting quality data to the Victorian Water Resource Data Warehouse in the 2009-2010.

3. Credibility of Waterwatch Data: The Data Confidence System

The Data Confidence system has been put in place to allow Waterwatch to ascertain the credibility of its data. Waterwatch Victoria has played an integral part of the process. Waterwatch Victoria resources including Waterwatch Victoria Equipment Manual, Waterwatch Victoria Methods Manual and Waterwatch Victoria Data Confidence Manual along with the Corangamite River Health Strategy, Corangamite Regional Catchment Strategy, the City of Greater Geelong Stormwater Quality Management Plan and the City of Greater Geelong Environmental Management Strategy have shaped the Data Confidence System of the current monitoring program. The output includes the following documents and technologies.

- Data Confidence Plan
- Corangamite Waterwatch Field Manual explains the procedure for and relevance of each parameter tested, the order in which tests should be performed, as well as safety, sampling and quality control (QC) procedures. It is this manual that should be referred to when all water quality testing is carried out.
- Results Book is used by monitors to record water quality data and associated observations. The book is also a record of site risk assessment.
- Education and Field Manual for the "*Coranga-mites: Action in the Catchment?*" school education program.
- Monitoring plans
- Training program for introducing new monitors to water quality monitoring and advanced "refresher" training to maintain data standards
- Equipment Logs track instruments and consumables
- Quality Assurance and Quality Control program (QA/QC is an integrated system of activities to ensure that data meets defined standards).
- Service Logs track equipment maintenance
- Summary Spreadsheet summarises the QA/QC activities that determine the standard of data generated by individual monitors
- Waterwatch Victoria Database: Stores Waterwatch data from each catchment region
- Watchman Database: Stores information on the training of monitors, participants at community events and equipment use (Section 13).

The credibility of our program can only be measured by systematically adhering to a set of procedures. Those procedures suit the purpose of collecting data by Waterwatch monitors ie for field equipment used by the community members rather than that used in a scientific laboratory.

4. Objectives and Aims of Data Confidence Plan

Simply defined, the Corangamite Waterwatch DCP is designed to help our Waterwatch network produce data with a known level of confidence. It has been used for the collection and management of data within the Corangamite Waterwatch program since 2005.

By developing and implementing the DCP, Corangamite Waterwatch aims to:

- Support community members interested in monitoring the water quality of their local waterway by developing an effective monitoring program to produce useful data.
- Demonstrate sound scientific principles in the training and assessment of skills and competencies to instil confidence within monitoring groups.
- Produce data of known integrity as per the State Waterwatch Victoria Data Confidence Framework
- Demonstrate data quality to program users and supporters including community members and sponsors
- Provide transparency to Natural Resource Management managers, ie- those responsible for the health of waterways.

The Corangamite Waterwatch DCP covers all aspects of data collection namely

- Sampling,
- Analysis,
- Data management, and
- Storage.

It illustrates the care taken with data collection and ensures that the data is of a known standard and credible. The plan will demonstrate when the reliability of data is at risk by identifying inadequate practices and procedures, contamination of samples and failure of equipment.

5. Data Confidence Framework

Waterwatch Victoria has developed a State Data Confidence Framework and Guidelines, identifying minimum data confidence standards for a range of monitoring purposes. The four classifications are standard 1 (education), standard 2 (education/data collection), standard 3 (data collation/education) and standard 4 (data collation). The Corangamite Waterwatch team has developed a regional Data Confidence Framework consistent with the Statewide guidelines. The Corangamite Data Confidence Framework lists the requirements for equipment, standard methods and competencies for each data standard (see Appendix A).

Consistent with this regional framework, Corangamite Waterwatch coordinators have identified where all local Waterwatch monitoring groups fit. A Summary Spreadsheet has been developed to track the standard of data being collected by monitors based on their participation in training and the QA/QC program, equipment maintenance and monitoring frequency. This summary is updated half yearly.

6. Monitoring Plans

Monitoring plans are completed for every group in the Corangamite Waterwatch water quality monitoring program. Each monitoring plan requires consultation between both the Waterwatch representative and the monitor/monitoring groups so that all expectations of the program from each side are understood.

Monitoring plans are developed to ensure that

- The monitoring undertaken addresses relevant issues and the questions being asked;
- Data quality meets the requirements of the data users;
- Data is reported in an informative manner;
- Appropriate time and resources are available for the required monitoring program.

The monitoring plan frames a series of questions that are given in the Waterwatch Victoria Data Confidence Manual. Plans are reviewed on an annual basis and the content is included in the group's yearly water quality report.

7. Parameters Monitored

Along with habitat surveys and macroinvertebrate surveys, the following physical-chemical parameters are monitored in the Corangamite region:

- Turbidity – Tube NTU or FAU
- Electrical Conductivity – $\mu\text{S}/\text{cm}$
- pH – pH units
- Reactive phosphorus (orthophosphate) – mg/L P
- Nitrate – mg/L NO_3
- Dissolved Oxygen – % O_2 saturation and mg/L O_2
- Air and water temperature – $^\circ\text{C}$

These surveys and parameters are measured at different frequencies (random, quarterly, monthly etc) depending on the time available to the members of monitoring groups. The parameters measured by monitors are assigned according to their group's monitoring plan.

8. Instrumentation

The Waterwatch program in the Corangamite region uses a number of different types of monitoring equipment as detailed in Table 1. This table includes equipment used for monitoring physical-chemical parameters: Instrument specifications, parameters monitored, and distributor/manufacturer details are noted. The type of instruments used for different monitoring standards (1, 2, 3 & 4) is discussed in the section titled '5. Data Confidence Framework' and are listed in Appendix A. The instruments managed by Corangamite Waterwatch have property labels with identification numbers that are allocated to numbered kits.

9. Standard Operating Procedures and Documentation

Standard Operating Procedures (SOPs) for each piece of equipment, including field operation, calibration, preventative maintenance, repair and general cleaning can be found in Corangamite Waterwatch Field Manuals. Just as the DCP is an evolving document, the field manual is regularly reviewed and updated as new equipment and procedures are introduced.

9.1 Record Documentation

The Corangamite Waterwatch facilitators maintain a series of logs to demonstrate that SOPs and appropriate quality control checks are being implemented by the various Monitoring Standards (as per the Corangamite Data Confidence Framework). Some of the information recorded in these logs will be transferred to the Watchman database for reporting purposes. The following logs are maintained in the Corangamite Waterwatch records:

- Equipment Logs record equipment purchase dates, equipment serial numbers, identification numbers and where the equipment is located or to whom it has been allocated.
- Training Logs record the type of training performed and the date of completion for Waterwatch staff and monitors.
- Service Logs track the frequency of servicing and repair of equipment used in the Corangamite Waterwatch program helping to maintain fully functional instruments.
- Monitor proficiency records monitor skills and ensures data collected is accurate and precise. Participation in the QAQC program by Corangamite Waterwatch staff and monitors is tracked as part of the Summary Spreadsheet.
- Kit Service Log provides the date of last service of the Waterwatch kit. It provides details of the equipment allocated to kit eg presence or absence of Dissolved Oxygen kit and type of phosphate testing kit included. The identification numbers of instrumentation is logged. Fresh calibration solutions are supplied at the time of kit servicing.

Table 1 Instrumentation used in the water quality monitoring program

Parameter	Instrumentation	Range	Resolution	Accuracy	Supplier
Electrical Conductivity	TDScan4	0 - 19.90 mS/cm	0.10mS/cm	±2% full scale	Vendart Westlab
	TDScan 3	0 – 1990 µS/cm	10µS/cm	±2% full scale	Vendart Westlab
	ECScan high	0-19.90 mS/cm	0.10mS/cm	±1% full scale	Vendart Westlab
	ECtestr11 (dual range)	0-20.00 mS/cm	10µS/cm (0-2mS) 0.10mS/cm (2-20mS)	±1% full scale (0-20mS)	Vendart Westlab
pH	pHScan2 or 4	1.0 - 14.0 pH	0.1 pH	±0.1 pH	Vendart Westlab
	pHtestr10	1.0 - 14.0 pH	0.01 pH	±0.01 pH	Vendart Westlab
	Macherey-Nagel pH-Fix Strips	4.5 - 10.00 pH	0.5 pH	Not available	Vendart Westlab
Turbidity	Turbidity Tube	<10 - 400 Tube NTU	Variable integers along length of tube	NTU scale on side of tube used as an approximation of true NTU measurement only	Vendart Westlab
	HACH DR890 Colorimeter (absorptometric method)	0 - 1000 FAU	2 FAU	±2 FAU	Biolab
Temperature	Enviro-Safe Thermometer	-5 - 50° C	1°C	±1°C	Vendart Westlab
	Digital thermometer	-50 to 200° C	0.1°C	±0.1°C	Westlab
Reactive Phosphorus	Merck Aquaquant Phosphorus test	0.015 - 0.14mg/IP	Various increments (0, 0.015, 0.03, 0.045, 0.06, 0.08, 0.11, 0.14 mg/L)	Not Available	Vendart
	Macherey-Nagel Visicolor HE	0.01-0.25	Various increments (0, 0.01, 0.02, 0.03, 0.05, 0.07, 0.10,	Not Available	Westlab

Parameter	Instrumentation	Range	Resolution	Accuracy	Supplier
	Phosphate test	mg/L P	0.15,0.20, 0.25 mg/L)		
	Macherey-Nagel Visocolor HE Phosphate test	0.05-1.0 mg/L P	Various increments (0, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.60,0.80, 1.0 mg/L)	Not Available	Westlab
	La Motte DC1200 Phosphate LR Colorimeter	Detection limit 0.05mg/L	0.01mg/L	±2 % full scale	Vendart
	HACH DR890 Colorimeter (ascorbic acid method)	0.0 – 0.815 mg/L P	0.02mg/l P	±0.02 mg/lP	Biolab
	HACH DR700 Colorimeter	0.0 – 0.815 mg/L P	Not Available	Not Available	Biolab
Dissolved Oxygen	La Motte DO test kit	0 – 20mg/l	0.2mg/l	Not Available	Vendart
	HACH DR890 Colorimeter	0 - 15mg/l O ₂	0.1mg/l O ₂	±0.4mg/l O ₂	Biolab
	HACH DR700 Colorimeter	0 - 14mg/l O ₂	0.1mg/l O ₂	±0.23mg/l O ₂	Biolab
	CHEMetes	0 - 12mg/l O ₂	Various increments (1, 2, 3, 4, 5, 6, 8, 10, 12 mg/L O ₂)	±½ standard colour increment	Water Test Systems
Nitrate (NO ₃ ⁻ N)	Macherey-Nagel Quantifix Nitrate Nitrite test	0-500 mg/lL	Various increments (0, 10, 25, 50, 100, 250, 500 mg/L NO ₃)	Not available	Westlab

Suppliers of the above equipment:

Vendart, Contact: Terry van Heerden, ph: 02 96791139

Biolab ph: 1300 735 295

Westlab, Contact Ted Fowler, ph 03 53332941

Water Test Systems, ph: 02 8706 5400

10. Monitoring Sites

Corangamite Waterwatch monitoring sites are listed on the Corangamite Waterwatch Database of which 148 are active (131 active in 2004). The individual monitor usually selects sites based on their own interests. School groups usually select sites that are close to the school grounds and accessible. Landcare groups usually select sites on their properties. Community groups' sites are selected based on the issue/input being monitored, eg. for stormwater issues the sites would be up and downstream of a drain. Priority waterways are identified in the Corangamite River Health Strategy, many of which are not monitored. These waterways will be targeted as potential monitoring sites for individuals interested in monitoring with no site in mind.

The six digit alpha-numerical site codes are allocated using the following system. The first three letters are determined by waterway or catchment abbreviations eg. Barwon River code is BAR, sites in the Swan Bay catchment have the code SWA, the monitoring site at Lake Purrumbete has the code PUR. The number allocation is dependent on the position in the catchment. In flowing systems, lower numbers are allocated in the upper catchment and higher numbers are allocated to the lower catchment e.g. the upper headwaters of the Barwon River is coded BAR010. In the case of nonflowing water bodies, such as wetlands and lakes, the numbers are allocated as above if there is a distinct altitude change between sites in a catchment or more generally from east to west direction in the catchment e.g. Bonnyvale Wetlands is located in the most westerly position of the Swan Bay catchment and has a site code of SWA135. For flowing drains, the methods for numbering sites developed above still apply eg drains in the township of Indented Head flowing from streets to beach are ordered from IND010 to IND050 in a general east to west direction. Generation of site code numbers is dependent on the neighbouring sites that have an established code i.e. the new site code number will fall between the adjacent site code numbers. The site code system in the Corangamite region is well recognised by community members, Waterwatch facilitators and data users.

Site locations are recorded in the database with Eastings and Northings map grid coordinates, as well as a detailed site description (including how to get there). The map grid coordinates are drawn from the Barwon Water Profis mapping program and Global Positioning System instrumentation using Map Grid of Australia (MGA) Zone 54 and 55.

11. Waterwatch staff: Roles and Responsibilities

All members of Corangamite Waterwatch have roles and responsibilities in the planning and implementation of the data confidence system in the Corangamite Region (see Table 2 below).

Table 2 – Positions Held by Corangamite Waterwatch Staff

Name	Title
Deirdre Murphy	Waterwatch Program Coordinator
Brenda Skene	Waterwatch Facilitator - Colac
Rebecca Callea	Waterwatch Education Officer

The Program Coordinators responsibilities are to

- Review the management of the program to ensure it is meeting the outputs stated in funding proposals
- Preparation of Water Quality Reports
- Ensure all Corangamite Waterwatch staff training needs are met
- Assist with the training and retraining of monitors' water quality data collection procedures (including snapshot and local events)
- Assist with scheduled equipment maintenance
- Enter and validate water quality data on Corangamite Waterwatch database
- Coordinate and supervise specialised activities including snapshot events and local projects
- The Corangamite Waterwatch Program Coordinator will implement the Corangamite Waterwatch Data Confidence Plan including the documentation of monitor records and all actions.
- Purchase and distribution of equipment, standards and reagents
- Maintenance of functional equipment (where external service and/or repair is required)
- Maintenance of QC logs

The Colac Waterwatch Facilitator has a role in assisting the Science Coordinator in the implementation of the Data Confidence Plan in the Colac region. The Colac Facilitator will also assist the Education Officer in the delivery of the Coranga-mites *Action in the Catchment* in the Colac region. Responsibilities in the Colac region include:

- Training and retraining of monitors water quality data collection procedures
- Coordinate and supervise specialised activities including snapshot events and local projects
- Organising scheduled equipment maintenance
- Ensuring the information for logging is transferred to the Program Coordinator
- Maintaining monitors records including contacts and summary spreadsheet
- Filing of hard copy records
- Validating and maintaining water quality data on Corangamite Waterwatch database

The Corangamite Waterwatch Education officer is responsible for the delivery of the *Coranga-mites: Action in the Catchment* Education program and assisting the other facilitators. Responsibilities include:

- Training and retraining teachers and parent classroom helpers participating on the education program in data collection procedures
- Assisting with scheduled 'Coranga-mites' equipment maintenance
- Coordinating and supervising specialised activities as part of the education program
- Preparing the *Coranga-mites- Action in the Catchment* annual report
- Maintaining 'Coranga-mites' records including contacts and relevant logs
- Filing of hardcopy records (*Coranga-mites*)
- Validating and maintaining water quality data on Corangamite Waterwatch database

12 Personnel Training

12.1 Corangamite Waterwatch Training Program for Coordinators and Facilitators

Waterwatch Coordinators and Facilitators attend training sessions organised by Waterwatch Victoria. These annual training opportunities include physical-chemical monitoring, macroinvertebrate sampling and identification and database training. All Corangamite Waterwatch staff attends this training upon joining the program, and then attends regular refresher sessions thereafter. Coordinators and facilitators

training is recorded on Training Forms and entered onto the Watchman Database. Training details are also logged in the Summary Spreadsheet, which is updated quarterly.

The minimum requirement of Corangamite Waterwatch Coordinators and Facilitators is to collect Standard 4 data (for the requirements see Regional Data Confidence Framework Appendix A). The Corangamite Waterwatch staff are encouraged to attend professional development sessions to maintain and continuously improve skills eg first aid training and Index of Stream Condition training. Staff training requirements is assessed annually.

12.2 Corangamite Waterwatch Training Program for Volunteer Monitors

Overview

The Corangamite Waterwatch Training Program is broken into three components:

- *Coranga-mites* training,
- Introductory training, and
- Advanced training.

The *Coranga-mites* training program is for teachers participating in the *Coranga-mites - Action in the Catchment* education program. Introductory training targets monitors collecting Standard 1 and 2 data and also serves as a refresher for monitors collecting Standard 3 data. The advanced training component targets those interested in macro-invertebrates and monitors collecting Standard 3 water quality data.

Corangamite Waterwatch staff organise training sessions and follow the training checklists (Appendix B) to ensure all relevant topics and methods are covered. Training sessions are advertised via the distribution of fliers, emails, and the Corangamite Waterwatch newsletter 'Watchout'.

Coranga-mites Training

This training is provided to teachers that have committed to participate in the *Coranga-mites – Action in the Catchment* Education Program. Teachers are required to attend one training session annually in either the Geelong region (three sessions are offered) or in the Ballarat region (one session offered). These individual training sessions cover all aspects of the education program and are presented at the beginning of the school year to new and existing *Coranga-mites* teachers. The water quality data collected during the *Coranga-mites* education program is of Standard 1. This training is organised by the Corangamite Waterwatch Education Officer. The session runs for two hours and is broken into two parts:

Introduction to the Program

This part of the training session covers the education program including, how Waterwatch fits in to the curriculum, safety and monthly activities, as outlined in the *Coranga-mites – Action in the Catchment* Education Manual and Field Manual.

Water Quality Monitoring and Interpretation

The Waterwatch water quality test kits are distributed to teachers participating in the education program. This part of the training session equips teachers with the necessary skills to use the Waterwatch water quality testing equipment. Teachers are instructed on interpretation of data using the "Interpreting Your Results" posters.

Teachers are encouraged to seek the support of Waterwatch throughout the year for assistance with the monthly activities. Follow up training in water quality monitoring is provided upon request.

Introductory Training

This training is provided to new monitors with little or no experience with the Corangamite Waterwatch Water Quality Test procedures. More than one training session may be required, introductory training may take up to 12 months depending on the expectations and commitment of the new monitor. This training program is usually provided to the individual monitor or monitoring group. The induction and habitat survey component of this training will take approximately one hour each. The physical and chemical monitoring component may take up to two hours. These three components may be delivered in one session or separately (depending on convenience) by any of the Corangamite Waterwatch Coordinators. Ideally, introductory training will be carried out at the new monitors site of interest.

Induction

The Corangamite Waterwatch program is introduced by discussing expectations and responsibilities of both Waterwatch and the monitor and where they fit into the DCP. A monitoring plan is completed during this session to help determine the most suitable monitoring program. The field manual contents are discussed, in particular, the safety aspects of monitoring. Training in chemical safety and field safety is given.

Habitat Survey

A habitat survey is demonstrated at the monitoring site of interest with full explanation of the terms used. A site description is completed. Habitat surveys and site descriptions are annual requirements for each monitoring site. This information is used to record any physical changes at the site and to ensure the detail of the monitoring site are kept up to date. It is included in the annual water quality report.

Physical and Chemical Monitoring

Physical and chemical testing is introduced and demonstrated. Topics covered in this session include safety, monitoring and sampling techniques, times and frequencies of testing, quality control, data management and water quality reports.

Follow up sessions may be organised if the monitor is not confident to carry out monitoring independently. These sessions should coincide with the next scheduled monitoring time.

Advanced Training

After participating in the introductory training program monitors wishing to collect Standard 3 data will be expected to participate in the advanced training program. Introductory training is offered as a refresher to existing monitors collecting Standard 2 and 3 data. Monitors collecting Standard 3 data are expected to participate in the refresher session delivered in their area annually by the Corangamite Waterwatch Coordinators. Macro-invertebrate training is optional for all monitors.

Macro-invertebrate Surveys

Monitors are introduced to how macro-invertebrates are used as an indication of water quality and their role in the ecosystem. The training includes safety, sampling procedures, sorting and identification to order level and calculation of SIGNAL scores.

Data Confidence Plan and QA/QC Program

The DCP is explained including, the expectations and requirements of monitors collecting Standard 3 data. This covers the equipment maintenance schedules, training sessions and QC program. The QA/QC program is explained in detail and gives monitors an indication of the timelines they will be working to. This information may be delivered during the refresher sessions or to monitors individually. Additional refresher training is recommended to monitors that fail to meet QA/QC requirements.

Refresher Sessions

Refresher sessions are held at local information sessions held throughout the region. Sessions may focus on habitat surveys, physical and chemical monitoring, macro-invertebrates training and the QA/QC program. Macro-invertebrate training is optional depending on the monitor's interest. Monitors collecting standard 3 data are expected to participate in the QA/QC component. These sessions should also be used to service water quality monitoring kits where necessary.

Training Checklists

There are checklists for each component of the training program to ensure that all aspects of the monitoring program are covered (refer to Appendix B). The checklists are based on the information and procedures in the relevant field manuals.

Training Documentation

Training requirements are recorded as part of each monitor's monitoring plan. Description of the training type, attendance, the date of completion and comments are recorded on the Corangamite Waterwatch Monitor Training forms (refer to Appendix C). Corangamite Waterwatch staff complete these training forms for each monitor after training. This information is entered on the Watchman database and is then filed with the relevant monitoring group's information.

Training information is also recorded on the Summary Spreadsheet for monitors collecting Standard 2, 3 and 4 water quality data. This is updated on a half yearly basis.

13. Information Management

The data handled by Corangamite Waterwatch has many varied uses. Water quality data collected by monitors is entered into a common database, the Corangamite Waterwatch Database, for use by our own monitors (in the form of water quality reports), Waterwatch Victoria, program sponsors and other data users upon request. In 2009-10, Standard 3 & 4 data from Corangamite Waterwatch Database will be available online from the Victoria Water Resource Data Warehouse.

The collection of other information regarding the role of the facilitators in an educative capacity is better handled by the Watchman database, a project/evaluation management tool.

13.1 Watchman Database

Watchman is an Access-based data management system created by Goulburn Broken Waterwatch. The program records activities at individual schools including the number and year level of the participants, and the type of activity (eg macroinvertebrate identification). Further information regarding contact details, equipment allocation, and training can be recorded. Similar records can be made for community groups. Reports can be generated to tally the events occurring within a certain time frame.

13.2 Corangamite Waterwatch Database

Waterwatch Victoria has recently upgraded an Access-based data management system for regional programs. The program makes possible the electronic transfer of data from Waterwatch monitors (through the use of an Offline Data Entry Application or ODEA), to local Waterwatch facilitators, and to Regional Waterwatch Coordinators (and regional Databases). This new data management system has a number of advanced data validation tools to minimise data transcription and/or entry error, as well as improved statistical analysis and reporting features.

From a quality control point of view, the database is able to identify any unusual data and also tag data according to its quality, as outlined below (and in the Regional Data Confidence Framework). It is this tagging system that will be used to export high quality Waterwatch data (Standard 3 or 4) for inclusion on the Victorian Water Quality Data Warehouse.

All data is stored in the Corangamite Waterwatch Database located on the CCMA network server. Corangamite Waterwatch staff enters data regularly and the CCMA network is backed up every weeknight. The unique data entry number and date of entry is noted. These datasheets are then filed at the Waterwatch section of the CCMA offices. Data sheets are filed according to their site codes.

Standard 1 and 2 data is not tagged as QA'ed on the Corangamite Waterwatch Database. Standard 3 and 4 data is tagged as QA'ed.

13.3 Data Validation

All monitors have relevant field data recording sheets provided to them in their Waterwatch Monitoring Results Book. Monitors complete data record sheets and forward a copy to Corangamite Waterwatch staff by person, fax, mail or email. Templates of the field data record sheets are located in Appendix D.

All data is checked for accuracy by the Waterwatch staff member responsible for data management prior to entry onto the Corangamite Waterwatch Database. The validity of the data is assessed by an experienced Co-ordinator using long term data sets together with local knowledge gained from our regular catchment-wide sampling program. When data quality is questioned, groups are encouraged to re-test or the data is not included onto the database.

The Waterwatch Database has a series of data validation features to help identify highly abnormal data as a result of typing transcription errors, and for flagging possible pollution incidents. Two types of limits are included in the database to flag unusual data. Hard limits reflect the maximum range of values for a parameter and are the same for all water types. Soft limits reflect the expected range of a parameter for a water system type in the Corangamite region. Data that falls outside any of the limits without valid explanation will not be automatically OK'ed for report with the other QA'ed data. Data can be manually OK'ed despite falling outside of soft limits if the result is determined to be legitimate. The soft limits are set by Corangamite Waterwatch and are listed in Table 3 – High and Low Soft Limits for Water Types in the Corangamite Region. The numbers were determined by using normal observations in frequently monitored sites and are subject to review.

Table 3 – High and Low Soft Limits for Water Types in the Corangamite Region

WATER TYPE	PARAMETER	HIGH SOFT	LOW SOFT	WATER TYPE	PARAMETER	HIGH SOFT	LOW SOFT
CREEK	DO (% sat)	120	60	LAKE	DO (% sat)	120	60
	EC (µS/cm)	60000	10		EC (µS/cm)	360000	10
	Nitrate (mg/L)	4	0		Nitrate (mg/L)	4	0
	OrthoP (mgP/L)	0.5	0		OrthoP (mgP/L)	0.5	0
	pH (units)	9	5		pH (units)	9.5	6
	Temp (C)	35	1		Temp (C)	35	1
	Turbidity (NTU)	400	0		Turbidity (NTU)	400	0
RIVER	DO (% sat)	120	60	DAM: CATCHMENT FED	DO (% sat)	120	60
	EC (µS/cm)	60000	10		EC (µS/cm)	1000	10
	Nitrate (mg/L)	4	0		Nitrate (mg/L)	4	0
	OrthoP (mgP/L)	0.5	0		OrthoP (mgP/L)	0.5	0
	pH (units)	9	5		pH (units)	9	5.5
	Temp (C)	30	1		Temp (C)	30	1
	Turbidity (NTU)	400	0		Turbidity (NTU)	400	0

Table 3 continued – High and Low Soft Limits for Water Types in the Corangamite Region

WATER TYPE	PARAMETER	HIGH SOFT	LOW SOFT	WATER TYPE	PARAMETER	HIGH SOFT	LOW SOFT
POND/WETLAND	DO (% sat)	120	60	DRAIN	DO (% sat)	120	60
	EC (µS/cm)	14000	10		EC (µS/cm)	70000	10
	Nitrate (mg/L)	4	0		Nitrate (mg/L)	4	0
	OrthoP (mgP/L)	0.5	0		OrthoP (mgP/L)	0.5	0
	pH (units)	9.5	5.5		pH (units)	9.5	6
	Temp (C)	30	1		Temp (C)	30	1
	Turbidity (NTU)	400	0		Turbidity (NTU)	400	0

Figure 2- Data Acquisition Flow Chart: This diagram shows the process for credible data collection. The quality control process steps are illustrated and the actions required by monitors and Waterwatch personnel to meet those standards.

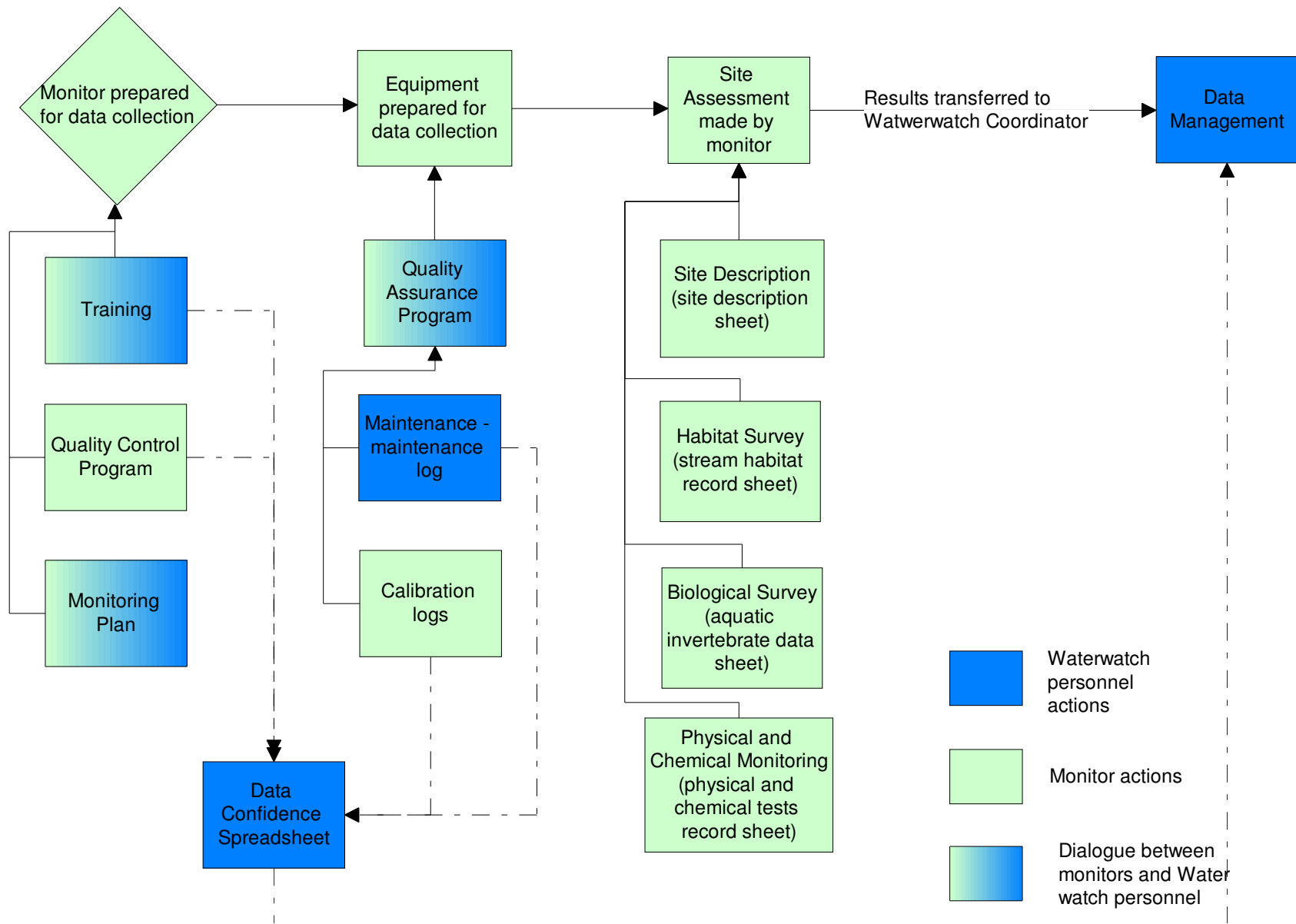
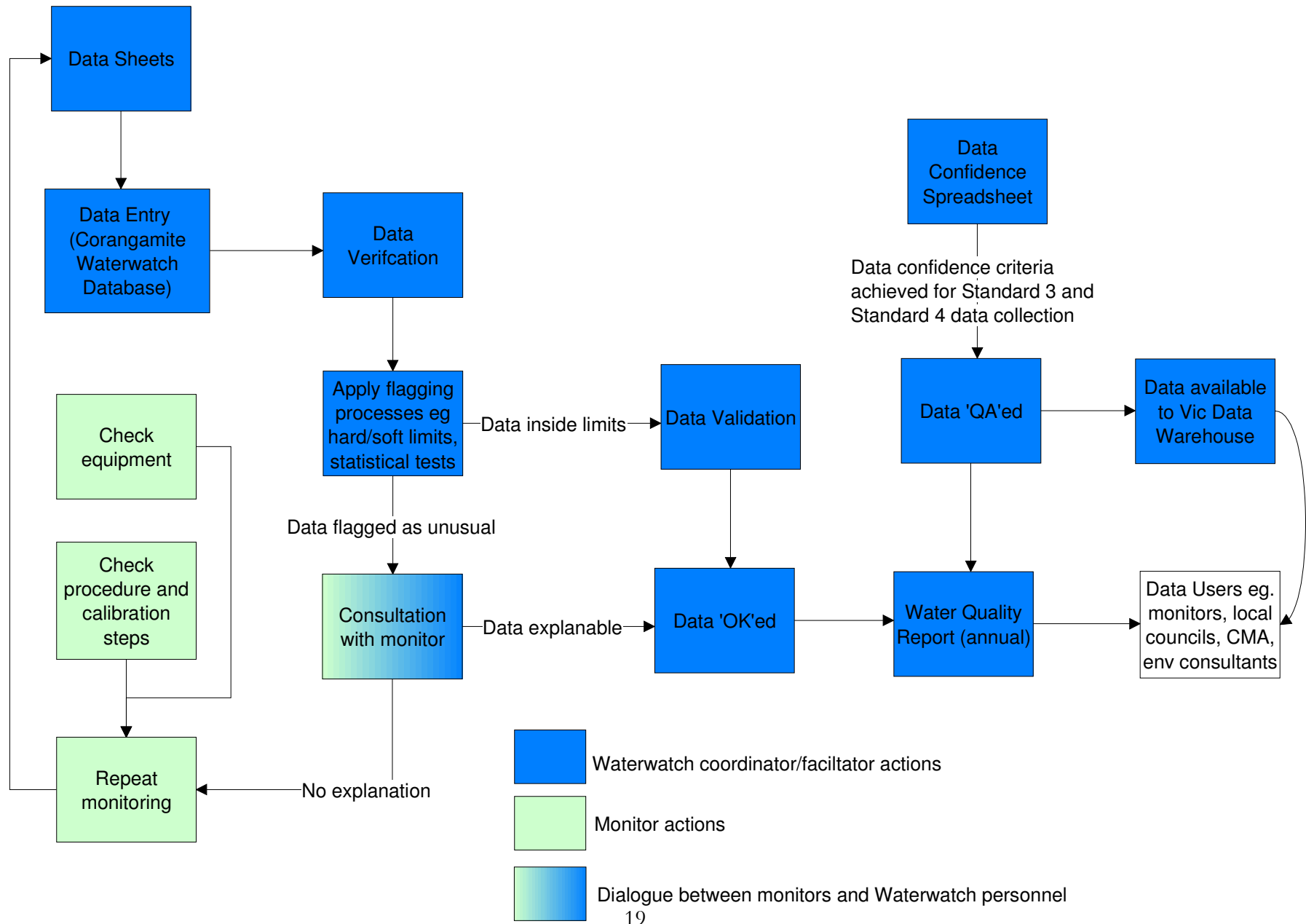


Figure 3. Data Management Flow Chart: This diagram shows the process for credible data management . The quality control process steps are illustrated and the actions required by monitors and Waterwatch personnel to meet those standards



13.4 Summary of the Information Management Process

The collection of credible data has many processes and these are illustrated in the above figures. The flow chart in Figure 2 shows the elements that have an influence on the data during the acquisition phase. Such elements include personnel training (see Section 12 above) and quality control record documentation (see Section 13 above). Figure 3 is a flow chart that illustrates how data is processed and delivered to the data users ie the data management phase. The major influence on the process between data entry to the Corangamite Waterwatch Database and the end user, are the verification and validation steps. As described above, the quality assurance is an important influence in the data management process 14. Performance Evaluation and Review

14 Quality Assurance and Quality Control (QA/QC) program

14.1 Corangamite Waterwatch QA/QC program

Corangamite Waterwatch runs a QA/QC program that includes precision and accuracy testing of monitors and equipment. The extent in which the monitor is involved depends on the standard of data being sought; this is shown in Appendix A – Regional Quality Control Review.

QA/QC mystery sample program
Monitors and staff are provided with the opportunity to check their accuracy for testing EC, pH and reactive phosphorus during this annual program. Laboratory prepared samples are distributed to all monitors collecting secondary and tertiary standard water quality data. Monitors collecting standard 3 data are expected to achieve results within the same limits as prescribed for the state program.
QA/QC split sample program
Monitors and staff are provided with the opportunity to check their precision and accuracy for testing EC, pH, turbidity and reactive phosphorus. Monitors are provided with sample bottles to fill during scheduled water quality testing and return with their results to Waterwatch staff for immediate testing.
QA/QC shadow testing program
Monitors and staff are provided with the opportunity to check their precision and accuracy for testing temperature, EC, pH, turbidity, dissolved oxygen and reactive phosphorus of stream samples against a second set of equipment. When Waterwatch staff visits monitors/monitoring groups to carry out scheduled equipment maintenance this check can be performed at the monitor's regular monitoring site.

The QA/QC program is considered to be an important part of the support monitors receive from Waterwatch facilitators. Monitors are offered the opportunity to participate in mystery sample testing twice a year. Waterwatch facilitators discuss data credibility at site visits, refresher sessions and through correspondence. Monitors are aware that full participation in the QA/QC program is necessary to achieve the best possible standard for Data Confidence. Mystery samples have been the most convenient method of conducting QA/QC however it is also feasible for the program to use shadow testing or split sampling. Shadow testing would be possible during refresher sessions when several

monitors could be doing the sample at the same time, as this would be more time efficient. The disadvantage of the split sample method is sample stability during storage and transportation, making it a less useful technique.

The acceptable error range for passing the QA/QC tests are given in the following table (Table 4). These ranges are consistent with Victoria Waterwatch Statewide 2004 QA/QC (see Section 15.2). The data values monitors give will depend on the equipment they are using. For instance, analysing a standard solution of 0.05mg/L P with an allowable error margin of 20% will give an acceptable range between 0.04 to 0.06 mg/L P. Consideration should be given to results that fall outside of this range when broad-increment equipment is used.

Table 4 Acceptable error ranges for parameters measured by the Corangamite Waterwatch QA/QC program using mystery samples.

Parameter	Accepted Error Range	Accepted Error Range
	Victoria Waterwatch	Corangamite Waterwatch
pH	± 0.3 – 0.5 pH units	± 0.5 pH units
EC	10%	10%
Reactive Phosphorus (mg/L P)	20%	20%
Turbidity	20%	not tested

The results of the QA/QC program are reported back to participating monitors. If monitors report values outside the allowed error range, they are contacted to find out why. Major causes are failure to follow SOP and instrumental defects.

Equipment Maintenance

Equipment Maintenance is performed twice a year on equipment used to collect Standard 3 or 4 data and annually on equipment for Standard 1 and 2 data. The 'Kit Servicing' procedure is located in Appendix E.

Annual QA/QC Program Activities

The activities in Table 5 are used to maintain the quality of the monitors' data collection. This planner helps Waterwatch staff to plan QA/QC, refresher training and equipment servicing. It also prompts for the quarterly updates of the Data Confidence Spreadsheet.

Table 5 Annual QA/QC program activities.

Month	Program Activity	Instrument & monitor checks for quality	
		Accuracy	Precision
January	Coranga-mites Equipment Maintenance (Standard 1)	✓	
February	Coranga-mites training workshops in Geelong and Colac and equipment distribution (Standard 1)		
March	Habitat survey and Physical/Chemical testing training workshops in Geelong and Colac (Refresher training). (Standard 2 & 3)	✓	
	QA/QC program - Mystery Samples (Standard 3)	✓	✓
	Update Data Confidence Spreadsheet (Standard 1, 2, 3)		
April	Review of documentation including field manual		
May	Equipment Maintenance (all equipment except Coranga-mites) (Standard 2 & 3)	✓	
June	Macro-invertebrate training (on request) (Standard 2 & 3)		
	Statewide QA/QC week 2005: Phys-chem & macros (Standard 2, 3 & 4)	✓	✓
July	Update Data Confidence Spreadsheet (Standard 2 & 3)		
August			
September	QA/QC program - Split Samples or Shadow Testing (Standard 3)	✓	✓
October	Update Data Confidence Spreadsheet (Standard 2 & 3)		
November	Coranga-mites Equipment collection (Standard 1)		
	Equipment Maintenance (Standard 2 & 3)	✓	
	Review monitoring plans (Standard 2 & 3)		
December	Update Data Confidence Spreadsheet (Standard 1, 2 & 3)		

14.2 State Waterwatch QA/QC program

Waterwatch Victoria conducts an annual QA/QC program, where Waterwatch staff are required to test solutions of known value as a means of checking instrument and user accuracy. These results are reported in an annual report by Waterwatch Victoria. Regions are encouraged to use the results for self-assessment purposes.

All Corangamite Waterwatch staff participates in the state-wide QA/QC program and are expected to achieve the accepted quality limits for EC, pH, turbidity and reactive phosphorus. Tolerance limits are shown in Table 4 for EC, pH, turbidity and reactive phosphorus (and are subject to review). Staff who do not achieve the required quality limits, must review their monitoring practices and adjust it appropriately (including retraining where required) before their data is accepted for the regional database. Equipment must also be reviewed.

Waterwatch staff and monitors who do not achieve the required quality limits (see Table 4) are required to retrain before their data is recognised as the standard prescribed in their monitoring plan. Standards will be reflected in the Data Confidence Spreadsheet.

15. Reports

Corangamite Waterwatch prepares annual Water Quality Reports for monitoring groups whose sites have been monitored at least four times in a calendar year. The annual water quality report includes brief analysis of the data collected, a description of the monitored site, calibration records, training records, QA/QC mystery sample results and recommended actions. A single report will be produced for groups that monitor at several sites along one waterway or in one sub-catchment. Water quality reports are distributed to the monitoring group or individual, CCMA, and local council (on request).

A short report is produced for the biannual QA/QC mystery sample program and distributed to participating monitors. This gives direct feedback to the monitors, providing a report they can show their peers and it also serves to benchmark their own performance in relation to the Waterwatch network.

Water quality data is featured occasionally in the Corangamite Waterwatch newsletter 'Watchout'. It serves to recognise the role of monitoring in the range of Waterwatch activities. Watchout is distributed to all monitors, stakeholders and interested individuals.

When data is requested, an activities form (Appendix C) is completed and the priority for delivering the requested data is decided. Once data has been delivered the information from the activity form is logged onto the Watchman database and then filed with a copy of the data requested.

16. Data Confidence Plan Review

A review will be undertaken of the Data Confidence Plan after the first year of operation. Subsequent reviews will then be on a biannual basis. All Waterwatch staff and selected monitors will be invited to participate in the reviews.

Annually, the Corangamite Waterwatch staff and the State Science Coordinator will review Standard 3 & 4 monitoring undertaken in the region. This review will be an opportunity to check that minimum QA/QC requirements for high quality data (that going onto the data warehouse) are being met through the implementation of the data confidence plan.

17. Acknowledgements

The preparation of the original 2005 document would not have been possible without the valuable input by the State Waterwatch team: Science Coordinator Sara Johnson and Project Officer Paul Puhar. The Corangamite Waterwatch team also appreciates the review by Greg Peters (Corangamite Catchment Management Authority) and David Sutherland (Barwon Water).

18. References

Corangamite Waterwatch Field Manual, 2005

“*Coranga-mites: Action in the Catchment*” Education Manual, 2004 (revised 2005)

“*Coranga-mites: Action in the Catchment*” Field Manual, 2004

Waterwatch Victoria Data Confidence Manual, 2000

Appendices

Appendix A: Corangamite Data Confidence Framework: Regional adaptation of the Waterwatch Victoria Data Confidence Framework - **Standard 1 Education**

Parameters		Electrical Conductivity	pH	Turbidity	Temperature	Reactive Phosphorous	Dissolved Oxygen
Recommended Equipment	Equipment type	TDScan4 or ECScan high	pH strips	Turbidity Tube (tube NTUs)	Thermometer	Merck Aquaquant Phosphorus test or Macherey-Nagel Visocolor HE Phosphate test	La Motte DO test kit
Standard Methods	Calibration methods	One point calibration (2000µS/cm)	No calibration required	No calibration required	No calibration required	Not applicable	No calibration required
	Sampling and measurement methods	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 22	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 18	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 24	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 12	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 20	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 14
	Quality Control mechanisms	Not applicable					
	Record Keeping	Instrument allocation log					
Competencies	Waterwatch monitor competencies	Group leader is shown best practice for each parameter prior to water quality testing activity (refer to Corangamite Waterwatch field manual) Field and chemical safety Sample collection					
	Waterwatch coordinator competencies	Thorough use and application of statewide standard procedures and regionally specific procedures (refer to Corangamite Waterwatch field manual). Participation in statewide QAQC program. Participation in phys/chem training and refresher courses					
Quality Control Review		Not applicable					
State-wide Quality Control review		Not applicable					
Monitoring Frequency	Physical-chemical parameters	Random					
Database	Data storage facility	Corangamite Waterwatch Database					
	Data validation	Data entered onto database by coordinator or trained Waterwatchers only. Data entered onto database is checked against datasheets for correct transfer. Data not tagged as QA'ed on Corangamite Waterwatch Database. Datasheets are clearly marked once data is entered onto data base.					

Appendix A cont'd: Corangamite Data Confidence Framework: Regional adaptation of the Waterwatch Victoria Data Confidence Framework – **Standard 2 Education & Data Collation**

Parameters		Electrical Conductivity	pH	Turbidity	Temperature	Reactive Phosphorous	Dissolved Oxygen
Recommended Equipment	Equipment type	TDScan4 or ECScan high	pH strips pHScan2	Turbidity Tube (tube NTUs)	Thermometer	Merck Aquaquant Phosphorus test or Macherey-Nagel Visocolor HE Phosphate test	La Motte DO test kit
Standard Methods	Calibration methods	One point calibration (2000µS/cm)	Strips: no calibration required pHScan2: two-point calibration (pH4 & pH 7 or pH7 & pH10 span appropriate for infield pH conditions)	Not Applicable	Check against precision thermometer	Not applicable	See instrument instructions
	Sampling and measurement methods	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 22	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 17	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 24	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 12	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 20	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 14
	Quality Control mechanisms	Refer to Corangamite Waterwatch Field Manual: page 25					
	Record Keeping	Instrument specification log; Record of Calibration; Maintenance log; Monitor training log; Reagents Log		Maintenance log; Monitor training log;		Maintenance log; Monitor training log; Reagents Log	
Competencies	Waterwatch monitor competencies	Demonstrated ability for sample collection and testing procedure as directed in Corangamite Waterwatch field manual Participation in annual training/refreshers session. Recording data; field and chemical safety					
	Waterwatch coordinator competencies	Thorough use and application of statewide standard procedures and regionally specific procedures (refer to Corangamite Waterwatch field manual). Participation in statewide QAQC program. Participation in phys/chem training and refresher courses					
Regional Quality Control Review		Optional participation in regional mystery sample program..			Not applicable	Optional participation in regional mystery sample program.	Not applicable
State-wide Quality Control review		Not applicable					
Monitoring Frequency	Physical-chemical parameters	One a year - Quarterly					

Database	Data storage facility	Corangamite Waterwatch database
	Data validation	Data entered onto database by coordinator or trained Waterwatchers only. Data entered onto database is checked against datasheets for correct transfer. Data not tagged as QA'ed in Corangamite Waterwatch Database. Datasheets are clearly marked once data is entered onto data base.

Appendix A cont'd: Corangamite Data Confidence Framework: Regional adaptation of the Waterwatch Victoria Data Confidence Framework – **Standard 3 Data Collation & Education**

Parameters		Electrical Conductivity	pH	Turbidity	Temperature	Reactive Phosphorus	Dissolved Oxygen
Recommended Equipment	Equipment type	TDScan 3 (for sample <2000µS/cm), TDScan4 or ECScan high (for sample >2000µS/cm)	pHScan2	Turbidity Tube (tube NTUs), **Hach DR 890 (FAUs)	Thermometer	Merck Aquaquant P test Macherey-Nagel Visocolor HE Phosphate test *Hach DR700, **Hach DR890	La Motte DO test kit *Hach DR700 **Hach DR890
Standard Methods	Calibration methods	One point calibration is appropriate to these instruments (1413µS/cm or 2000µS/cm respectively)	Two-point calibration (pH7 & pH10) before all sampling	Tube: no calibration DR890: by manufacturer	Check against precision thermometer (in solution)	Colorimeter calibration curves with know standards	La Motte DO test kit: reagents replaced biannually with fresh reagents HACH colorimeters: See instrument instructions
	Sampling and measurement methods	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 22	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 17	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 24 **HACH DR/890 Data logging Colorimeter Handbook p511	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 12	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 20 *HACH DR/700 Colorimeter Manual module 81 p47 **HACH DR/890 Data logging Colorimeter Handbook p407	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 14 *HACH DR/700 Colorimeter Manual module 52 p97 **HACH DR/890 Data logging Colorimeter Handbook p369
	Quality Control mechanisms	Refer to Corangamite Waterwatch Field Manual: page 25					
	Record Keeping	Instrument specification log; Calibration log; Maintenance log; Training log; Reagent Log					

Competencies	Waterwatch monitor competencies	Demonstrated sample collection and testing procedure as directed in Corangamite Waterwatch field manual Participation in training/refresher sessions. Logging calibration records. Recording data; field and chemical safety. Participation in regional QA/QC program.					
	Waterwatch coordinator competencies	Thorough use and application of statewide standard procedures and regionally specific procedures (refer to Corangamite Waterwatch field manual). Participation in statewide QA/QC program. Participation in phys/chem training and refresher courses					
Regional Quality Control Review		Participation in regional QA/QC program (twice/year). Acceptable limits $\pm 10\%$ EC	Participation in regional QA/QC program (twice/year). Acceptable limits ± 0.3 pH units	Participation in regional refresher sessions and QA/QC program. Shadow test against other parties	Participation in regional refresher sessions and QA/QC program. Shadow test against other parties	Participation in regional QA/QC program (twice/year). Acceptable limits $\pm 20\%$ actual mg/L value	Participation in regional refresher sessions and QA/QC program. Shadow test known sample against other parties.
State-wide Quality Control review		Yearly review of regional implementation of DCP. Participation in statewide QA/QC encouraged (but not mandatory)					
Monitoring Frequency	Physical-chemical parameters	Monthly - Quarterly					
Database	Data storage facility	Regional Waterwatch database; DSE Data Warehouse					
	Data validation	Data entered onto database by coordinator or trained Waterwatchers only. Data entered onto database is checked against datasheets for correct transfer, or checked with monitors if considered an anomaly. Data tagged as QA'ed on Corangamite Waterwatch Database. Datasheets are clearly marked once data is entered onto data base.					

Appendix A cont'd: Corangamite Data Confidence Framework: Regional adaptation of the Waterwatch Victoria Data Confidence Framework – **Standard 4 Data Collation**

Parameters		Electrical Conductivity	pH	Turbidity*	Temperature	Reactive Phosphorus*	Dissolved Oxygen*
Recommended Equipment	Equipment type	TDScan 3 (for sample $< 2000\mu\text{S/cm}$), TDScan4 or ECScan high (for sample $> 2000\mu\text{S/cm}$)	pHScan2	Hach DR 890 (FAUs)	Thermometer	Hach DR700 Hach DR890	Hach DR700 Hach DR890
Standard Methods	Calibration methods	One point calibration is appropriate to these instruments ($1413\mu\text{S/cm}$ or $2000\mu\text{S/cm}$ respectively)	Two-point calibration (pH7 & pH10); Calibration before all sampling.	DR890: by manufacturer	Check against precision thermometer (in solution)	Colorimeter calibration curves with know standards	See instrument instructions

	Sampling and measurement methods	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 17	Refer to Corangamite Waterwatch Field Manual: sampling page 10	Refer to Corangamite Waterwatch Field Manual: sampling page 10 measurement page 12	Refer to Corangamite Waterwatch Field Manual: sampling page 10	Refer to Corangamite Waterwatch Field Manual: sampling page 10
	Quality Control mechanisms	Refer to Corangamite Waterwatch Field Manual: page 25					
	Record Keeping	Instrument specification log; Calibration log (EC and pH meters only); Maintenance log; Monitor training log; Coordinator training log					
Competencies	Waterwatch monitor competencies	Quaternary standard exclusive to Corangamite Waterwatch Coordinators where equipment is available.					
	Waterwatch coordinator competencies	Thorough use and application of statewide standard procedures and regionally specific procedures (refer to Corangamite Waterwatch field manual). Participation in statewide QAQC program. Participation in phys/chem training and refresher courses					
Regional Quality Control Review		Regional mystery samples for volunteers to measure for core indicators (twice/year)	Regional mystery samples for volunteers to measure for core indicators (twice/year)	Regional mystery samples for volunteers to measure for core indicators (twice/year)	Shadow testing in field against other water monitoring parties or check against precision thermometer (in water at 2 temperature points)	Participation in regional mystery sample program (2 times per year) Groups encouraged to fall consistently within acceptable limits	Regional mystery samples for volunteers to measure for core indicators (twice/year)
State-wide Quality Control review		State-wide mystery samples (June): Monitor expected to fall consistently with in acceptable limits (10% EC) Yearly review of regional implementation of DCP	State-wide mystery samples (June): Monitor expected to fall consistently with in acceptable limits (± 0.3 pH units) Yearly review of regional implementation of DCP	State-wide mystery samples (June): Monitor expected to fall consistently with in acceptable limits ($\pm 20\%$ NTUs) Yearly review of regional implementation of DCP	Shadow test against other parties or check against precision thermometer (in water at 2 temperature points). Yearly review of regional implementation of DCP	State-wide mystery samples (June): Monitor expected to fall consistently with in acceptable limits ($\pm 20\%$ mg/L P value). Yearly review of regional implementation of DCP	Shadow test against other parties. Monitor expected to fall consistently with in acceptable limits ($\pm 20\%$ mg/L) Yearly review of regional implementation of DCP
Monitoring Frequency	Physical-chemical parameters	Monthly (min)	Monthly (min)	Monthly (min)	Monthly (min)	Monthly (min)	Monthly (min)
Database	Data storage facility	Regional Waterwatch database; DSE Data Warehouse					
	Data validation	Data entered onto database by coordinator or trained Waterwatchers only. Data entered onto database is checked against datasheets for correct transfer, or checked with monitors if considered an anomaly. Data tagged as QA'ed in Corangamite Waterwatch Database. Datasheets are clearly marked once data is entered onto database.					

*Discussion with Sara Johnson in August 2004 that the requirements for these parameters are subject to change with the modified Waterwatch Victoria Data Confidence Guidelines

Appendix B. Training checklists for “Coranga-mites”, Introductory, Refresher and Advanced components of the Waterwatch training process.

Training Checklist – Coranga-mites Component

An explanation of the information and procedures in the Coranga-mites – Action in the Catchment education manual and the Coranga-mites Field manual.

The Corangamite Waterwatch program	<input type="checkbox"/>
Corangamites- Action in the Catchment - overview	<input type="checkbox"/>
Monthly Activities	<input type="checkbox"/>
Rainwatch	<input type="checkbox"/>
Habitat Survey	
Define stream habitat zones	<input type="checkbox"/>
Water Quality Monitoring	
Field Safety	<input type="checkbox"/>
Chemical Safety	<input type="checkbox"/>
Sample Collection, Preservation and Storage	<input type="checkbox"/>
Sampling equipment and maintenance	<input type="checkbox"/>
Testing order	<input type="checkbox"/>
Procedure, calibration and maintenance for	Temperature <input type="checkbox"/>
	pH <input type="checkbox"/>
	Phosphorous <input type="checkbox"/>
	Conductivity <input type="checkbox"/>
	Turbidity <input type="checkbox"/>
Interpreting Results	<input type="checkbox"/>
Macro-invertebrate Sweep - sampling	<input type="checkbox"/>
Equipment	<input type="checkbox"/>
Data Management	<input type="checkbox"/>
Complete Kit contents and Distribution Form	<input type="checkbox"/>

Training Checklist – Introductory/Refresher Component

Information and procedures as stated in the Corangamite Waterwatch Field Manual – for secondary and tertiary standard data collection.

- The Corangamite Waterwatch program
- Complete General Information Form
- Complete/ Review Monitoring Plan (expectations and responsibilities)
- Establish standard of data to be collected
- Complete Site Description Sheet 1
- Habitat Survey
 - Define stream habitat zones
 - Complete Stream Habitat Record Sheet
- Physical and Chemical Testing
 - Field Safety
 - Chemical Safety
 - Sample Collection
 - Sampling equipment and maintenance
 - Sample Preservation and storage
 - Testing order
 - Procedure and calibration for:
 - Temperature
 - Dissolved Oxygen
 - pH
 - Phosphorous
 - Conductivity
 - Turbidity
- Record precalibration values for pH and EC meter (Standard 3 data collection only)
- Complete Physical and Chemical Tests Record Sheet
- Data Management

Training Checklist – Advanced Component

Information and procedures as stated in the Corangamite Waterwatch Field Manual – for standard 2 and standard 3 data collection.

Review the following:

- The Corangamite Waterwatch program
- General Information Form
- Monitoring Plan (expectations and responsibilities)
- Complete Site Description Sheet 1 (annual)

Follow procedures in the Corangamite Waterwatch Field Manual for:

Macro-invertebrates

- Field safety
- Equipment
- Kick Sampling
- Sweep Sampling
- Sorting and Identification
- SIGNAL scores – Complete Aquatic Invertebrate Data Sheet

Quality Control Program

- Requirements
- Mystery samples
- Shadow samples
- Results

- Data Management

Appendix C. The training form used to log Waterwatch training sessions and the activity form used to log community participation in Waterwatch events. Data collected is entered in the Watchman database.

Training Form

Training Facilitator: _____

Trainee: _____ Monitoring Group: _____

Date: _____ Time: _____ Duration: _____

Training Type: (please circle) Coranga-mites Introductory Intro- Follow up Refresher
Advanced Advanced (QAQC only)

QC competencies met: Y/N Trainee data standard: primary secondary tertiary

Training checklist completed: Y/N

Activities Form

Activity: _____

Facilitator: _____

Date: _____ Time Start: _____ Finish: _____

Location: _____

School/Group: _____

Contact: _____ Contact No.: _____

Appendix D. Field data sheet used to collect Standard 2 and 3 data



Physical & Chemical Tests Record Sheet
(To be completed monthly)

Site Name:		Site Code:	
Name of Monitoring Group:			
Person(s) Conducting the test:			
Date of test:		Time of test:	
Site Risk Assessment Completed: <input type="checkbox"/> signature please: (see inside back cover flap) Please note any circumstantial hazards and additional risks (see below)			
Test	Result (units)		Comments
D.O.	mg/L	% sat.	
Water Temperature			° C
Air Temperature			° C
pH	Meter calibrated to pH 7 <input type="checkbox"/> & pH 10 <input type="checkbox"/>		
Salinity	Meter calibrated to 2000 EC <input type="checkbox"/>		E.C.
Reactive Phosphorus			mg/L P
Turbidity			N.T.U./P.T.U.
Weather conditions at the time of sampling:			
<input type="checkbox"/> sunny <input type="checkbox"/> cloudy <input type="checkbox"/> overcast <input type="checkbox"/> raining <input type="checkbox"/> windy			
Rainfall:			
Last rainfall: <input type="checkbox"/> More than week ago <input type="checkbox"/> During the last week <input type="checkbox"/> During the last 24 hours <input type="checkbox"/> Raining now			
Amount of rain: _____			
Water flow		Water appearance	
Flow indicator: _____ ML/day		<input type="checkbox"/> Clear <input type="checkbox"/> Milky <input type="checkbox"/> Foamy/frothy <input type="checkbox"/> Muddy <input type="checkbox"/> Smelly <input type="checkbox"/> Stained green <input type="checkbox"/> Scummy <input type="checkbox"/> Oily <input type="checkbox"/> Stained brown <input type="checkbox"/> Other (description)	
Estimate of flow			
<input type="checkbox"/> Not flowing <input type="checkbox"/> Slow <input type="checkbox"/> Moderate <input type="checkbox"/> Rapid			
Stream depth and width			
Depth indicator: _____metres		<input type="checkbox"/> 0 - 50 cm deep <input type="checkbox"/> 51cm-1m deep <input type="checkbox"/> 1 to 2 m deep	
Average width of stream: _____metres		<input type="checkbox"/> 2 to 5 m deep <input type="checkbox"/> >5 m deep <input type="checkbox"/> Unknown depth	
Drains		Circumstantial hazards and additional risks	
Water flowing from drain: <input type="checkbox"/>		Hazard: _____ Risk: _____	
Color: _____ Odour: _____		Risk Control Measures:	
No water flowing from drain: <input type="checkbox"/>			
Litter pollutants: (Tick type found)			
<input type="checkbox"/> plastic <input type="checkbox"/> clothing <input type="checkbox"/> car bodies <input type="checkbox"/> paper <input type="checkbox"/> bottles <input type="checkbox"/> polystyrene <input type="checkbox"/> oil <input type="checkbox"/> petrol/diesel <input type="checkbox"/> packets <input type="checkbox"/> cans <input type="checkbox"/> waxed cardboard <input type="checkbox"/> other _____			

Appendix E: Kit servicing procedure



WATER MONITORING KIT SERVICING

The Lamotte water quality kits used by both primary and landcare groups need to be regularly serviced to ensure probes, glassware, etc., are clean and results obtained are accurate. This guide will help you follow an easy procedure to cleaning all the equipment used.

What the servicing kit should contain :

- 1 litre bottle fresh conductivity standard
- 100ml bottle 10% HCL
- 100ml bottle 50% methylated spirits
- Fresh pH 7 Buffer
- Fresh pH 10 Buffer
- 2 waste bottles
- Safety gloves and glasses
- 1 box of tissues
- Normal saline eyewash ampules
- 2 bottles of distilled water
- Replacement Batteries
- Two small beakers

WARNING :

Wear safety gloves and glasses when handling any of the above chemicals.

All wastes should be disposed of into the wastes bottle and returned to the lab.

All kits should be clearly labelled and contain field notes.

MSDS (material safety data sheets) for all chemicals must be included

1. pH Meter

The glass probe on the pH meter is very sensitive and needs to be thoroughly cleaned with acid and methylated spirits to remove any contaminants affecting the performance of this meter.

- Step 1. Place the probe in a beaker with enough 10% Hydrochloric acid (HCL) to cover the probe only, allow probe to soak in the acid for no longer than 1 minute. Rinse the probe thoroughly with tap water and wipe dry with a tissue.

Step 2. Place a few drops of methylated spirits on a tissue and gently wipe the glass probe clean, be careful not to touch the probe. Rinse the probe with distilled water and place probe in a fresh pH 7 and pH 10 Buffer to check calibration.

* **N.B.** Replace the pH 7 and pH 10 Buffers with the new buffers supplied in the servicing kit. Check that batteries are OK, often the meter won't calibrate if batteries are on the way out. Check levels of Buffers and distilled water. Replenish if low.

Remember to leave the pH meter soaking in the pH Buffer 7 when not in use (mention this to groups).

2. Phosphate Kit

Contamination of the glass tubes within the phosphate kit may occur at any time. It is important that these glass tubes are soaked in acid to remove any phosphate that is bound to the glass.

Step 1. Replace both glass tubes with tubes that have been cleaned at the cage in Decon 30 (5% solution).

Step 2. Check chemical levels are OK. Replace P1 or P2 as necessary

3. Conductivity Meter

The stainless steel electrodes need to be kept clean and free from dirt etc., to ensure accurate readings are obtained.

Step 1. To a beaker add enough 50% methylated spirits to cover the electrodes only. Allow to stand for 15-20 minutes.

Step 2. After elapsed time, pour into waste bottle and gently wipe the electrodes with a tissue then rinse with distilled water.

* **N.B.** Replace the conductivity standard and check to see if the meter is correctly calibrated. Adjust as necessary. Check batteries as well, if reading is faint, won't stabilize, disappears or won't calibrate, often batteries are the problem.

4. D.O. Kit

The glassware used in D.O. determination also needs to be clean and free of contaminants.

Step 1. Replace the sample bottle, titration container and syringe with apparatus that has been cleaned at the cage with Decon 30 (5% solution).

Step 2. Chemical bottles should be replaced with bottles that have been filled in the cage to minimise handling risks.

5. Turbidity Tube, Thermometer

These two items are easily cleaned. The thermometer should be checked for any cracks and glass should be clean to make readings easy. The turbidity tube should also be free from dirt both inside and out. Rinsing with tap water should remove all dirt from inside and wiping the outside of tube should clean the plastic.