North Central Waterwatch Program

Data Confidence Plan

North Central Waterwatch (Project Name) North Central Catchment Management Authority (Responsible Agency) Updated September 2008 (Date) *Project Manager* Signature	
	Name/Date
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Supported by:

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1. Waterwatch in the North Central Region

1.1 The Region

The North Central region is one of ten Catchment Management Authority (CMA) regions in Victoria. It comprises an area of almost three million hectares and covers approximately 13% of the State of Victoria. The region extends from the Great Dividing Range in the south, to the Murray River in the north, a distance of up to 280km. It is around 150km wide and extends from the Mt Camel Range in the east to the western boundary of the Avon-Richardson Catchment beyond Donald. Approximately 200,000 people live in the region.

The North Central CMA region is geographically diverse with water availability variable. The Loddon, Campaspe, Avoca, and Avon-Richardson river systems comprise the major sub-catchment systems. The Loddon and the Campaspe Rivers flow northwards into the Murray River system. The Avon-Richardson River flows into a terminal lake (Lake Buloke) and the Avoca River flows into Lake Bael Bael which, in a wet year, flows into the Kerang Lakes and eventually into the Murray River.

Flow is variable across the catchment. Rainfall is usually dependable during the winter months in the southern areas; however the recent drought has seen poor seasonal rainfall. The Loddon and Campaspe Rivers are regulated systems, while the Avoca and Avon-Richardson Rivers are unregulated and hence suffer from highly variable flow regimes.

1.2 North Central Waterwatch Program - Overview

North Central Waterwatch seeks to protect and enhance the health and improve community understanding of the four major river systems, and associated waterbodies, within the North Central Region through awareness raising and community monitoring activities.

The Waterwatch program has operated in the North Central region since 1993. The program has been successful in attracting large numbers of individuals and groups to monitor local waterways and learn about water quality issues. Some groups and individuals have been monitoring for over 12 years.

Waterwatch is just one of the organisations undertaking water quality monitoring in the North Central region of Victoria. Other groups undertaking significant surface water monitoring include Department of Sustainability and Environment, Goulburn Murray Water, Coliban Water, Lower Murray Water, Central Highlands Water, Wimmera Mallee Water, Bureau of Meteorology, Environmental Protection Authority (EPA) and Murray Darling Basin Commission. PIRVic regularly monitor groundwater. As part of the Victorian Water Quality Monitoring Network (VWQMN), contractors (currently Ecowise Environmental, ALS Laboratory and Theiss) undertake surface water monitoring at permanent monitoring sites across the region.

The Waterwatch program is the only monitoring program in the region actively engaging a broad sector of the community in water quality and catchment health issues.

Four staff members support and coordinate the Waterwatch program in the North Central region. Roles, duties and time allocations vary for each position. Staff are located across the region with the Regional Coordinator (1 FTE) and the Loddon Campaspe facilitators (dryland and irrigation) (2 FTE) based at the North Central Catchment Management Authority (NCCMA) Huntly office. The Avoca/Avon-Richardson facilitator (1 FTE) is located at the DPI office in St Arnaud.

Water quality monitoring is conducted with a predominantly education and indicative waterway condition focus. The majority of participants include: schools, landholders and community groups such as Landcare. Community monitors are usually individuals who have become aware of the program through Landcare groups.

1.3 North Central Community Stream Sampling Project

North Central Waterwatch received funding in 2006 through the Australian Government's "Community Stream Sampling and Salinity Mapping Project—in the Murray Darling Basin" to implement a community based salinity mapping project. The project spanned across two years and was funded under the National Action Plan for Salinity and Water Quality (NAP). The project was administered by the Department of Agriculture, Fisheries and Forestry's Bureau of Rural Sciences.

The project aimed to build on existing salinity data through new stream sampling and salinity mapping; to help communities within the Murray Darling Basin identify areas of high salinity risk and prioritise investments for future salinity management.

This project was an important component of efforts to deal with salinity and its impact on river health. It allowed a major expansion of the existing Waterwatch monitoring network within the region and created a strong focus on salinity monitoring. New and existing Waterwatch monitors were offered the opportunity to participate in the North Central Community Stream Sampling Project. Participants received upgraded salinity monitoring equipment as well as increased technical support and training.

Participants in the program were required to obtain a 'Standard 3 or 4' in electrical conductivity monitoring to ensure that their data was of a sufficiently high standard to be included on the Bureau of Rural Sciences database.

1.4 Strategic Relevance

The North Central Regional Catchment Strategy (RCS) was developed by the NCCMA in consultation with its partner agencies and the community; it sets out a vision and integrated planning framework for land, water and biodiversity management in the North Central Region. In a practical sense, the RCS is an investment guide for natural resource management funds from State and Commonwealth governments and other sources. North Central Waterwatch activities directly contribute to the achievement of several targets outlined in the RCS. Continued support of the North Central Waterwatch program is listed as one of the key actions within the 'Community' section of the strategy.

The North Central River Health Strategy (RHS) is the key regional policy document providing direction in river health management across the region. It focuses on the management and ecological condition of waterways and covers activities in the catchment that may have an impact on the health of our rivers. The North Central RHS has been directed by the Victorian River Health Strategy (VRHS, 2002) which provides the state-wide framework for the future management of Victorian waterways. The VRHS clearly recognises the education/participation and water quality monitoring roles of Waterwatch in riverine management. In addition to this, the following actions are also identified in the VRHS:

- Community monitoring programs such as the Victorian Waterwatch Program will continue to develop tools and training aimed at increasing the value and useability of the data collected by communities.
- Catchment Management Authorities (CMAs) will develop partnerships with regional community monitoring networks to provide additional monitoring to support regional management requirements.

North Central Waterwatch is also identified in the Avoca and Avon Richardson Nutrient Management Strategies as an important vehicle for public education and data supply.

1.5 On-ground monitoring

Water quality monitoring is performed on many of the diverse water systems found in the North Central region. The nature of the data collected is dependant upon the water quality issues relevant to that area and/or water type. Traditionally, surface water and stormwater systems have been the focus of North Central Waterwatch monitoring. Annual Saltwatch snapshots have captured some groundwater data, and there is the potential to increase monitoring of irrigation and drainage channels in the lower catchments.

Waterwatch monitors in the Avoca and Avon-Richardson catchments tend to monitor the main river systems. Some tributaries are monitored; however, due to the ephemeral nature of these, many are not regularly tested.

Monitoring in the Loddon and Campaspe systems focuses on the main river systems, with an increasing number of tributaries being monitored. Monitoring is undertaken at various frequencies depending on the group and monitoring purpose. Some monitors test seasonally, with others monitoring sporadically or on an as-needs basis. With the recent focus of engaging and enthusing new monitors, an increasing number of groups and individuals are monitoring regularly on a monthly basis.

The data collected by monitors is stored on the regional Waterwatch Database. On request, an annual report for the site/s they have been monitoring is provided to monitors. Groups are encouraged to share this data and to use it to help determine on-ground actions that may lead to improvements in water quality. Water quality data is also available to our partner organisations and the general public upon request.

In 2007 approximately 200 sites were monitored on a monthly basis (where possible) for the parameters: turbidity, electrical conductivity, temperature, reactive phosphorus, and pH.

North Central Waterwatch is sponsored and supported by many organisations including: DSE, DPI, Coliban Water, City of Greater Bendigo, Shire of Campaspe, Water Eco Science, Lower Murray Water, Buloke Shire, Rochester Water Services Committee, and Waterwatch Victoria.

1.6 Objectives of the Data Confidence Plan

Through producing a Data Confidence Plan, North Central Waterwatch aims to:

- Demonstrate data quality of a known integrity to program stakeholders, (data users, sponsors – actual and potential, community monitoring network, North Central CMA, the Natural Resource Management Committee, Local Government);
- Assist groups to develop effective monitoring programs that produce relevant data;
- Provide training opportunities to monitors to ensure a high standard of competence in water testing is attained;
- Provide satisfaction to volunteers by clearly highlighting the value of their data;
- Benchmark current practices, through the documentation of procedures to ensure continuity of program delivery and efficiency and instil proper scientific principles in all monitoring;
- Fill water quality information gaps for the NCCMA.

1.7 Waterwatch Data Confidence System

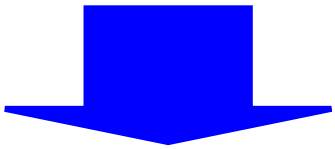
The objectives and direction of monitoring within the North Central region's Waterwatch program is driven by a number of local, regional and state natural resource management frameworks. The diagram over page outlines the range of inputs that influence the Waterwatch program in the region.

Relevant Waterwatch Victoria Resources

- Waterwatch Victoria Equipment Manual
- Waterwatch Victoria Methods Manual
- Waterwatch Victoria Data Confidence Manual
- Waterwatch Victoria Data Confidence Guidelines

Relevant Regional NRM Strategies and Frameworks

- North Central Regional Catchment Strategy
- North Central Regional River Health Strategy
- Local Government Stormwater Management Plans (12 Plans in region)
- Catchment Nutrient Management Strategies (4 in region)
- Local Government Water Quality plans for Urban Lakes



North Central Waterwatch Program

- North Central Waterwatch Data Confidence Plan
- North Central Waterwatch Monitoring Methods Manual (including sampling, checklists and QC records)
- Watchman Database (group information, training records, equipment services/maintenance/calibration records)
- Waterwatch Database (group/site information, data storage/management)
- North Central Waterwatch Monitor Resource Manual
- River Detectives Resources - curriculum materials
- Environmental Education Resources – Urban Stormwater, Salinity and Waterways Manuals

1.8 Staff Roles and Responsibilities

The following table lists the key personnel directly involved in the implementation of the North Central Waterwatch program.

Name	Position Title
Bianca Huider	Regional Waterwatch Coordinator
Melanie Barrot	Waterwatch Facilitator Avoca/Avon-Richardson
Vacant	Waterwatch Facilitator (Irrigation) Loddon/Campaspe
Britt Gregory/Shane Thaddeus	Waterwatch Facilitator (Dryland) Loddon/Campaspe

Other personnel that play an important role in ensuring the continued success of North Central Waterwatch are:

- **NRMC panel** - The NRMC panel supervises and supports the Waterwatch program, ensuring the program meets the needs of the North Central CMA and the community.

- **CMA Community and Partnerships manager** - The Community and Partnerships manager ensures that the Waterwatch team is meeting specified milestones on a regular basis. Feedback on the program and any data confidence issues can be raised here.

North Central Waterwatch Facilitators and the Regional Coordinator have many duties specific to data confidence. Waterwatch Facilitators are responsible for the on-ground implementation of the program, including:

- Training of new monitors in sample collection and testing, maintenance and operation of equipment;
- Regular training for all monitors in the use of equipment and data interpretation;
- Provision of calibration solutions to monitoring groups for calibration of their equipment;
- Maintenance of North Central Waterwatch monitoring equipment (serial numbers, routine cleaning, servicing, repairs, calibration), and stock (calibration solutions, reagents);

- Maintenance of quality control logs (where required);
- Maintenance of volunteer records, including contact and training details;
- Development of monitoring plans in consultation with community monitors;
- Collection of site information including GPS and photo records;
- Validation and maintenance of water quality data on the regional Waterwatch database;
- Filing of hardcopy records/archives (datasheets/volunteer records/logs);
- Coordination and supervision of specialised activities including snapshot events and local projects;
- Stock-take of equipment;
- Collection and input of relevant information to be entered onto the Watchman Database; and
- Preparation of reports (data interpretation, project management, meeting minutes, milestone reporting, monthly reporting, newsletter articles and/or notes).

The Regional Waterwatch Coordinator undertakes many of the above roles, but also has a number of additional data confidence responsibilities:

- Review of the regional Data Confidence Plan, Interpretation and Methods Manual, and local documentation in consultation with the Waterwatch Facilitators to ensure that on-ground monitoring activities are accurately documented and reflected;
- Identify training opportunities for Waterwatch staff;
- Publish data reports in conjunction with the Waterwatch Facilitators;
- Ensure Waterwatch data is being collected in a manner consistent with broader regional monitoring objectives (e.g. Regional River Health Strategy, Index of Stream Condition, NCCMA River Health unit, Asset based projects);
- Integrate Waterwatch activities into other CMA activities;
- Purchase equipment, stock and maintain a log of equipment and identification numbers;
- Provide input into the development of river health investment plans and policies; and
- Human resource officer for Waterwatch Facilitators.

1.9 Parameters monitored

Participants of the North Central Waterwatch Program have the opportunity to monitor the following water quality parameters:

- Turbidity
- Electrical Conductivity
- Ammonia
- Reactive Phosphorus
- Temperature
- pH
- Oxygen
- Alkalinity
- E Coli

Note: Not all parameters are monitored at all sites. The suite of tests conducted depends on the purpose of monitoring and site characteristics.

It is envisioned that habitat surveys will be completed at all sites on the commencement of monitoring and will be revisited annually by monitors/facilitators. Macroinvertebrates have been monitored at some sites, predominantly as an awareness raising exercise, with community and school groups. Detailed macroinvertebrate training is available to all monitoring groups upon request.

1.10 Instrumentation

The North Central Waterwatch program utilises various types of monitoring equipment. The following list includes equipment used for monitoring physical and chemical parameters. Instrument specifications (instrument type/model, range, resolution and accuracy), parameters monitored (including units), and distributor/manufacturer details (company name, contact name, address and phone number) are noted. This list does not identify which types of instruments are used for different monitoring purposes. Monitoring kits are inscribed with serial numbers for identification and to aid equipment tracking. The Watchman database is used to record purchase dates, calibration and servicing information.

Instrument type and model	**Parameters monitored** (e.g. pH)	**Units of measurement** (pH units)	**Range** (e.g. 0 – 14 pH)	**Resolution** (e.g. 0.01 pH)	**Accuracy** (e.g. ± 0.05 pH units)	**Distributor name and contact details for repairs/servicing/ enquiries** (name, address, phone, email)
Visocolor HE Ammonia test (DEV) – low range	Ammonium	mg/l NH4	0.00-0.5	Variable resolution increments: 0.02 – 0.1	Unspecified	WestLab PO Box 1630 Ballarat 3350 Phone 1800 358 101
pH Strips Machery Nagel pH fix 0-14	pH	pH units	0-14	1	Unspecified	WestLab PO Box 1630 Ballarat Phone 1800 358 101
Hanna HI98130 Combo	pH	pH units	0- 14	0.01	±0.01	Hanna Instruments PO Box 1005 Braeside 3195 Phone 9769 0666
LaMotte TRACER Combo pocket tester	pH	pH units	0-14	0.01	± 2% f.s	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139
Eutech EcoScan pH5	pH	pH units	0-14	0.01	±0.01	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139

Visocolor HE Phosphate test (DEV) – low range	Reactive Phosphorus	mg/l PO4-P	0.01-0.25	Variable resolution increments: 0.01 – 0.05	Unspecified	WestLab PO Box 1630 Ballarat 3350 Phone 1800 358 101
Visocolor HE Phosphate test (DEV) – high range	Reactive Phosphorus	mg/l PO4-P	0.25 – 1	Variable resolution increments: 0.05 – 0.2	Unspecified	WestLab PO Box 1630 Ballarat 3350 Phone 1800 358 101
Turbidity Tube	Turbidity	Tube NTU's	0-400	Variable increments along length of tube.	NTU scale on side of tube used as an approximation of true NTU measurement .	Waterwatch Victoria DSE 240 Victoria Pde East Melbourne Phone 9412 4072
Hach 2100P Portable Turbidimeter	Turbidity	NTU's	0-1000 NTU (3 manual ranges)	0.01 NTU on lowest range	± 2% (0-500 NTU range), or ± 3% (500-1000 NTU range)	Biolab Locked Bag 24 Mulgrave 3170 Phone 1300 735 295
Hanna HI98130 Dist 6	Electrical Conductivity	µS/cm	0-20,000	10	± 2% f.s	Hanna Instruments PO Box 1005 Braeside 3195 Phone 9769 0666
Hanna HI98130 Combo	Electrical Conductivity	µS/cm	0-20,000	10	± 2% f.s	Hanna Instruments PO Box 1005 Braeside 3195 Phone 9769 0666
LaMotte TRACER EC pocket tester	Electrical Conductivity	µS/cm	0-19,999	0.1 µS on lowest range	± 2% f.s	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139
LaMotte TRACER Combo pocket tester	Electrical Conductivity	µS/cm	0-19,999	0.1 µS on lowest range	± 2% f.s	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139
Eutech CON 6/TDS 6	Electrical Conductivity	µS/cm	0-200,000	Dependent on range chosen 0.01µS,	± 1% f.s	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765

				0.1µS, 1µS, 0.01mS, 0.1mS		Phone 02 9679 1139
Hach senSION5 conductivity meter	Electrical Conductivity	µS/cm	0-200,000 (4 ranges)	Dep. On range chosen 0.1µS, 1µS, 0.01mS, 0.1mS	±0.5% FS (first three ranges), ±1% FS (upper range)	Biolab Locked Bag 24 Mulgrave 3170 Phone 1300 735 295
HACH DR890 – for total P test (test-n tube)	Total Phosphorus	mg/l PO4-P	0.00 – 1.14P	Unspecified.	Unspecified.	Biolab Locked Bag 24 Mulgrave 3170 Phone 1300 735 295
Hanna HI98130 Dist 6	Temperature	ºC	0.0 – 60.0ºC	0.1ºC	±0.5ºC (@20ºC)	Hanna Instruments PO Box 1005 Braeside 3195 Phone 9769 0666
Hanna HI98130 Combo	Temperature	ºC	0.0 – 60.0ºC	0.1ºC	±0.5ºC (@20ºC)	Hanna Instruments PO Box 1005 Braeside 3195 Phone 9769 0666
LaMotte TRACER EC pocket tester	Temperature	ºC	0 – 65.0ºC	0.1ºC	±1ºC (@20ºC)	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139
LaMotte TRACER pH/EC pocket tester	Temperature	ºC	0 – 90ºC	0.1ºC	±1ºC (@20ºC)	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139
LaMotte TRACER DO pocket tester	Dissolved oxygen	mg/L or % saturation	0-200%Sat or 0-20mg/L	0.1%Sat or 0.01mg/L	±2% both units	Vendart Pty Ltd 21 Hynds Rd, Box Hill NSW 2765 Phone 02 9679 1139

2. Monitoring Sites

Waterwatch monitoring sites listed on the regional database include a number of active and inactive sites. Most sites have been chosen by Waterwatch monitors because of interest or custodial connection with the site and/or area, combined with easy access.

Waterwatch Coordinators and Facilitators will, where possible and practical, undertake monitoring at strategic sites, to assist with filling information gaps for the North Central CMA and other agencies. Many of the strategic sites will be located in the upper and lower reaches of streams to allow upstream-downstream comparisons, and/or to determine the contribution of tributaries to rivers.

Each site is allocated a site code, which consists of a 3 letter followed by a 3 digit number sequence. Site codes are allocated by the Regional Coordinator or relevant Waterwatch Facilitator. A detailed 'Site Description' sheet (see appendix) must be completed prior to the allocation of a new site code. Site information is then entered into the Waterwatch Database and also retained as a hardcopy.

The location of each Waterwatch monitoring site is stored in the regional Waterwatch database. CFA fire maps and topographic maps have traditionally been used to identify site coordinates (easting/northing) for new monitoring sites (AMD66). New sites in the Avoca/Avon-Richardson catchment (April 2003 onwards) and Loddon Campaspe catchments (May 2004 onwards) have been, and will continue to be logged with GPS (WGS84, equivalent to GDA). Easting and northing grid coordinates (MGA) are provided for each site, along with a site description.

High quality data intended to go onto the Victorian Data Warehouse must have GDA coordinates (easting and northing).

Note: In the past there was much less focus on creating consistent site codes, therefore some historic sites do not conform to the coding processes described in the following sections.

2.1 Rivers and Creeks

The three-letter sequence refers directly to the name of the river or creek. Where the first three letters of a river/creek name are the same as another river/creek, a similar coding is applied and further information is provided in the site description e.g. the Avoca River and Avon River.

For example:
LOD = Loddon River
CAM = Campaspe River
AVO = Avoca River
AVN = Avon River
RIC = Richardson River

Site numbers are allocated based on the approximate distance downstream of the headwaters. Sites downstream of the headwaters are numbered chronologically in relation to the site's location along the river e.g. 001 at the headwaters and 999 at the tail waters or junction with another river.

For example, AVO500 is a site approximately half way along the Avoca River, near Charlton.

2.2 Lakes, Reservoirs, Dams, Wetlands and Bores

Lakes, dams and wetlands are often monitored by landholders and the data is entered onto the Waterwatch database. The method for allocating codes for lakes, dams and wetlands is as follows:

2.21 Lakes

The first letter of the three letter sequence is always L for Lake. The last two letters are always the first two letters of the lakes' name e.g. Lake Buloke would be LBU.

Three numeric digits are allocated in relation to the sites' location along the major feeding watercourse. Where this is not relevant, the numeric digits are determined based on the number of sites with the same three letter sequence e.g. if there are already 2 sites beginning with LBU the following numeric digits would be 003.

2.22 Reservoirs

The first letter of the three letter sequence is always R for Reservoir. The last two letters are always the first two letters of the Reservoirs' name e.g. Kennington Reservoir would be RKE.

Three numeric digits are allocated in relation to the sites' location along the major feeding watercourse. Where this is not relevant, the numeric digits are determined based on the number of sites with the same three letter sequence e.g. if there are already 2 sites beginning with RKE the following numeric digits would be 003.

2.23 Dams and Wetlands

The first letter of the three letter sequence is always D for Dam or W for Wetland. The second letter is the first letter of the area, and the third letter is the first letter of the landowners' surname or first letter of the wetland name.

Therefore a dam (whether it be catchment or channel fed) in Goornong owned by the Howard's would have an alpha code of DGH.

For dams and wetlands, the three numeric digits are coded in order of commencement of monitoring, with the first site for a particular dam or wetland coded 001. For multiple sites with the same first three letters the numeric digits will continue onwards from 001 e.g. 002, 003 and so on.

2.24 Bores

The first letter of the three letter sequence is always B for Bore. The second letter is the first letter of the area and the third letter is the first letter of the landowners' surname.

Therefore a bore in Bendigo on the Smith's property would be BBS.

For bores, the three numeric digits are coded in order of commencement of monitoring, with the first site for a particular bore coded 001. For multiple sites with the same first three letters the numeric digits will continue onwards from 001 e.g. 002, 003 and so on.

3. Monitoring Groups

There exists a wide range of monitoring groups and individuals across the North Central region. Many monitor as part of an established group such as Landcare, while others monitor as an individual.

As with site coding, there needs to be a consistent approach to creating group and sampler codes. These codes are created by Waterwatch Facilitators and the Regional Coordinator.

3.1 Group codes

Group codes should be created as follows:

- Landcare groups- begin with LC followed by the name of the Landcare group. E.g. Castlemaine Landcare Group would be LCCastlemaine
- River Detectives Schools- begin with RD followed by the name of the school. E.g. Tarnagulla PS would be RDTarnagullaPS
- Government departments- begin with GV followed by the name of the department and location. E.g. DPI in Charlton would be GVDPICharlton
- Individuals- begin with IN followed by the person's surname and their first name. E.g. John Smith would be INSmithJohn
- Other (a group other than Landcare)- begin with OT followed by the name of the group and location. E.g. the Angling Club in Donald would be OTAngling clubDonald

3.2 Sampler codes

Sampler codes relate to the persons undertaking the water testing. For a group there may be several samplers who rotate sampling. Under these circumstances it will be necessary to create sampler codes for each person to ensure data is entered into the Waterwatch database against the relevant person.

All sampler codes should begin with the person's surname followed by the first letter of their first name. E.g. Peter Walter would be WalterP.

4. Regional Data Confidence Framework

4.1 Overview

Waterwatch Victoria has a State-wide Data Confidence Framework and Guidelines, identifying minimum data confidence standards for a range of monitoring purposes. The framework and guidelines were developed to ensure that river health data collected by Waterwatch groups is recognised, valued and utilised to the greatest degree possible. This Data Confidence Plan has been based on the State-wide model.

Monitor data confidence standards are identified through discussions between Waterwatch Facilitators and the Regional Coordinator. The Waterwatch Facilitator maintains a complete list of local groups' standards, with the Regional Coordinator updating a regional list on a regular basis.

Deciding the data confidence standard of new and existing groups depends on five factors:

- monitoring frequency
- training
- quality controls (testing, QA/QC events)
- equipment used
- methodology

The standards framework, including: training requirements, equipment servicing and QA/QC for monitors in the North Central area is outlined in section 4.2.

Monitor data confidence standards can be allocated by parameter if deemed appropriate by the Waterwatch Facilitator or Regional Coordinator.

4.2 North Central Standards Framework

4.21 Standard 1 – Education focus

Data use:
Data collected is stored on the North Central Waterwatch database and is only weakly indicative of water quality conditions. Pollution events or dramatic variations in water quality may be detected, but should be investigated further by a more qualified monitor. Primary level data should not be used for decision making purposes. The data collected will not be placed on the State Data Warehouse.

Recommended Monitoring Groups:
- Primary and Secondary Schools

Training:
- Participants/monitors attend a single educational water quality monitoring session, performing one or more of the water quality tests during this session.
- Teachers and students are shown best practice monitoring techniques and learn about some of the different water quality parameters, and how they link with environmental condition.

Quality Control:
- Minimal or no supervision on monitoring quality for each participant. No QA/QC checks are required.

Prior Water Testing Experience:
- Participants have little, if any, prior experience in water quality monitoring.

Monitoring Frequency:
- Variable, but normally very infrequent. There may not be any inclination for the group to become more regular water quality monitors.

Parameters Measured
- Turbidity, Reactive Phosphate, EC, pH, Temperature.
- Physical habitat and macroinvertebrates may be monitored.

Recommended Equipment:
- Turbidity Tube, Visocolor HE Phosphate Test Kit, Tracer EC/Temperature meter, Machery Nagel pH strips.

4.22 Standard 2 – Education "Indicative" Data

Data Use:
Data collected is stored on the Regional Waterwatch Database. This data can be used to form indicative long-term water quality trends and identify problem areas requiring additional follow-up monitoring by a Standard 3 or 4 monitor.

Recommended Monitoring Groups:
- Primary and Secondary Schools
- Green Corps Groups
- Landcare Groups
- Adult Volunteers

Training:
- Monitors trained by a Waterwatch Facilitator on monitoring procedures.
- A refresher training course is provided annually.

Quality Control:
- Monitors are tested throughout training to ensure their monitoring technique is correct. Monitors participate in regional and state-wide QA/QC events.
- Equipment will be serviced at least annually by Waterwatch staff, or on an as-needs basis.

Prior Water Testing Experience:
- Monitors have little, if any, prior experience in water quality monitoring.

Monitoring Frequency:
- Varies from fortnightly to yearly.

Parameters Measured:
- Turbidity, Reactive Phosphate, EC, pH, Temperature and Ammonium.
- Physical habitat and macroinvertebrates may be monitored.

Recommended Equipment:
- Turbidity Tube, Visocolor HE Phosphate Test Kit, Machery Nagel pH strips, Tracer EC meter, Tracer pH meter, Visocolor HE Ammonium Test Kit.

4.23 Standard 3 – "High Quality" Data Collection Focus, Educational Benefits

Data Use:
Data collected is stored on the Regional Waterwatch Database and will be uploaded onto the Victorian Data Warehouse. Standard 3 data provides an accurate indication of water quality trends.

Recommended Monitoring Groups:
- Landcare Groups
- TAFE/Tertiary Students
- Adult Volunteers
- Waterwatch Coordinators/Facilitators

Training:
- Participants trained by a Waterwatch Facilitator in correct QA/QC procedures.
- A refresher-training course is provided annually.
- Participants will be in close contact with Waterwatch Staff.

Quality Control:
- Participants will undertake regular calibration and maintenance of equipment.
- Calibration logs are to be kept for EC and pH.
- Participants will participate in State-wide and Regional QA/QC, and refresher training at least annually.
- Monitors using Turbidity Tubes for Tertiary monitoring must annually check their technique against a well-calibrated turbidity meter.

Prior Water Testing Experience:
- Monitors need little, if any, prior experience in water quality monitoring.

Monitoring Frequency:
- Varies from weekly to quarterly.

Parameters Measured:
- Turbidity, Reactive Phosphorus, EC, pH, Temperature and Ammonium.
- Physical habitat and macroinvertebrates may be monitored.

Recommended Equipment:
- Turbidity Tube, Visocolor Phosphate Test Kit, Tracer EC meter, Tracer pH meter, Visocolor Ammonia test kit, Eutech CON 6 conductivity meter.

4.24 Standard 4 – Data Warehouse focus

Data Use:
Data collected is stored on the Regional Waterwatch Database and uploaded onto the Victorian Data Warehouse. This data will be offered to internal and external organisations. This data is scientifically credible and comparable against other agency collected data, and can be used to make important managerial decisions.

Recommended Monitoring Groups:
- Waterwatch Coordinators/Facilitators

Training:
- Monitors will be trained by Waterwatch Victoria and the Regional Coordinator.
- Extra QA/QC training is available to participants.
- Monitors will participate in refresher training courses at least annually, or as offered by State Waterwatch.

Quality Control:
- Monitors are tested by State Waterwatch staff and peers to ensure their monitoring technique is correct.
- Monitors will undertake regular calibration and maintenance of equipment.
- Calibration logs must be kept for EC and pH.
- Monitors will participate in annual regional and state QA/QC events.

Prior Water Testing Experience:
- Monitors will have prior water testing experience.

Monitoring Frequency:
- At least monthly.

Parameters Measured:
- Turbidity, Reactive Phosphate, EC, pH, Temperature, Ammonium, Oxygen, Alkalinity, E Coli.
- Physical habitat, macroinvertebrates and flow may be monitored.

Recommended Equipment:
- Hach Nephelometric Turbidity Meter, Hach Colorimeter/Photometer (phosphorus), COD digester, Sension5 EC meter, Eutech CON 6 conductivity meter, Eutech EcoScan pH 5 meter, Tracer DO meter.

4.25 Further Standards information

The requirements of obtaining the QA/QC standards above are intended to be used as a guide for monitors and Waterwatch staff.

Much of the required sampling methodology has not been covered in this document. For further information regarding monitoring methods, please refer to the North Central Waterwatch Program – Interpretation and Methods Manual. Please consult with North Central Waterwatch staff regarding any queries or requests for further training.

All data collected by Waterwatch monitors has the potential to be used in the future to some capacity. The QA/QC standard of the monitor collecting the data greatly influences the audience that is most likely to use the data and to what purpose they employ it. Below is a list of the possible audience and purpose of use, for North Central Waterwatch data:

Data Confidence Standard	Possible Data Users	Possible Purpose/Use
Standard 1	Students, general public, other Waterwatch monitors, Waterwatch staff	School assignments, general information, basis for further study
Standard 2	Students, general public, other Waterwatch monitors, Waterwatch staff, NCCMA, EPA, DPI, DSE	School assignments, general information, basis for further study, indication of water quality issues
Standard 3	Waterwatch staff, NCCMA, EPA, DPI, DSE	Basis for further study, indication of water quality trends, EPA investigations, Catchment Condition Reports
Standard 4	Waterwatch staff, NCCMA, EPA, DPI, DSE	Establishing water quality trends, EPA investigations, Catchment Condition Reports

4.3 Monitoring plans

Developing a monitoring plan is a key component of the regional data confidence development process.

Water quality monitoring plans are prepared in consultation with the community monitor/s. These help consolidate the reasons for monitoring, and also give a clearer picture of what technical support might be required, where monitoring data should be stored and how it could be used. Monitoring plans will also outline the data confidence level for each group.

Note: groups may have different data confidence levels for different parameters.

In developing these plans, monitors are asked a range of questions to determine the most relevant parameters to monitor; the most appropriate frequency of monitoring; and their target data confidence 'Standard'.

In addition to the monitoring plan, a site description form is filled out to provide information on the site being monitored.

The local Waterwatch Coordinator/Facilitator retains individual/group Monitoring Plans on file. Plans are reviewed annually or more often if changes to monitoring focus occur.

A 'North Central Waterwatch Monitoring Plan' template can be found in Appendix 1.

A 'Site Description' template can be found in Appendix 2.

5. Standard Operating Procedures

All sampling, preservation/storage, testing, calibration and preventative maintenance procedures have been collated into the North Central Waterwatch Program – Interpretation and Methods Manual. The manual contains methods for each parameter and instruments listed in the instrumentation table in Section 1.9. The manual describes the specific steps and processes for establishing, documenting, recording, maintaining and performing monitoring activities.

5.1 Instrumentation Calibration, Repair and Servicing

Instruments including pH, EC, and turbidity meters, are calibrated according to the North Central Waterwatch Program Interpretation and Methods Manual. Standard 3 and 4 monitors are provided with calibration log sheets during induction and are trained in their use.

A 'Calibration Record sheet' can be found in Appendix 3.

Calibration buffers/solutions are prepared by a NATA accredited laboratory (WSL, Bendigo). These standard solutions include Electrical Conductivity- 1413µS/cm and 12880 µS/cm, and pH- 7, 4 and 10. Main stock is stored at the North Central CMA office, with small quantities being distributed to monitors on a 6 monthly to yearly basis for calibration purposes. Calibration solutions are freshly prepared every 6 months, with the use-by-date clearly recorded on the label of every bottle distributed.

Community monitors are encouraged to maintain their equipment in good working order and to check for instrument deterioration before each use. Waterwatch Facilitators and the Regional Coordinator make formal checks for deterioration at half yearly individual visits and QA/QC training days. Instruments requiring repair or servicing are returned to the distributor or manufacturer. An 'Equipment Service Form' is completed by the Waterwatch Facilitator following each kit service. This information is entered into the Waterwatch Database. Kit service information is used to inform Waterwatch Facilitators when the next kit service and calibration is required.

An 'Equipment Service Form' can be found in Appendix 4.

Minimum equipment servicing requirements for selected equipment

Equipment	Calibration Frequency	Inspection Frequency	Type of Inspection
Turbidity Tube	N/A	Annually	Visual
Conductivity Meters	Before use (e.g. monthly)	Annually	Battery, cleanliness, electrode condition and calibration
pH Meters	Before use (e.g. monthly	Annually	Battery, cleanliness, electrode condition and calibration
Visocolor Reactive Phosphate Kit	N/A	Annually	Reagent deterioration, colour wheel fading, use by date of reagents, glassware condition
Turbidity Meter	Monthly, or more frequently if required	6 monthly	Battery, cleanliness and calibration
pH strips	N/A	Before use (volunteer) Annually	Liquid contamination and fade, use by date stated on packaging

5.2 Training

5.21 Staff Training

Waterwatch Facilitators and the Regional Coordinator attend training workshops, provided by Waterwatch Victoria, covering chemical/physical and biological testing methodologies. Waterwatch Facilitators attend refresher courses at least every two years thereafter.

Other professional development opportunities are encouraged. The Regional Coordinator organises further training in adult learning tools, monitoring and evaluation, freshwater ecology and water quality monitoring. The Regional Coordinator maintains a training record log for North Central Waterwatch staff which is stored on the North Central CMA computer network.

The Regional Coordinator and Waterwatch Facilitators must maintain at least a Standard 3 data confidence level and aim to achieve Standard 4.

5.22 Training provided by North Central Waterwatch

North Central Waterwatch staff primarily train volunteer monitors to undertake unsupervised water quality monitoring. Training involves a range of activities to ensure that basic protocols are followed whilst collecting and testing water samples.

This training is undertaken prior to the commencement of any Waterwatch monitoring program, irrespective of the level of monitoring being planned. North Central Waterwatch currently conducts training and refresher training with community monitors on an as-needs basis, or at least annually.

5.23 New Individuals/ Groups

The training needs of new groups will be determined by a number of factors including the experience and knowledge of members, the parameters being monitored by the group and the number of members undertaking monitoring.

As a **guide,** new monitors will generally require the following initial training:

- an introduction, outlining background of the North Central Waterwatch program and the requirements of new monitors;
- correct sampling procedures;
- correct use of equipment;
- calibration of equipment; and
- limitations and effectiveness of equipment.

This session will also help the group and North Central Waterwatch staff to develop a monitoring plan, should the group decide to undertake regular monitoring.

A full training session should be conducted with those group members wishing to undertake monitoring. North Central Waterwatch staff will follow a training checklist to ensure all relevant topics and methods have been covered. It will generally be necessary for North Central Waterwatch staff to attend at least one (usually the first) in-field monitoring session with group members. This will ensure group members have the confidence to carry out sampling and analyses in the field.

The 'Training Checklist' appears in Appendix 5

5.24 Established Groups

In-field training should be considered on an annual basis for established and experienced groups. This would act as a refresher session to provide an opportunity for North Central Waterwatch staff to check monitor technique, inspect and calibrate

equipment, provide more detailed training (macroinvertebrates, habitat assessment, freshwater ecology etc), review testing results, inspect monitoring sites and review monitoring plans.

5.25 River Detectives Schools

Traditionally, many schools in the North Central region have monitored in an ad-hoc and infrequent nature. Due to constraints in Waterwatch Facilitator time and an increased focus on the collection of consistent and reliable Waterwatch data from the regional and state level, North Central Waterwatch developed the River Detectives Program (adapted from the 'Catchment Capers' model used by Goulburn Broken Waterwatch). By incorporating monitoring activities into the school curriculum, this new program helps to ensure schools submit regular data and that water testing equipment purchased by North Central Waterwatch is used in an effective manner.

The River Detectives Program is designed to help school students learn about river health and water quality in relation to their local waterways in a hands-on and meaningful way. Upper primary and lower secondary students across the North Central catchment can participate in this ten month water quality monitoring program. Students perform chemical and physical tests each month on water collected from their nominated waterbody. They can also choose to participate in monthly activities that complement their monitoring program and link to their curriculum.

Each participating school receives a water testing kit capable of measuring: temperature, EC, turbidity, pH and total reactive phosphate. The kit remains the property of North Central Waterwatch and must be returned at the end of the school year. Kits will be reassigned the following year, after Waterwatch Facilitators have conducted a full inspection and maintenance. Schools with poor monitoring records may forfeit access to a water testing kit if demand from new schools is high.

Waterwatch Facilitators receive many requests to visit schools and run activities – schools participating in the River Detectives Program take priority when allocating time.

Participating teachers will be offered training at the beginning and middle of each school year, in the form of a teacher PD session.

As a **guide,** schools/teachers wishing to become part of the River Detectives Program will generally require the following training:

- An introductory session outlining the background of the River Detectives Program detailing: frequency of monitoring, testing equipment and procedures, and how the program links into the curriculum;
- correct sampling procedures;
- correct use of equipment;
- calibration of equipment;
- limitations and effectiveness of equipment; and
- an introduction to the River Detectives manuals and poster – how to use them and what to do with the results;

A full training session should be conducted with the teacher/s wishing to undertake high quality (Standard 3) monitoring. North Central Waterwatch staff will follow the training checklist to ensure all relevant topics and methods have been covered.

6. Data Management in the North Central Region

6.1 Waterwatch Database

Regional Waterwatch databases are regularly upgraded by Victoria Waterwatch. The new database allows data to be electronically transferred from Waterwatch monitors (through the use of an Offline Data Entry Application or ODEA), to Regional Waterwatch Coordinators, then from Regional Coordinators to the Victoria Water Resource Data Warehouse.

6.11 Data Validation

The 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 unusual data; and tag data according to its quality. This tagging system will be used to export high quality Waterwatch data for inclusion onto the Victoria Water Resource Data Warehouse.

Data anomalies are investigated with the monitor who recorded the data. If the anomaly is resolved, the data is added to the database. Unverified data is not added onto the database. It is assumed that data anomalies are caused in most instances by human error, for example – transcription error or incorrect use of equipment. When verifying data, Waterwatch staff will provide feedback to the monitor in an attempt to rectify the problem. Calibration logs are an effective tool for highlighting any meter issues that may arise.

Soft limits are a feature of the Waterwatch Database. Water types are allocated soft limits; these are the expected range of values for each parameter. The Regional Coordinator sets these limits, drawing upon long term data sets and local knowledge. This feature flags possible transcription errors during data entry; any data that falls outside of these soft limits will not be automatically verified within the database. If the data is correct Waterwatch staff can override the soft limit and ‘OK’ the results.

North Central Soft Limits for River and Stream water types

Parameter	Low Soft Limit	High Soft Limit
Electrical Conductivity	0	20,000
Turbidity	<10	50
pH	6	9
Reactive Phosphorus	0.00	0.3
Temperature	2	20

6.12 Data Management

All hardcopy datasheets forwarded onto Waterwatch staff, for entry into the Waterwatch database, are filed and stored by the relevant Waterwatch Facilitator.

A back-up of the North Central Waterwatch database is made once every 3 months and burnt to CD, to minimise the risk of data loss. This database is located on the North Central CMA's network drive.

All raw data can be exported from the Waterwatch database upon request. It is envisioned that the North Central CMA, NRMC, agencies such as DPI and DSE, TAFE, universities, and other groups will continue to request Waterwatch data. Data use is reported to the Waterwatch monitoring network via the quarterly Catchment Connection newsletter.

Data is interpreted and reported via a number of avenues across the North Central region, including: Annual reports, PowerPoint presentations, and site reports.

6.13 Data Entry

All data received from Waterwatch monitors is checked by the relevant Waterwatch Facilitator before entry into the Waterwatch database. Checks are made to reduce error and to maintain a high standard of data quality.

It is realised that there will be some variation of data recording standards between monitors due to competency and monitoring standard. For example, when testing for turbidity some monitors prefer to stipulate the range rather than an actual value e.g. 20-30 instead of 27. This does bring about a few issues when it comes to data entry

and interpretation. Under circumstances such as these it is necessary to ensure standard data entry procedures are carried out as follows.

Standard water quality data entry procedures

Turbidity – Where a range of values is stated, for example 20-30 NTU, the middle value should be entered into the database. Therefore in this case 25 would be entered. Where the values are recorded as <10 or >400 they should be entered as 5 and 400 respectively. This allows for graphing and interpretation of results.

Electrical Conductivity – Where a reading exceeds the limit of the meter, the result cannot be entered as 20,000+ µS/cm or >20,000 µS/cm. It is necessary to either perform a dilution or make a note that the sample exceeds the limit of the meter- Waterwatch Facilitators can advise monitors of the dilution procedure. All results must be entered into the database in micro Siemens per centimetre (µS/cm).

pH – A range or number between the stated values can not be entered into the database e.g. 6.25 is not a valid result for pH strips with a graduation of 0.5.

Reactive Phosphorus – A range cannot be given for this parameter. Where the colour is not an exact match, a value must either be selected or recorded as N/A due to an inability to determine a result. The result must be entered in mg/L P.

6.2 Watchman Database

Watchman is an internal, program management database designed for management and evaluation of regional Waterwatch programs. It has the ability to store and report information related to program delivery, such as: monitor contact details; education sessions and training (opportunities, histories and attendances); special events; participant numbers; equipment (calibration, servicing, location); and media event records.

7. Performance Evaluation and Review

The North Central Waterwatch program will use a number of mechanisms to review the success of this Data Confidence Plan and its implementation. State-wide QA/QC testing will be used as external checks of the program.

7.1 State-wide QA/QC

Waterwatch Victoria conducts an annual QA/QC week, where all Waterwatch staff are required to test mystery solutions, as a means of checking instrument and user accuracy. Standard 3 community monitors are strongly encouraged to participate in this activity. These results are reported in an annual report compiled by Waterwatch Victoria. Waterwatch staff are encouraged to use the results to self-assess regional monitoring programs, especially Standard 3 and 4 monitoring. This is a very effective way of determining any issues with meters or protocols, which can then be resolved.

7.2 Regional QA/QC

QA/QC events are designed to:

- assess proficiencies of training and accuracy of equipment;
- identify individual monitor's strengths/weaknesses, and areas for follow-up training and/or advancement; and
- provide monitors with a new challenge.

Regional events should be held on an annual basis for Standard 1 and 2 monitors. More frequent events may be held for Standard 3 and 4 monitors.

Regional QA/QC events can be performed by using mystery samples, and/or parallel monitoring with a second instrument in the field. The choice will depend on cost primarily – it is envisaged that more experienced monitors will participate in the mystery sample technique, while the second instrument testing will be performed with less experienced monitors.

Parameters tested during QA/QC events will vary depending on the parameters tested by monitors. Field events will be organised by Waterwatch staff to compare instruments in areas relevant to monitors. Shadow testing will enable Waterwatch

staff to assess the accuracy of monitors' equipment, while also assessing technique and methodology. Mystery samples may be used in conjunction with shadow testing at regional events; however, it is envisaged that the use of mystery samples will be mainly restricted to state-wide QA/QC events.

Other CMA staff and interested parties will also be invited to these events to encourage learning (especially for the mystery sample tests) and provide an opportunity for community members to communicate their findings and ask questions. These events will also be used to inspect monitors kits and ensure equipment is working correctly. Both accuracy and precision will be assessed. Accuracy is how close the result is to the 'real' result. Precision is how closely results are replicated when measuring identical samples. E.g. Accuracy is how close to the "bulls-eye" you are, while precision is how tightly grouped your hits are. Both aspects are extremely important in determining data confidence.

North Central Annual Quality Control activities

Activity	Type of Quality Control	Accuracy	Precision
Regional - cross-testing meters in field conditions	Calibration; method; equipment; precision.	✓	✓
Regional - QA/QC mystery samples.	Calibration; method; equipment.	✓	
Checks during training workshops	Calibration; method.	✓	
Individual monitor visits bi-annual (preferred). Check all equipment is working and clean, meters are being calibrated, and that information is being recorded correctly	Calibration; method; equipment; precision.	✓	✓

The activities in the above table are used to establish and maintain the quality of monitor collected data. Standard 3 and 4 monitors are required to participate in two QA/QC activities per year. Waterwatch Coordinators, Facilitators and monitors, who do not achieve the required quality limits, are required to re-train before their data is accepted for the Victorian Data Warehouse.

7.3 Data Confidence Plan review

The Regional Coordinator will undertake an annual review of the North Central Waterwatch Program Data Confidence Plan and its implementation. The Waterwatch Victoria Science Coordinator will also provide assistance and input. This is an opportunity to re-evaluate the monitoring competencies of groups, and to review whether or not monitoring standards (particularly Standard 3 and 4) are being maintained.

The review of the data confidence plan will coincide with an annual stock-take of Waterwatch equipment.

8. Quality Control Documentation

The following records have been developed for the North Central Waterwatch monitoring program. These logs allow the program to be tracked, continually assessed and improved to maintain a high level of data confidence.

Instrument Identification Logs (refer to Instrumentation section 1.10)
This log identifies: location of instrument, date of purchase and supplier.

Calibration Logs (refer to Standard Operating Procedures section 5)
Calibration logs track the frequency of instrument calibration, and additional information such as pre and/or post calibration checks. These logs have been developed for EC and pH meters.

A Calibration Record sheet appears in Appendix 3.

Repair and Servicing Logs (refer to Repair and Servicing section 5.1)
The repair and servicing log tracks the frequency of servicing for all Waterwatch monitoring equipment. It allows for identification and replacement of faulty equipment.

An Equipment Service form appears in Appendix 4.

North Central Waterwatch Training Checklist (refer to Training section 5.2)
A training checklist for new groups is used along with the training log to identify training gaps for groups. The Watchman database is used to log this information at a regional level.

A Training Checklist appears in Appendix 5.

North Central Waterwatch Groups Logs (refer to Training section 5.2)
This log allows North Central Waterwatch staff to keep track of monitors training. The Watchman database is used to log this information at a regional level.

The Waterwatch group Training Log appears in Appendix 6.

Mystery Sample record sheet (refer to Performance Evaluation and Review section 7)

This record sheet records results from regional and state-wide mystery sample events for EC, pH, reactive phosphorus and turbidity. It records variations between regional Waterwatch equipment measurements and mystery solution values.

The Mystery Sample record sheet appears in Appendix 7.

Shadow testing/cross testing Record sheet (refer to Performance Evaluation and review section 7)

This form records variations between a Waterwatch instrument value and a shadow testing instrument value when testing water samples.

The Shadow Testing record sheet appears in Appendix 8.

9. Appendices – Operational Record Documents

Appendix 1 – Monitoring Plan

North Central Waterwatch
Monitoring Plan

Group Name _____ Date _____

Group Contact _____

1. Why are you monitoring?

The first step in planning is to ask why you want to monitor. Answers may vary, but often groups simply want to know what the stream is like. Record your answer/s below.

_____

_____

_____

_____

2. Who will use your data?

Potential users might include students and/or group members. List the main groups you think will want to use your data.

_____

_____

_____

_____

3. How will the data be used?

Data could be used for more than one purpose, e.g. to educate students about the principles of ecology or to identify major issues in the waterway. Knowing the potential main uses of the data will help determine the correct data to collect. List the possible uses.

_____

_____

_____

_____

4. What will you monitor?

The things you choose to monitor will depend on the question/s you are asking as well as the resources available. E.g. if your group wants to learn about the general ecological health of the waterway, the main types of water bugs (macro-invertebrates) present could tell an interesting story, while water quality monitoring can provide a snapshot of condition, or trends over time. List the things you would like to monitor.

_____

_____

_____

_____

5. What data quality do you want?

This depends on the question/s you are asking and how you intend to use the data. At the very least, your data should be accurate enough to indicate the location of grossly contaminated sites. Depending on your findings, you may then choose to refine your monitoring program. E.g. for groups with a focus on education and awareness raising, the quality of the data is secondary to the actual process of collecting it.

_____

_____

_____

_____

6. What methods will you use?

This depends on your objective/s and resources. There are often several ways of testing the same parameter. For example, for high precision turbidity readings from zero to 1000 NTU, a turbidity meter costing several thousand dollars is needed, but a turbidity tube (~$50) is suitable for less precise readings between 10 and 400 NTU. Keep in mind that it is important to use the same methods at all sites to allow comparison of data. List the methods you will use.

_____

_____

_____

_____

7. Where will you monitor?

The location of monitoring sites depends on whether you are monitoring a river, lake or estuary, as well as the monitoring purpose. E.g. monitoring at a variety of typical sites in the catchment is good for providing information about its overall condition. On the other hand, sites located above and below a source of contamination are needed to indicate the impact of the point source. List the names of waterbodies/waterways you intend on monitoring

_____

_____

_____

_____

8. When and how often will you monitor?

Monitoring effort can vary depending on the purpose/s of monitoring and resources. Monitoring frequency can include: once-off, quarterly, monthly, fortnightly or weekly. Some monitors test their sites on the same day each month, while others fit it in whenever they can during the month. Describe when and how often you will monitor.

_____

_____

_____

_____

9. Who will be involved and how?

Indicate who will carry out surveys and/or test water samples, who will arrange transport to sites and back, who will prepare the water testing equipment to be used, who will photograph sites, etc.

_____

_____

_____

_____

10. How will the data be managed and reported?

It is important to record and present the data accurately. This can help to raise awareness of waterway condition amongst group members and assist in refining your monitoring activities. List who will look after the data and describe how the data will be managed E.g. who will pass it onto their Waterwatch Facilitator? Who will do the testing?

_____

_____

_____

_____

11. How will you ensure your data is credible?

Developing answers to the first ten questions is the first step to conducting an effective visit to the waterway. It is important that all group members undertaking surveys and monitoring are adequately trained. Examples of ensuring credible data include: instruments will be maintained and cleaned by the group, meters will be calibrated and read correctly, and water samples will be collected according to the Methods Manual. List what you will do to improve the credibility of your data.

_____

_____

_____

_____

Appendix 2 – Site Description template

Site Description

Name of monitoring group:	
Person (s) conducting survey:	
Date of survey:	**Time of survey or test:**
Site name:	**Site code:**
Name of map or directory used:	**Map number:**
Easting ☐☐☐☐	**Northing** ☐☐☐☐☐
Name of nearest town:	**Altitude:**

Brief description of site and/or comments:

_____
_____
_____
_____

Type of water body:

☐ River ☐ Large stream ☐ Small Stream ☐ Lake/reservoir

☐ Channel ☐ Pond/Wetland ☐ Bore ☐ Other_____

Position in catchment:

☐ Upper Catchment ☐ Middle Catchment ☐ Lower Catchment

Water use:

☐ Recreation ☐ Industrial ☐ Agricultural

☐ Domestic drinking supply ☐ Other _____

Location of drains:

Distance from drain to monitoring site:_____ meters ☐ Upstream ☐ Downstream

Type: ☐ Open drain ☐ Pipe

Drain size: Open drain width _____ Pipe diameter _____

Flow: ☐ Fast ☐ Slow ☐ Trickle ☐ Not flowing

Description of drain water:

Colour _____
Odour _____
Other (oil, scum, milky etc)_____

Weather conditions at time of sampling:

☐ Sunny ☐ Cloudy ☐ Overcast ☐ Raining ☐ Windy

Air temperature: _____ °C

Rainfall:

☐ More than a week ago ☐ During the last 3 days

☐ Raining now Amount of rainfall _____

Water conditions:

Water flow: ☐ Not flowing ☐ Slow ☐ Fast ☐ Rapid
☐ Temporary ☐ Permanent

Water appearance: ☐ Clear ☐ Muddy

☐ Smelly (describe) _____

☐ Frothy /foamy ☐ Scummy ☐ Oily ☐ Stained brown ☐ Milky

Other (describe)_____

Stream width and depth:
Measured from deepest section of the stream

Depth ☐ **Measured** ☐ **Estimated**

☐ Up to 5cm ☐ 5-40cm ☐ 40-100cm ☐ 1-2m ☐ over 10m ☐ Unknown

Average width of stream (m): _____

☐ **Measured** ☐ **Estimated**

Adjacent land use:

☐ Bushland area ☐ Forestry ☐ School ☐ Urban residential

☐ Rural residential ☐ Vacant land ☐ Construction site ☐ Mining site

☐ Landfill site ☐ Road ☐ Recreation ☐ Park/Garden

☐ Industrial (describe)_____

☐ Commercial (describe)_____

☐ Other (describe) _____

Agriculture:

☐ Cropping ☐ Orchard ☐ Piggery ☐ Dairy ☐ Grazing

☐ Unrestricted stock access ☐ Other (describe)

Litter/pollutants:
Tick type found and approximate number of examples found

☐ Cans _____ ☐ Paper _____ ☐ Clothing _____

☐ Oil _____(m^2) ☐ Food packets _____ ☐ Plastic _____

☐ Polystyrene _____ ☐ Car bodies _____ ☐ Waxed cardboard _____

☐ Bottles _____ ☐ Petrol/diesel_____(m^2)

☐ Other (describe) _____

Appendix 3 – Calibration Record Sheet

North Central Waterwatch
Calibration Record (for EC or pH)

*** Record reading (measured value) before adjusting calibration ***

Group name:	**Waterwatch Facilitator:**
Equipment type:	**Supplier:**
Date purchased:	**Equipment number:**

Proposed calibration frequency:_____

The following table can be used to record up to a three-point calibration.

Date	Calibration standard expiry date	Calibration results					
		Expected value	Measured value	Expected value	Measured value	Expected value	Measured value

Appendix 4 – Equipment Service Form

North Central Waterwatch
Equipment Service Form

Group Name_____

Contact Person_____

pH Strips/meter

Number_____

❒ Sufficient strips for 12 months. ❒ Calibrated ❒ Cleaned

❒ Buffer solution checked/replenished ❒ Batteries checked/replaced

Conductivity Meter

Number _____

❒ Cleaned ❒ Calibrated ❒ Batteries checked/replaced

❒ Standard Solution replenished

Phosphorus Kit

❒ Glassware Cleaned ❒ Reagents replaced ❒ Safety Glasses present

❒ Filter Paper (optional) ❒ Syringe filter (optional)

Turbidity Tube

❒ Cleaned ❒ Replaced

Equipment Problems:

Serviced by: **Date:**

Appendix 5 – Training Checklist

North Central Waterwatch
Training Checklist

The following topics should be covered in all training sessions for each level of monitoring.

Date: _____ **Trainer:** _____

Participants: _____
_____
_____
_____
_____

Sampling and Storage of Samples
- Cleaning of sampling container;
- Labelling of sampling containers;
- Correct sampling procedures; and
- Storage of samples not analysed in situ.

Testing Procedures
- Variety of parameters available for testing;
- Reasons for parameter selection;
- Methodologies for selected parameters;
- Safety; and
- Quality control.

Equipment
- Cleaning of equipment;
- Servicing and maintenance of equipment;
- Storage of equipment;
- Limitations of equipment; and
- Calibration of equipment.

Recording of Data
- Record sheets;
- Reporting units;
- Recording of equipment calibration; and the
- Waterwatch database.

Appendix 6 – Training Log

North Central Waterwatch
Monitor Training Log

Date	Name of trainer	Name of Individual	Training Aspect	Level

Appendix 7 – Mystery Sample Record Sheet

Waterwatch Victoria QA/QC Mystery Samples

Region: _____ **Date**: _____

Name: _____

Standard: _____

Parameter	Equipment Type/No.	*Sample A*	*Sample B*
pH			
Electrical Conductivity (µS/cm)			
Turbidity (NTU)			
Total Reactive Phosphate - as P (mg/L)			
Comments (E.g. calibration notes, dilutions, suspect equipment):			

Return Sheet to: North Central Waterwatch
PO Box 18
Huntly 3551
Phone 5440 1829
Fax 5448 7148

Appendix 8 – Shadow Testing record sheet

North Central Waterwatch QA/QC Shadow Testing

Date _____

Name of monitor _____

Name of shadow tester _____

	Monitor		**Shadow Tester**	
Parameter	Equipment type/model	Result	Equipment type/model	Result
Electrical Conductivity (µs/cm)				
pH				
Turbidity (NTU)				
Total Reactive Phosphate (mg/L P)				
Ammonia (mg/L)				
Alkalinity				
Comments :				