Northern Water Monitoring Program
Monitoring and Reporting Framework

November 2006

Launceston Environment Centre Inc.

Northern Waterwatch

WATERWATCH Tasmania
Communities Caring for Catchments

Natural Heritage Trust
Helping Communities Helping Australia

NRM North
Natural Resource Management in Northern Tasmania

The Northern Tasmanian Natural Resource Management Association (NRM North) initiated the Northern Water Monitoring Program (NWMP) in 2004 to assess water quality and river health. The program is funded by the Australian Government's Natural Heritage Trust, through the NRM North Regional Investment Proposal. In-kind support is received from the Dorset and Flinders councils and the Queen Victoria Museum.

The NWMP is carried out by the NRM North Water Monitoring Team in partnership with the Launceston Environment Centre (LEC). The LEC is a non-profit, community organization. This framework was developed by the NRM North Water Monitoring Team in consultation with the Department of Primary Industry and Water (DPIW). The NRM North Water Monitoring Team train and support a Northern Waterwatch network of volunteer monitors.

The objectives of the NWMP are:
1) to support the identification and delivery of NRM objectives and outcomes by establishing a strategic water quality monitoring program in Northern Tasmania;
2) to provide water quality information for the identification of NRM targets and establish a core component for the monitoring and evaluation framework for the region; and
3) to support the capacity of the community to participate in the regional strategic water quality monitoring program and take action towards achieving on ground NRM outcomes.

The major outputs for the NWMP are:
1) a strategic water quality monitoring program complementing DPIW site locations and collecting data towards reporting on relevant Resource Condition Targets and Management Action Targets for NRM North;
2) the alignment of community water quality monitoring undertaken in the region to the national standards and targets and to the national monitoring and evaluation framework;
3) a current status report of the quality of the Northern Regions surface water resources, drawing on all available data;
4) a greater return on previous investment in the Waterwatch network by incorporating it into the NWMP and increasing its capacity to deliver high quality, consistent and accurate data that will significantly assist NRM planning, monitoring and evaluation.

The NRM North Water Monitoring Team has established a strategic region-wide water quality and river health monitoring program at monitoring sites that complement those monitored by DPIW. The data meets the Australia and New Zealand Environment and Conservation Council (ANZECC) standards, is stored in the national Waterwatch database structure and is available to the community via the DPIW website www.dpiw.tas.gov.au/waterdata.

councils, other relevant authorities and community Waterwatch volunteers. This audit indicated gaps in water quality and river health monitoring.

Sites throughout the region are selected for monitoring on the basis of the following criteria:

1) On a broad, regional scale, sites are chosen to fill in gaps in monitoring by DPIW and other agencies, for example, at the bottom of major rivers, the bottom of major tributaries, where land use changes occur, at reference sites and at sites of high conservation interest, (e.g. Little Waterhouse Lake, a Ramsar wetland.)

2) Sites are then field tested by NRM North Water Monitoring Team members for accessibility, practicality and safety. Many sites are accessed from public roads. Where sites occur on private land, landowner permission has been sought.

3) Sites are also assessed for suitability for AUSRIVAS assessment of river health. AUSRIVAS requires a suitable riffle or edgewater habitat for aquatic macroinvertebrates. Sites lacking a suitable habitat are assessed for water quality only.

4) Where a number of possible sites occur in an area and are similar in accessibility, practicality, safety and suitability for AUSRIVAS, a site with previous monitoring records is chosen in preference to one for which no historical data exists. Local stakeholder input allows for fine-tuning.

Community engagement

An integral part of the program is the monitoring conducted by a network of community Northern Waterwatch volunteers. These volunteers are provided with ongoing training, equipment, calibration of equipment and technical support including Quality Assurance/Quality Control. Team members run information session at field days and community events, aiming to raise the awareness of the project and to involve the community in water quality monitoring and the NRM process. Volunteers may choose to test water quality at nominated sites on a monthly basis and/or river health in spring and autumn. The Northern Waterwatch Volunteer Equipment Register can be found at Appendix 2.

River health assessment

AUSRIVAS is a nationally recognised system for the rapid biological assessment of river health. NRM North Water Monitoring Team members have attained AUSRIVAS accreditation and are able to conduct these assessments. Samples are collected to identify streamlife, mostly to family level, eg Leptoceridae (stick caddis). The health of the riparian vegetation, levels of erosion, siltation and pollution are also assessed and recorded.

Northern Waterwatch volunteers assess river health using Signal 2 - A Scoring System for Macro-invertebrates ("Water Bugs") in Australian Waters. Samples are collected to identify streamlife to major groups such as such as Trichoptera (caddisfly larvae). Volunteers assessing river health are supplied with a net, tubs, ice cube trays and pipettes. Where appropriate, volunteers are supplied with waders and life jackets.

(Appendix 13).

Sampling for nutrients or contaminates may be carried out at key sites. Phosphorous, Nitrogen and Bacteriological Sampling Protocols and Standards by TasLab Services are outlined at Appendix 10.

Northern Waterwatch volunteers monitor water quality monthly at further sites. Volunteers are supplied with a kit consisting of a Hanna 98311 or 98312 meter, which measures electrical conductivity and temperature and also a turbidity tube. Where appropriate, volunteers are supplied with a sampling pole and bottle and high visibility vest.

Photopoints

Photopoints are established for all NRM North Water Monitoring Team sites. Digital photographs are taken at the time of AUSRIVAS sampling to provide a snapshot of the river condition. Photos are taken from the sample site; upstream, downstream, across the river and into the river substrate. These photographs are then transferred and saved on the computer that houses the Waterwatch database.

Site hygiene protocols

Management of Chytrid

Batrachtrium dendrobatidis is a water-borne fungus, which can become a virulent pathogen of amphibians. The fungus can cause the disease Chytridiomycosis, commonly known as the amphibian or frog chytrid disease. Water monitoring equipment is perceived to be of minimal risk for transferring pathogens after discussions with DPIW River Health Team and Inland Fisheries Service. Equipment such as sampling nets, boots and waders pose a risk of spreading the fungus between sites. The greatest risk of transferring the disease is from the direct handling of infected frogs and, to a reduced degree, tadpoles.

Chytrid has been detected in over 40 species of native amphibians in Australia. It is yet to be established if the fungus is exotic or endemic to Australia The chytrid fungus infects keratin layers around tadpole's mouthparts and keratin in the skin of adult frogs. The chytrid fungus is an aquatic organism with two life stages: a) a sessile, reproductive zoosporangium and b) a motile, uniflagellated zoospore released from the zoosporangium. The infective stage of *B.dendrobatidis* is the free-living zoospore, and the transmission of these requires water. Zoospores released from an infected amphibian can potentially infect other amphibians in the same water. The ability for the fungus to survive in the environment in the absence of an amphibian host is poorly understood. However studies conducted by Australian researchers have indicated that the zoospores can survive in tap water and deionized water for 3 to 4 weeks, and in lake water for up to 7 weeks.
Reference: Johnson,M and Speare,R. Survival of Batrachochytrium dendrobatidis in water: Quarantine and disease control implications. Emerging Infectious Diseases. Vol 9, No.8, 2003.

- Carry a field hygiene kit consisting of: toilet cleaner, disposable gloves, hand cleaner, plastic bags for rubbish.

Dry AUSRIVAS equipment thoroughly between sites if possible. If not:

- Soak nets with a 1:20 (5%) solution of household disinfectant.
- Scrub waders, boots and trays with disinfectant solution.
- Clean and disinfect equipment well away from water bodies.

These protocols will also reduce the risk of spreading other pests and diseases such as Phytophora.

Weeds

The spread of weeds will be managed by adhering to the following after each site visit:

- Wear boots or gaiters to prevent seeds sticking to clothing,
- Check boots for mud/seeds and clean on site, away from the waterway,
- Make sure seeds and pieces of plant matter in equipment boxes etc are all emptied out before leaving site,
- Keep vehicles on hard surfaces and on defined tracks,
- Collect samples of suspicious or unknown plant species and deliver them *ASAP* to your local Weeds Officer for identification.

OCCUPATIONAL HEALTH AND SAFETY

This is detailed in the following: Occupational Health and Safety Risk Minimiser (Appendix 5), Field Log (Appendix 6), Field Information Sheet and Access Sketch (Appendix 7), Remote and Isolated Work Policy (Appendix 8) and Incident Report Sheet (Appendix 9). All team members are covered by Workers' Compensation and Professional Indemnity insurance through the LEC. All Waterwatch volunteers are covered by Public Liability and Volunteer Workers' insurance through the LEC.

REPORTING

There is a requirement to report at regional, state and federal levels on the condition and management of our water resources. The parameters monitored are ANZECC water quality indicators, which can be used for State of the Environment reporting as well as reporting against NRM North Resource Condition and Management Action Targets. Measuring these parameters provides a snapshot of water quality and river health and will assist in setting catchment specific trigger values, identifying long-term trends, determining vulnerable ecosystems and evaluating the effectiveness of catchment management.

Data collected from the program is used to produce an annual State of the Region Report: Water Quality and Stream Condition in Northern Tasmania. The storage of the data at a state level, with access via the DPIW web site, also allows regional and community groups to use the information for local catchment reporting.

Unique site codes for each monitoring site have been developed to meet the national Waterwatch standards. Each waterbody in Tasmania has been assigned a unique combination of three letters and three numbers. These are listed in Appendix 14. The convention used is that the letters reflect the name of the waterbody and the numbers indicate the position of the site in the catchment, with numbers increasing downstream, eg KMR010 would represent the Kings Meadows Rivulet at a site high up in the catchment, whilst KMR050 would represent a site on the Kings Meadows Rivulet lower down in the catchment. When data is transferred to DPIW, a different coding system is used. This system is currently being reviewed.

Water Quality Data

The NRM North Water Monitoring Team has adopted the national Waterwatch database. This is a Microsoft Access Database and runs as a stand-alone application. The datafile can be transported and used on any PC that has the Waterwatch application loaded. This file simply overwrites the existing file of the same name for an update of the data. This allows for multiple copies of the same database and data content, although it is not a networked application.

NRM North Water Monitoring Team water quality data is recorded onto the Water Quality Monitoring Sample Field Sheet (Appendix 3). Community water quality data is recorded onto the Northern Waterwatch Volunteer Sample Field Sheet (Appendix 4) and forwarded to the NRM North Water Monitoring Team. All water quality data is given an equipment number code and a quality code and entered onto the local version of the Waterwatch Database, (Version 3), at the LEC. A backup copy is held on the Dorset Council server.
This database is provided to DPIW at 6 monthly intervals for inclusion in the Water Information System Tasmania website (WIST) at www.dpiw.tas.gov.au/waterdata.

Equipment Number Coding

Each type of equipment has a unique number code. This is entered in the 'xtrainfo' 'method code' section of the database and is as follows:
1 = Conductivity meter, Hanna HI9033
2 = Conductivity meter, Hanna HI98311
3 = Conductivity meter, Hanna HI98312
9 = Conductivity meter, WTW 315*i*
10 = pH meter, Hanna HI9025C
12 = pH meter, WTW 315*i*
20 = Turbidity meter, Hanna 93703C
23 = Turbidity, tube
30 = Alkalinity, Hanna HI3811

Quality Assurance/ Quality Control Coding

The accuracy of the equipment and protocols used set the quality code for data entered into the Waterwatch database. This is tagged in the 'xtrainfo' 'result comment' section of the database.

- +/- 5% = within 5 % of actual value,
- +/- 10% = within 10 % of actual value

To maintain a +/-5% coding:

- Equipment will be Hanna HI9033, Hanna HI9025C, Hanna 93703C, WTW 315*i* or similar,
- Adult monitors will have undergone adequate training in site selection, sampling and monitoring,
- Details of each meter will be recorded on an Equipment Maintenance and Calibration Record Sheet (Appendix 1),
- Sampling and monitoring protocols should meet Aust/ISO standards as set out in the Community Water Quality Sampling Protocols & Standards (Appendix 12),
- Meters will be calibrated prior to each field trip,
- An external agent such as Imbros will service meters at 12 monthly intervals,
- Equipment number and quality coding will be recorded on field record sheets.

To maintain a +/-10% or +/-20% coding:

- Equipment will be a turbidity tube or Hanna 98311 or 98312 or similar,
- Adult monitors will have undergone adequate training in site selection, sampling and monitoring,
- Details of each meter will be recorded on an Equipment Maintenance and Calibration Record Sheet,
- Sampling protocols should be consistent with the Waterwatch Tasmania Reference Manual and the Waterwatch Australia National Technical Manual,
- A NWMP Officer will calibrate and service meters at 6 monthly intervals,
- Mystery solutions will be used at six monthly intervals as an additional external check,
- Equipment number and quality coding will be recorded on field record sheets.

River Health Data

AUSRIVAS data collected by the NRM North Water Monitoring Team is stored on completed AUSRIVAS Habitat Assessment Sheets (Appendix 14), Macroinvertebrate MRHI Identification Sheets (Appendix 11) and entered onto a version of the AUSRIVAS database housed at the LEC. Sheets are photocopied and forwarded to DPIW at the end of each season for inclusion in the state AUSRIVAS database. The data is run through the online AUSRIVAS model to obtain river health assessments. Community data is recorded onto The Macroinvertebrate Result Sheet (Signal 2) Major Groups Record Sheet and the Habitat Rating Record Sheet from the Waterwatch Tasmania Reference Manual. Copies of these sheets are forwarded to the NRM North Water Monitoring Team.

Geographic Information System (GIS)

A Geographic Information System is being established. The GIS will be used to link the site data in the Waterwatch database with site locations. This data will also be linked with existing datasets such as soils, geology and vegetation to perform further data interpretation and analysis of catchment threats and values. The GIS will be used to model the status of the various water quality indicators over time. The information products produced will provide valuable visual interpretation of the data trends and the current health of the waterways. They will be used in community education sessions and for project planning and reporting. Site details will be recorded in AGD66 as well as GDA94.

Test equipment name: ____

Identification number: ____

Inspection frequency: ____

Type of inspection: ____

Calibration standards used:____

Calibration frequency: ____

Expiry date of reagents (if applicable) : ____________________________________

Date of calibration	Expected value	Measured Value	Expected value	Measured Value	Calibrated by:	Comments

Location/Site Name				
Site No				
Day				
Date				
Time (EST)				
Recent Weather Conditions				
Conductivity µS Meter No:				
pH units Meter No:				
Temperature ^{o}C Meter No:				
Turbidity NTU Meter No:				
Other				
Other				
Other				

COMMENTS:

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☐ Entered on database ☐ Checked ☐ Form Filed

Location/Site Name				
Site No				
Day				
Date				
Time (EST)				
Recent Weather Conditions				
Conductivity µS Meter No:				
Temperature ^{o}C Meter No:				
Turbidity tube				
Other				
Other				

COMMENTS:

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☐ Entered on Database ☐ Checked ☐ Form Filed

The aim of the OHS Risk Minimiser is to get the team thinking about their work environment and to identify potential OHS risks each time an employee commences work with the project. Through early risk identification, exposure to potential accidents and injury can be reduced. *The Risk Minimiser is not a pre-employment medical assessment.* Any risks identified will not prejudice a person's continuing employment with the project. The Risk Minimiser form is to be completed by the manager and employees *after* an employee has accepted an offer of employment with the project.

Part 1: Employer Statement to be completed by Project Manager

Employee Name	
Position Title	

Please indicate by ticking the appropriate box, whether the employee's work will involve any of the activities listed below.
Note: Where 'Yes' boxes have been ticked, further information such as the level and frequency of the activity or exposure, any protective equipment that is required or particular process to be followed must be supplied.

Activity:

Driving a Project vehicle ☐
Frequency: Monthly water quality monitoring of sites, seasonal AUSRIVAS assessment of sites, community engagement, attendance at meetings and workshops.
Equipment: CDMA mobile phone and car booster kit.
Process: Current drivers license required. Areas covered are assessed for mobile phone coverage. Team leader or other contact person notified at the beginning and end of any monitoring run or whenever going into and coming out of an area without mobile coverage.

Stopping on road sides ☐
Frequency: Monthly water monitoring of sites and seasonal AUSRIVAS.
Equipment: High visibility vest.
Process: Park as far off road as possible. Wear high visibility vest.

Working in a water environment ☐
Frequency: Monthly water quality monitoring of sites, seasonal AUSRIVAS assessment of sites, training of volunteers.
Equipment: First aid kit, sampling pole, waders, life jacket, handwash.
Process: Roller bandage carried in water monitoring kit during warmer months.
Ausrivas sites assessed for safety of flow. Assessment not carried out if flow is too high to be safely in the water. Waders and lifejacket used for AUSRIVAS assessment.
Long handled sampling pole used where banks are steep. Handwash used after degraded sites.

Team leader's signature Date:

Team leader's full name (Please Print)

you will help to identify and minimise the risk of injury and accident and help to achieve a workplace culture that fosters a high standard of occupational health and safety.

Contact name (partner etc) _____
Phone _____(bh)_____(ah)
Address_____
Preferred doctor_____
Phone _____
Address_____

Details of pre-existing conditions, (eg asthma, diabetes, epilepsy, high blood pressure, allergies, injuries), as well as medication required for these.

_____
_____
_____
_____M
edication
_____
_____

Part 3: Employee Declaration

I declare that I have read Parts 1 and 2 of the Occupational Health and Safety Risk Minimiser and that I have completed Part 2 to the best of my knowledge and ability by disclosing all relevant facts, as they are known to me. I also agree to undergo any medical or ergonomic assessment required to enable me to perform the duties involved in this position.
(Any assessment required will be paid for by the NWMP).

Employee's signature Date:

Appendix 8 details the guidelines to follow when working in remote or isolated areas, and appendix 9 is the incident report sheet for recording incidents.

sheets .

Field Worker 1 ……..……..
Field Worker 2 ……..……
Testing Run Area: …… Date ……/……/……
Name of person on phone standby: …….
Phone number of standby: ……
Time of departure: ……...….am / pm Confirmed with Standby person Yes No
Time of Agreed phone contact:
Agreed time for return: ……am / pm (Standby to allow 1 hour only after agreed
Time of confirmation of return)
Actual time of return: …… am / pm Confirmed with Standby person Yes No

Pre-Run Checks:
Vehicle: petrol, oil, water
Personal: mobile phone, boots, sunscreen, hat, coat, food, drink, spare clothes
Water quality equipment: water test kit, record sheets, pencils
Water quality equipment calibrated
First aid kit
Field hygiene kit: toilet cleaner, hand cleaner, disposable gloves, rubbish bag.

Additional checklist for AUSRIVAS:
Waders, life jacket, table, chairs, net, tubs, tweezers, alkalinity kit, distance measurer, camera, habitat record sheets, buckets, barrel with 1:20 disinfectant, scrubbing brush bug containers with 75% ethanol, 20%water, 5% glycerol

Incidents/Accidents/Special Comments etc:
Briefly describe event and state any actions taken on the Incident report sheet (appendix 9).

Name of Site …… Site Code …… Catchment ……..……
Recorder's name ……Date……
GDA94 Easting …… Northing ……
AGD66 Easting …… Northing…….

Occupational Health & Safety:
If there are any incidents/accidents please fill out an Incident Report Sheet and report the matter to the NRM North Water Monitoring Team Leader , 0429 318 554, dsearle@dorset.tas.gov.au
Access: (Site map on back of sheet) ……..……
……..
Hazards – Existing (i.e. steep banks, thick vegetation, leeches, large trees etc):
……
……..
……..
Hazards – Potential (i.e. large overhanging branches, timber harvesting, trucks using the road, river prone to flooding etc)
……..
……..
……..
Testing details:
NWMP DPIW Waterwatch other
Position in catchment upper middle lower
Frequency of tests …… Subject to tidal conditions?: Yes No

Riparian (riverbank) vegetation (Left and right banks facing downstream)
Left: Nil Sparse Moderate Thick
Right: Nil .Sparse Moderate Thick

Surrounding Land Use: Native forest Forestry Pasture Cropping Urban
Other ……..
Weeds: Blackberries Pines Gorse Willow Broom Other …….

Name of Landowner (if on private land) ……..
Phone Number ……..Mobile ……
Name of any other group involved with site i.e. Rivercare etc: …….
Contact Name: ……Phone: ……..……..……

Photopoint
directions……..
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employees to rely on additional or specialised competencies and resources to effectively manage emergencies or life threatening situations (should they occur).'

The NWMP is committed to providing a safe and healthy workplace for all persons within its 'duty of care'. In providing a safe and healthy work environment, all employees should assist in the recognition, evaluation and control of workplace hazards.

Working in remote/isolated locations presents considerable risk unless adequate planning is taken to ensure the health and safety of participating employees. Through hazard identification and risk assessment process, all work activities undertaken in remote/isolated locations must be adequately controlled to ensure employees are equipped, competent and prepared to manage foreseeable events and /or emergencies. All remote/isolated work activities must be thoroughly planned and documented. Participating employees must endorse the plan and comply with its requirements.

Objective
To ensure all remote/isolated work activities are suitably risk assessed and contingency planning is implemented to manage foreseeable conditions and events.

Documentation
To meet legislative and 'duty of care' requirements, there is the need to follow a structured process when planning remote/isolated work activities. Site and job safety analysis, operational plans and emergency response protocols must be completed for all remote/isolated work activities and all steps adequately documented and made available to employees.

- Identify hazards associated with the work activity and complete appropriate documentation,
- Identify competency and training requirements and complete a training register for the work activity,
- All participants to complete an Occupational Health and Safety Risk Minimiser including medical disclosure details,
- Determine Emergency Responses for foreseeable conditions and events,
- Determine reporting protocols and establish contacts,
- Participating personnel to view and acknowledge the plan,
- File documentation.

Forms
Field Log: To be filled out before each field trip
Field Information Sheet and Access Sketch: To be filled out and updated as necessary.
Incident Report Sheet: To be filled out as required.

Job Safety Analysis (JSA)
Identify hazards: People, environment, work methods, materials, equipment. As each hazard is identified it should be documented, risk assessed and appropriate control measures implemented.
Competency and training requirements will be identified through the JSA process. It is essential that employees undertaking works in remote/isolated locations receive suitable information, instruction, training and /or supervision and are capable of responding to foreseeable incidents.

Emergency Response Plans (ERP)
The JSA process will identify areas in the work systems that have the potential to cause injury or harm. With risk controls in place, there remains no guarantee that emergency situations will not arise. To manage such occurrences, there must be a detailed assessment into how emergencies will be controlled. Planning should be based on likely events. The ERP should contain a list of local area services that can be contacted in the

remote/isolated work activities must be competent in the use of the communications equipment.

Whenever possible, a documented assessment of communications capabilities should be undertaken in the location in which the equipment will be used.

First Aid Training
First Aid training and equipment must be adequate for expected injuries and /or medical conditions. Consideration should be given to the expected time delays between contacting emergency services and their arrival at the location. Extended time delays may require a higher level of patient care or necessitate the use of alternative forms of evacuation.

Equipment Check Lists
When planning work in remote/isolated areas, it is necessary to ensure all items of equipment are checked and in good working order. Equipment checklists should be developed to prevent key items being forgotten.

Reporting
To monitor the health and safety of employees participating in remote/isolated work activities, there is a requirement to conduct reporting schedules and these must be strictly followed.

Contingency plans must be developed to manage instances where individuals or groups fail to respond or make contact. To ensure reasonable checks are made to assess safety, there must be adequate information on telephone contact details, geographical location of the work activity, road/track routes, particulars of the vehicle being used and family contacts. If reasonable effort to contact the group or individual fails, then police should be notified within a reasonable time period.

Employees responsible for monitoring a remote/isolated work activity must not assume an individual or group are okay until they have made verbal contact.

On site risk assessment
During remote /isolated work activities there remains a requirement for all participating employees to monitor and assess the working environment for hazards. To facilitate changing circumstances, there must be scope for discretionary action that allows a task or modified duty to be performed safely through an on-site (real time) risk assessment. The risk assessment should involve all participating employees (whenever possible) and team consensus must be reached that the task is safe to perform. No task should be undertaken when the risk assessment indicates a high probability of an incident occurring.

An On-Site Risk Assessment Form should be completed during the risk assessment process or as soon as is reasonably practical afterwards. The form must be completed and signed by participants in the modified task to indicate they agree with the risk assessment and consent to their involvement. In the case of a lack of consensus, the group must defer to the person who deems the situation to be a threat and doesn't feel safe proceeding with the activity. This decision must be noted on the site form and reported to a representative of the NWMP Steering Committee as soon as practical and the matter should then be discussed further. Proceeding with an activity that may put a person's safety at risk may also jeopardise another's safety if they have to act to help or save that person.

Employees have the right under 'Section 17' of the Workplace Health and Safety Act to refuse to work when: 'there is reasonable grounds to believe that, as a result of work being carried on at a workplace, there is a risk of imminent and serious injury to, or imminent and serious harm to the health of, any person, an employee may refuse to work if it is not within the employee's ability to rectify the cause of the risk'.

happened.

Date of event/accident: ……/……../……..
Name of Person filing the report: ……..……..…..
Name of Witness: ……..……
Location where the incident took place: ……
Site Code : …… ……
Description of event/accident: ……..……..……
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Action Taken ……..……..
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Signed: ……..…….. Witnessed by: ……...…..

Print name …… Print name ……

Date: ……/……../…… Date: ……/……../……

Office Only:
Date report received …../…../…. Name of Person who received report: ….……..……

Signature of person receiving the report ……

Action Taken ……

NRM North Water Monitoring Team Leader, Debbie Searle, PO Box 21 Scottsdale Tas, 7260,
0429 318 554, dsearle@dorset.tas.gov.au

• DO NOT open the sample bottle obtained from TasLab Services (or alternative sample container) until immediately before filling.
• DO NOT rinse out the bottle before taking a sample, especially when sampling chlorinated water, as it contains a chlorine neutraliser (sodium thiosulphate) - N.B. if a test for residual chlorine is required, a sample must be taken in a separate bottle that does not contain neutraliser (25 mL is sufficient for this test)
• When removing cap or stopper from the sample bottle, hold it in such a way that the fingers do not come into contact with its inside surface or with the neck of the bottle. Do not put down the cap or stopper in such a way that will allow it to become contaminated.
• Hold the bottle near the base rather than near the neck.
• Fill the bottle immediately with sample and replace the closure, observing the same precautions as for opening.
• DO NOT COMPLETELY FILL THE BOTTLE but leave about 2.5 cm (1 inch) headspace.

Sampling from a river, spring, lake, reservoir, or well
a) Take a sample which is representative of the water used by the consumer. Therefore do not sample too near the bank, or too far from the draw-off point.
b) Hold the bottle near its base and plunge it, neck downwards, to about 30 cm below surface.
c) Turn the bottle until the neck points slightly upwards with the mouth directed towards the current. If there is no current, move the bottle forward away from the hand. If the bank is likely to be disturbed during sampling, or there is some other difficulty in taking a sample at the edge of the bank, attach the bottle to a rigid pole (1 to 1.5 m long).
d) When the bottle has filled, remove it from the water and immediately replace the closure.
e) If it is not practicable to collect samples this way, a weight can be attached to the bottle which is then lowered into the water attached to the end of a line. If this needs to be done frequently, it can be more convenient to have a weighted frame made to hold the bottle.

Sample size
Samples should be sufficient for all tests required plus an extra 50%, but preferably not less than 250 mL for bacteriological testing, except for waters known to be highly polluted. At least 500 mL is required for a full examination of drinking waters and pool waters.

Sampling and care of water samples for bacterological examination
It is important to take water samples carefully because this can be vital to the deductions that are drawn from the results. Every care must be taken to avoid contamination during sampling.
At the sampling site, if there are other samples being taken (e.g. for chemical testing), the sample for bacteriological testing should always be taken first.

Chlorinated water samples
As any residual chlorine should be neutralised at the time samples are taken, 0.1 mL (2 drops) of a 10% solution of sodium thiosulphate is added to each 500 mL sample bottle (1 drop per 250 mL bottle) before sterilisation. This gives a concentration of about 20 mg/L in the sample, which is sufficient to neutralise more than 2 mg/L of free and combined chlorine in all except highly chlorinated waters. Unchlorinated samples will not be affected by the thiosulphate.

levels of indicator bacteria may have changed enough to give a misleading interpretation of the actual condition of the water. In such circumstances, clients are normally informed and given the option of re-sampling or continuing with the test.

Data which should accompany samples

• All samples should be labelled and identified, and accompanied by adequate descriptive data - bottle labels have spaces for the basic sample details. It is advisable to fill these in before sampling - use a ballpoint pen or a pencil (avoid felt pens or other ink pens that are liable to run when wet - these make the labels illegible).

• Except for routine testing, it is advisable to notify the laboratory by phone, fax, or E-mail when forwarding samples - this will help to ensure that the sample type and quantity is suitable for the tests required

• The laboratory request form should also be completed (in case labels become detached or impossible to read). Other details to include with the sample/s, are the name of the sender /collector, the type of water, the source of the sample, the date and time of collection, and the reason for examination (e.g. suitability for drinking, suspected cause of illness etc). Other relevant information (e.g. weather conditions, accessibility to animals etc) is also useful if an interpretative report is required.

Cautionary note: A single laboratory bacteriological examination, no matter how favourable the result, does not justify the conclusion that the water is suitable for drinking purposes. It merely indicates whether or not it has been subject to recent faecal pollution, and this does not exclude the possibility of dangerous pollution in the future, or in the more distant past. It also does not exclude the presence of other pollutants.

Order	Family	Riffle	Edgewater			Riffle	Edgewater
Platyhelminthes	Turbellaria			**Ephemeroptera**	Baetidae		
Nematomorpha	Gordiidae				Caenidae		
Oligochaeta					Leptophlebiidae		
Hirudinea					Oniscigastridae		
Hydracarina					Siphlonuridae		
Mollusca	Sphaeriidae			**Hemiptera**	Corixidae		
	Ancylidae				Gelastocoridae		
	Hydrobiidae				Gerridae		
	Lymnaeidae				Naucoridae		
	Physidae				Notonectidae		
	Planorbidae				Saldidae		
Amphipoda	Ceinidae				Veliidae		
	Corophidae			**Lepidoptera**	Pyralidae		
	Eusiridae			**Mecoptera**	Nannochoristidae		
	Paracalliopidae			**Neuroptera**	Osmylidae		
	Paramelitidae				Sisyridae		
	Talitridae			**Odonata**	Aeshnidae		
Decapoda	Atyidae				Gomphidae		
	Hymenosomatidae				Hemicorduliidae		
	Parastacidae				Synthemistidae		
Syncarida	Anaspididae				Telephlebiidae		
Isopoda	Janiridae				Coenagrionidae		
	Oniscidae				Lestidae		
	Phreatoicidae			**Plectoptera**	Austroperlidae		
Coleoptera	Chrysomelidae Adults				Eustheniidae		
	Chrysomelidae Larvae				Gripopterygidae		
	Dytiscidae Adults				Notonemouridae		
	Dytiscidae Larvae			**Trichoptera**	Atriplectididae		
	Elmidae Adults				Calamoceratidae		
	Elmidae Larvae				Calocidae		
	Gyrinidae Adults				Conoesucidae		
	Gyrinidae Larvae				Ecnomidae		
	Heteroceridae				Glossosomatidae		
	Hydraenidae				Helicophidae		
	Hydrophilidae				Helicopsychidae		
	Noteridae				Hydrobiosidae		
	Psephenidae				Hydropsychidae		
	Curculionidae				Hydroptilidae		
	Scirtidae				Leptoceridae		
	Staphylinidae				Limnephilidae		
	Carabidae				Odontoceridae		
Diptera	Athericidae				Oeconesidae		
	Blephariceridae				Philopotamidae		
	Ceratopogonidae				Philorheithridae		
	Chaoboridae				Plectrotarsidae		
Chironomidae:	ch Orthocladiinae				Polycentropodidae		
	ch Chironominae				Tasimiidae		
	ch Podonominae				Unid. Pupae		
	ch Diamesinae			**Unid**			
	ch Tanypodinae			**Other Taxa:**			
	Culicidae						
	Dixidae						
	Empididae						
	Ephydridae						
	Psychodidae						
	Simuliidae				**Total No. of Taxa:**		
	Stratiomyidae						
	Thaumaleidae				**Total No. of individuals:**		
	Tipulidae						
	Unid. Pupae						
					Entered onto database:		.

Appendix 12: Community Water Quality Sampling Protocols and Standards

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WATER ASSESSMENT AND PLANNING BRANCH DPIW

COMMUNITY WATER QUALITY SAMPLING PROTOCOLS & STANDARDS

Reference resources of State, Australian and International standards for water quality monitoring

September 2004

National standards that should be applied when developing new protocols to ensure uniformity consistency of methodologies and values for water quality measurement.

This guide is just that, a guide, and a summary of relevant standards developed using Australian Standards (refer section 1.2) and it is strongly recommended that these documents should be purchased and referred to in conjunction with this guide. There are also several publications similar to this, that have been prepared by other State Governments. The Queensland Governments Environmental Protection Agency have produced a *Water Quality Sampling Manual* that is available on-line (http://www.env.qld.gov.au/publications?id=330) and is another good source of information.

Water Quality monitoring may be carried out for a number of different reasons and the data collected will have different uses and different levels of data confidence associated with it. This manual prescribes to the level of data confidence required for National and State water resource management defined by the *ANZECC Guidelines for Water Quality Monitoring and Reporting (2000*) and the Natural Resource Management (NRM) Monitoring and Evaluation Framework.

NATIONAL GUIDELINES FOR WATER QUALITY MONITORING

In Australia the State and National Water Quality Monitoring Strategies conform to the *ANZECC Guidelines for Water Quality Monitoring and Reporting (2000)*. This document sets the national framework for water quality monitoring and reporting protocols used by Australian Federal and State Government agencies in the monitoring of water resources.

The *ANZECC Guidelines for Water Quality Monitoring and Reporting (2000) http://www.deh.gov.au/water/publications/quality* are supplemented by the *Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000)* (A.K.A The Water Quality Guidelines) http://www.deh.gov.au/water/publications/quality. The Water Quality Guidelines provide additional practical and scientific information for applying national and regional guidelines to local site specific applications. The main objective of the Water Quality Guidelines is to provide an over arching national resource to the current scientific advice for the development of site specific water quality monitoring and management at the local and regional scale.

National Water Quality Targets

The Water Quality Guidelines also set national default trigger values for water quality relating to a range of environmental values that can be applied in the absence of verifiable local water quality data http://www.deh.gov.au/water/quality/targets/map.php . These trigger values are however, very broad and in most cases are a rough guide. The only way to develop representative guidelines for specific sites is to undertake long term monitoring. There are many sites that do not fall strictly within these guidelines due to site-specific variation and local conditions. This must be kept in mind when applying these general guidelines.

The Guidelines are not standards but are intended as a guide to assist in the development of local water quality monitoring and management strategies. The default trigger levels are broad scale, risk based assessment of environmental condition and are a starting point for water resource managers to refine these guidelines and develop more site specific guidelines at a local scale based on sound

The International Organisation for Standardisation (ISO, http://www.iso.ch) is a worldwide federation of national standards bodies from some 100 countries, established as a non-governmental organisation in 1947.
Standards Australia (http://www.standards.com.au) represents Australia within the ISO, to meet the needs of national technical infrastructure for contemporary, internationally aligned standards.
Coordinated across these two organisations is a range of standards relevant to a water data infrastructure, covering aspects of data delivery, spatial representation and technical content.

National Water Quality Standards

The Australian and New Zealand Standards (AS/NZS 1998) describe National standard methods for the collection of water quality samples. The following documents are available for purchase on line at http://www.standards.com.au :

- AS/NZS 5667.4:1998
  Water quality - Sampling - Guidance on sampling from lakes, natural and man-made
- AS/NZS 5667.6:1998
  Water quality - Sampling - Guidance on sampling of rivers and streams
- AS/NZS 5667.1:1998
  Water quality - Sampling - Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.

Standard Operating Procedures & Useful Documents

There are numerous other documents that have been developed to provide National guidelines for the development of Standard Operating Procedures. Of relevance to the collection of Water Quality Samples the following document contains some useful information.

- ***A Preliminary Guide to the Standard Operating Procedures for Sampling Contaminated Groundwater*** Occasional Paper No. 2 Water Resources Management Committee, The Australian Water Resources Council, September, 1991 **(Refer Chapter 6.0 Surface Water Sampling, 7.0 Field Measurements)**

The Queensland Governments Environmental Protection Agency have produced a *Water Quality Sampling Manual* that is available online and is a comprehensive source of information and standard operating procedures and protocols (http://www.env.qld.gov.au/publications?id=330)

DPIW PROTOCOLS FOR WATER SAMPLE COLLECTION, TRANSPORT AND STORAGE

Where possible, water quality measurements should be made *insitu* and in a site location that is representative of the conditions at the sampling site. This section refers to sample collection for analysis *exsitu* by a certified NATA accredited laboratory.

These Standard Operating Procedures have been developed by The Department of Primary Industries and Water, Tasmania, for use by their staff in collecting field water samples. These procedures have been developed to comply with Australian and International standards. These procedures may not fulfil the requirements of all water monitoring applications. Each organisation should develop their own specific SOP's to suit their requirements using the relevant Australian

Equipment

- Single-use **sample bottles, filters** and **syringes** are available from Analytical Services Tasmania (AST). Sample bottles have colour coded labels for specific types of water quality analysis and testing. Sample Bottles Types
- Extra bottles, syringes and filters should be carried in the field. In particular extra filters are often required for samples of elevated turbidity. Maintain a good supply of filters, syringes and bottles that can be used as spares or if there is a problem with availability.
- A **sampling rod** can be made from an aluminium pool net pole or wooden handle with a large clamp or bicycle water bottle holder attached to the end. The sample bottle can be secured on the end of the pole and will to allow greater reach to sample from the main flow of larger creeks and rivers.

General Rules

- Complete label details with waterproof pen before collecting sample.
- Wear disposable vinyl gloves if possible.
- **Collect sample directly into sample container if possible. If not, collect in a sampling beaker (rinse out twice with water to be sampled) and transfer immediately to the sample container.**
- If the bottle contains a preservative do not over fill the bottle as preservative may be diluted or lost.
- Collect sample in an open channel sample where the flow is greatest. Invert the bottle and lower until the mouth of the bottle is 10cm below the surface but ensure that it does not pick up any settled solids from the base of the channel. Take sample by facing the mouth of the bottle upstream and turn the bottle upright until it fills.
- Keep your hand downstream and/or out of the flow as much as possible.
- Take spare bottles.
- Document sampling site by GPS coordinates, detailed description, photo etc. Field notes must accurately describe where samples were collected, to allow cross-checking with the sampling locations.
- Fill in field data sheets, describe the sample taken, their labels and all other variables measured prior to leaving a sampling site. It is particularly important to record comments on sampling conditions and recent weather and flow conditions as these will directly influence water quality.
- Record all times in Eastern Standard Time.
- Bottles containing general ions, heavy metals and bacteriological samples should be filled completely.
- Do not fill nutrient bottles to the top allow room for expansion when frozen.
- Immediately after collection all samples are to be placed in an eski with an adequate supply of ice bricks for cooling. Bacteriological bottles must be kept out of sunlight by wrapping in a brown paper bag or foil.

Sample Storage and Preservation (AS/NZS 5667.1:1998 Section 11)

the laboratory as soon as possible. Consult with laboratory for storage times.
- Bacteriological samples must be delivered to the testing laboratory on the day of collection.
- Completed sample submission forms that should be available from the analyst or lab, must accompany samples delivered to the testing laboratory.
- Problems and errors in sampling are to be recorded on field sheets and on the sample submission form that is given to the testing laboratory.

DO NOT
- Smoke during operations.
- Rinse sample bottle with waters to be sampled unless specified to do so by the laboratory.
- Risk loss of preservatives by overfilling containers.

DPIW FILTERED SAMPLE METHOD FOR DISSOLVED NUTRIENTS (AS 5667.1:1998 Section 11.7)

Australian Standard, AS 5667.1:1998 Section 11.7, recommends that field filtration be done at time of collection to guarantee the soluble nutrient concentrations do not alter.

Preventing Contamination of Filtered Samples
- Use disposable vinyl gloves.
- Do not touch filter or syringe tips.
- Do not smoke.
- Ensure cooler box is clean.
- Do not store samples or equipment near fish products or food.
- Leave bottle lids up side down while sub sampling.
- Wash hand after going to the toilet or eating food when taking bacteriological or nutrient samples.

Sample collection
- Collect directly into 250 ml green label bottle (do not rinse) or sampling device.
- Collect sample in an open channel sample where the flow is greatest.
- Invert the bottle and lower until the mouth of the bottle is 10cm below the surface but ensure that it does not pick up any settled solids from the base of the channel.
- Take sample by facing the mouth of the bottle upstream and turn the bottle upright until it fills.
- Keep your hand downstream and/or out of the flow as much as possible.
- Make a field note of the conditions at the sample site at the time of sampling

Filtration procedure for soluble nutrients
- Shake sample bottle thoroughly
- Rinse syringe with ~ 5 ml of sample by removing plunger and pouring sample directly from bottle to syringe to avoid cross contamination. Discard rinse water.
- Connect filter unit without touching any of the filter (remove foil and hold by plastic cover).
- Shake sample bottle thoroughly, remove plunger and fill syringe with sample by pouring directly from sample bottle into syringe.
- Replace plunger and discard the first 5-10 drops of water.
- Collect remainder of filtered water in a 50 ml tube labelled “Filtered for Dissolved Nutrients”.
- If the syringe filter fouls before the sample has been completely filtered, invert the syringe so that

Total nutrients

- The remainder of the sample (~150-200 ml) is used for total nutrient determination
- Leave a headspace (~10% of container volume) for aeration, mixing and thermal expansion that occurs during freezing.

Preservation

- Return to lab immediately in chilled container. If this is not possible, freeze, ensuring the freezer has not been used for storage of material that could contaminate the sample, eg food products.

Quality Assurance Quality Control: Blanks and Duplicates (AS/NZS 5667.1:1998 Sect. 5)

- Blank samples should be used periodically to check on field procedures, containers, equipment and transport. These should be processed in the filed following normal field procedures as appropriate i.e. filtration.
- Duplicate samples should be taken to reveal the magnitude of errors (contamination, random and systematic) occurring between sampling and sample analysis.
- Ensure equipment is calibrated and functioning accurately prior to departure.
- Use sample bottles supplied by analytical laboratory.
- Only use bottles particular to each parameter being sampled. Bottles are prepared specifically depending on the parameter they are measuring.
- Bottles that have been used should be discarded.
- The insides of bottles and lids should not come into contact with hands or objects.

Laboratory Washing Procedures for Plastic HDPE Bottles

- **Currently required for re-usable sample bottles only.**
- Removing labels from the outside of the bottles and using methylated spirits to clean permanent marker from the outside of bottles, the following procedure should be used to thoroughly clean the inside of the bottle;

1. Mix up a solution of Decon / CONTRAD (low phosphorus detergent) at a ratio of 50mL detergent : 500mL deionised water.
2. Add about 10mL of this solution to each bottle and top the bottle up with hot tap water. Screw lid loosely back onto the bottle and leave bottle to soak for 2 hours.
3. After 2 hours, rinse out the bottle with hot tap water, rinsing at least 3 times to ensure all suds are removed. If there is still some dirt or other marks remaining on the inside bottom of the bottle, try and remove with a bottle-brush. Otherwise, discard the bottle.
4. Finally, rinse bottle out 3 time using deionised water (filling the bottle to about ½ full every rinse.

- When a new batch of bottles is received, they need to be washed and blanks sent to the lab for analysis (QA/QC).

Blanks and replicates should be tested during any monitoring program at least once every 4 months or upon any change in monitoring procedure.

Procedures for the Use of Hand Held Meters

There are limited national standards for the use of hand held meters and the accepted convention is to **undertake measurements in accordance with the operation manual supplied by the**

- Follow manufactures instructions on use, maintenance and storage.
- Calibrate all meters prior to each field trip. Some meters will require calibration before each sample. Check with manufactures recommendations.
- Maintain a regular service regime for all meters (depending on usage) using an accredited service and repairer (Imbros).
- Transport in a shockproof and waterproof container i.e. Pelican case.
- Carry required equipment in the field for calibrations.
- Carry required equipment in the field for basic repairs such as replacement of DO meter membranes.
- Maintain a log for each meter detailing service history, repairs and other relevant information.
- Dry out meter case at the end of each day.
- Place probes in the stream rather than drop them.
- For river sampling, probes should ideally be placed well below the surface in moving water or as close as possible to the main stream (DO meters should not be placed in white water).

Dissolved Oxygen Meters

- Meters such as YSI 550 require calibration for changes in altitude. These meters should be turned on 30 minutes prior to the first calibration and sample, at the beginning of the day and left on throughout the day to allow for an accurate calibration at each site. In general most DO meters require stabilisation before an accurate reading can be taken and should be left on throughout the day.
- Most dissolved oxygen meters require running water past the probe membrane. If the site is a still water site the probe must be moved steadily through the water. Consult manufactures instructions for recommended water velocity past the probe.
- Do not sample immediately below or in white water.

pH Meters

- Make sure the probe is stored in the wetting cap and that there is a small amount of water in it. Do not use distilled water in the wetting cap. Use the manufacturers storage solution in the wetting cap for long term storage of the probe.
- Calibration should be conducted using a 2 point calibration procedure using two buffered standards in the pH range of normal field measurements.

Turbidity Meters

- Do not leave the sample tube in the meter. It should be stored securely to avoid scratching the glass.
- Rinse the tube at least twice at the sample site and take the sample below the surface.
- Empty the sample at each site.
- Wipe a small amount of silicon oil on the outside of the tube once or twice a day.
- Collect the sample directly into the sampling cuvet (cell) as per bottle sampling.

Electrical Conductivity Meters

- In the absence of a dedicated temperature probe or thermometer it is a national convention to

AWRC Basin No	AWRC Basin Name	AWRC Catchment	Subcatchment	Site code
1	Flinders-Cape Barren Islands	Big River	Big River	BIR 000
1	Flinders-Cape Barren Islands	Boat Harbour Creek	Boat Harbour Creek	BOA 000
1	Flinders-Cape Barren Islands	Chew Tobacco Creek	Chew Tobacco Creek	CHE 000
1	Flinders-Cape Barren Islands	Cronleys Creek	Cronleys Creek	CRO 000
1	Flinders-Cape Barren Islands	Dover River	Dover River	DRR 000
1	Flinders-Cape Barren Islands	Edens Creek	Edens Creek	EDN 000
1	Flinders-Cape Barren Islands	Fergusons Creek	Fergusons Creek	FER 000
1	Flinders-Cape Barren Islands	Fotheringale Creek	Fotheringale Creek	FOT 000
1	Flinders-Cape Barren Islands	Gambles Creek	Gambles Creek	GAM 000
1	Flinders-Cape Barren Islands	Hays Creek	Hays Creek	HAY 000
1	Flinders-Cape Barren Islands	Killiecrankie Creek	Killiecrankie Creek	KIL 000
1	Flinders-Cape Barren Islands	Leventhorpe Creek	Leventhorpe Creek	LVN 000
1	Flinders-Cape Barren Islands	Little River	Little River	LTL 000
1	Flinders-Cape Barren Islands	Mines Creek	Mines Creek	MNS 000
1	Flinders-Cape Barren Islands	Modder River	Modder River	MOD 000
1	Flinders-Cape Barren Islands	Nalinga Creek	Nalinga Creek	NAL 000
1	Flinders-Cape Barren Islands	Nelsons Drain	Nelsons Drain	NEL 000
1	Flinders-Cape Barren Islands	North East River	North East River	NER 000
1	Flinders-Cape Barren Islands	Pats River	Officers Creek	OFF 000
1	Flinders-Cape Barren Islands	Pats River	Pats River	PTS 000
1	Flinders-Cape Barren Islands	Pats River	South Pats River	SPA 000
1	Flinders-Cape Barren Islands	Pickford Creek	Pickford Creek	PKF 000
1	Flinders-Cape Barren Islands	Pratts River	Pratts River	PRS 000
1	Flinders-Cape Barren Islands	Reddins Creek	Reddins Creek	RDN 000
1	Flinders-Cape Barren Islands	Rices River	Rices River	RIC 000
1	Flinders-Cape Barren Islands	Rooks River	Rooks River	ROO 000
1	Flinders-Cape Barren Islands	Samphire River	Fannings Creek	FAN 000
1	Flinders-Cape Barren Islands	Samphire River	Red Creek	RDC 000
1	Flinders-Cape Barren Islands	Samphire River	Samphire River	SAM 000
1	Flinders-Cape Barren Islands	Samphire River	Unavale Creek	UNA 000
1	Flinders-Cape Barren Islands	Stony Creek	Stony Creek	SNY 000
2	East Coast	Apsley River	Apsley River	APS 000
2	East Coast	Banticks Creek	Banticks Creek	BAN 000
2	East Coast	Barilla Bay Rivulet	Barilla Bay Rivulet	BLB 000
2	East Coast	Bay of Fires Drainage Basin	Grants Lagoon	GRL 000
2	East Coast	Bay of Fires Drainage Basin	Scotsmans Creek	SCO 000
2	East Coast	Bay of Fires Drainage Basin	Sloop Creek	SLO 000
2	East Coast	Bay of Fires Drainage Basin	Swimcart Creek	SWI 000
2	East Coast	Belbin Creek	Belbin Creek	BEL 000
2	East Coast	Big Lagoon Creek	Big Lagoon Creek	BCR 000
2	East Coast	Bream Creek	Bream Creek	BRE 000
2	East Coast	Buxton River	Buxton River	BUX 000
2	East Coast	Carlton River	Carlton River	CAR 000
2	East Coast	Carlton River	Tanners Creek	TAN 000
2	East Coast	Clarence Plains Rivulet	Clarence Plains Rivulet	CPR 000
2	East Coast	Dodges Rivulet	Dodges Rivulet	DOD 000
2	East Coast	Douglas River	Douglas River	DOU 000
2	East Coast	Duckhole Rivulet	Duckhole Rivulet	DCR 000
2	East Coast	Forcett Rivulet	Forcett Rivulet	FRC 000
2	East Coast	Four Mile Creek	Four Mile Creek	FMC 000
2	East Coast	Georges Bay	Boggy Creek	BOG 000
2	East Coast	Georges Bay	Constable Creek	CON 000
2	East Coast	Georges Bay	Georges Bay	GEB 000

2	East Coast	George River	South George River	SGR 000
2	East Coast	Gilking Creek	Gilking Creek	GIL 000
2	East Coast	Great Fraser River	Ansons River	ANS 000
2	East Coast	Great Fraser River	Great Fraser River	GFR 000
2	East Coast	Great Fraser River	Last River	LAS 000
2	East Coast	Great Fraser River	Spurs Rivulet	SPU 000
2	East Coast	Great Musselroe River	Great Musselroe River	GMU 000
2	East Coast	Great Musselroe River	Icena Creek	ICE 000
2	East Coast	Griffiths Rivulet	Griffiths Rivulet	GRI 000
2	East Coast	Iron Creek	No Sub Catchments	
2	East Coast	Iron Creek	Iron Creek	ICK 000
2	East Coast	Kangaroo Bay Rivulet	Kangaroo Bay Rivulet	KAN 000
2	East Coast	Little Musselroe River	Little Musselroe River	LMU 000
2	East Coast	Little Swanport River	Little Swanport River	LSR 000
2	East Coast	Maclaines Creek	Maclaines Creek	MCL 000
2	East Coast	Meredith River	Meredith River	MRD 000
2	East Coast	Orielton Rivulet	Orielton Lagoon	ORL 000
2	East Coast	Orielton Rivulet	Orielton Rivulet	ORR 000
2	East Coast	Pats River	Pats River	PAT 000
2	East Coast	Ravensdale Rivulet	Ravensdale Rivulet	RAV 000
2	East Coast	Sandspit Rivulet	Sandspit Rivulet	SND 000
2	East Coast	Scamander River	Avenue River	AVE 000
2	East Coast	Scamander River	Brilliant Creek	BRL 000
2	East Coast	Scamander River	Cato Creek	CAT 000
2	East Coast	Scamander River	Scamander River	SCA 000
16	Mersey River	Andrews Creek	Andrews Creek	AND 000
16	Mersey River	Dasher River	Dasher River	DAS 000
16	Mersey River	Dasher River	O'Neill's Creek	ONC 000
16	Mersey River	Mersey River	Arm River	ARM 000
16	Mersey River	Mersey River	Brown's Creek	BNS 000
16	Mersey River	Mersey River	Bishton Creek	BIS 000
16	Mersey River	Mersey River	Bonneys Creek	BON 000
16	Mersey River	Mersey River	Caroline Creek	CLC 000
16	Mersey River	Mersey River	Cockers Creek	COC 000
16	Mersey River	Mersey River	Coiler Creek	COI 000
16	Mersey River	Mersey River	Figure of Eight Creek	FEC 000
16	Mersey River	Mersey River	Fish River	FIS 000
16	Mersey River	Mersey River	Fisher River	FSR 000
16	Mersey River	Mersey River	Household Creek	HHC 000
16	Mersey River	Mersey River	Kings Creek	KNC 000
16	Mersey River	Mersey River	Little Fisher River	LFI 000
16	Mersey River	Mersey River	Lobster River	LOB 000
16	Mersey River	Mersey River	Mersey River	MER 000
16	Mersey River	Mersey River	No Sub Catchments	MDT 000
16	Mersey River	Mersey River	Minnow River	MIN 000
16	Mersey River	Mersey River	Mole Creek	MOL 000
16	Mersey River	Mersey River	No Sub Catchments	MUN 050
16	Mersey River	Mersey River	Parramatta Creek	PMC 000
16	Mersey River	Mersey River	Ration Tree Creek	RAT 000
16	Mersey River	Mersey River	Redwater Creek	RED 000
16	Mersey River	Mersey River	Sassafras Creek	SAS 000
16	Mersey River	Mersey River	Warm Spring	WSP 000
16	Mersey River	Pardoe Creek	Pardoe Creek	PAD 000
17	Rubicon River	Panatana Rt	Appleby Creek	APP 000

17	Rubicon River	Rubicon River	Franklin Rt	FRR 000
17	Rubicon River	Rubicon River	Greens Creek	GRE 000
17	Rubicon River	Rubicon River	Kermode Creek	KMD000
17	Rubicon River	Rubicon River	Parrot Creek	PRT 000
17	Rubicon River	Rubicon River	Rubicon River	RUB 000
17	Rubicon River	Rubicon River	Saxon Creek	SAX000
17	Rubicon River	Rubicon River	Sheepwash Creek	SHE 000
18	Tamar River	Macquarie River	Blackmans River	BLR 000
18	Tamar River	Macquarie River	Blanchards Creek	BLN 000
18	Tamar River	Macquarie River	Brumby's Creek	BRU 000
18	Tamar River	Macquarie River	Elizabeth River	ELI 000
18	Tamar River	Macquarie River	Floods Creek	FLC 000
18	Tamar River	Macquarie River	Gavins Creek	GAV 000
18	Tamar River	Macquarie River	Glen Morriston Rivulet	GMR 000
18	Tamar River	Macquarie River	Green Creek	GRC 000
18	Tamar River	Macquarie River	Isis River	ISI 000
18	Tamar River	Macquarie River	Kitty Rivulet	KIT 000
18	Tamar River	Macquarie River	Lake River	LAK 000
18	Tamar River	Macquarie River	Macquarie River	MAC 000
18	Tamar River	Macquarie River	Scrubby Den Rivulet	SDR 000
18	Tamar River	Macquarie River	Tumbledown Creek	TUM 000
18	Tamar River	Macquarie River	York Rivulet	YOR 000
18	Meander River	Brushy Rivulet	Brushy Rivulet	BRT 000
18	Meander River	Brushy Rivulet	Bryans Creek	BRY 000
18	Meander River	Dungiven Rivulet	Dungiven Rivulet	DUR 000
18	Meander River	Huntsman Rivulet	Huntsman Rivulet	HUN 000
18	Meander River	Jackeys Creek	Jackeys Creek	JKC 000
18	Meander River	Liffey River	Bates Creek	BTC 000
18	Meander River	Liffey River	Becketts Creek	BEC 000
18	Meander River	Liffey River	Bluff Creek	BLU 00
18	Meander River	Liffey River	Bullock Holes Creek	BHC 000
18	Meander River	Liffey River	Cobblers Creek	COB 000
18	Meander River	Liffey River	Liffey river	LIF 000
18	Meander River	Liffey River	Myrtle Creek	MRT 000
18	Meander River	Liffey River	Pages creek	PGC 000
18	Meander River	Meander River	Bonneys Creek	BNN 000
18	Meander River	Meander River	Cat and Kitten Creek	CKC 000
18	Meander River	Meander River	Chester Rivulet	CTR 000
18	Meander River	Meander River	Meander River	MEA 000
18	Meander River	Meander River	Springlands Creek	SDC 000
18	Meander River	Muddy Creek	Muddy Creek	MUD 000
18	Meander River	Muddy Creek	Stockers Creek	SKC 000
18	Meander River	Pipers Lagoon Creek	Pipers Lagoon Creek	PLC 000
18	Meander River	Quamby Brook	Buffalo Creek	BOC 000
18	Meander River	Quamby Brook	Eden Rivulet	EDE 000
18	Meander River	Quamby Brook	Quamby Brook	QUA 000
18	Meander River	Quamby Brook	Swamp Gum Rt	SGM 000
18	Meander River	Sugarloaf Creek	Black Sugarloaf Creek	BSC 000
18	Meander River	Sugarloaf Creek	Four Springs Creek	FSC 000
18	Meander River	Sugarloaf Creek	Reids Creek	REI 000
18	Meander River	Sugarloaf Creek	Sugarloaf Creek	SLC 000
18	Meander River	Upper Meander River	Dunnings Rt	DNG 000
18	Meander River	Upper Meander River	Mother Cummins Rt	MOT 000
18	Meander River	Upper Meander River	Sales Rt	SLS 000

18	Meander River	Western Creek	Western Creek	WES 000
18	Meander River	Whitemore/Murfett Creek	Black Hills Creek	BLK 000
18	Meander River	Whitemore/Murfett Creek	Whitemore/Murfett Creek	WMC 000
18	Tamar River	North Esk River	Barrow Creek	BRW 000
18	Tamar River	North Esk River	Bennies Creek	BES 000
18	Tamar River	North Esk River	Burns Creek	BUR 000
18	Tamar River	North Esk River	Camden Rivulet	CDN 000
18	Tamar River	North Esk River	Coquet Creek	COQ 000
18	Tamar River	North Esk River	Distillery Creek	DIS 000
18	Tamar River	North Esk River	Heritage Forest Creek	HFC 000
18	Tamar River	North Esk River	Jinglers Creek	JIN 000
18	Tamar River	North Esk River	Kings Meadows Rt	KMR 000
18	Tamar River	North Esk River	North Esk River	NSK 000
18	Tamar River	North Esk River	O'Plain Creek	OPL 000
18	Tamar River	North Esk River	Patersonia Rivulet	PTR 000
18	Tamar River	North Esk River	Pig-Run Creek	PRC 000
18	Tamar River	North Esk River	Rose Rivulet	ROS 000
18	Tamar River	North Esk River	St Patricks River	SPR 000
18	Tamar River	North Esk River	Weavers Creek	WEA 000
18	Tamar River	South Esk River	Barton Creek	BAR 000
18	Tamar River	South Esk River	Ben Lomond Rivulet	BEN 000
18	Tamar River	South Esk River	Blackmans Creek	BLC 000
18	Tamar River	South Esk River	Break O'Day River	BOD 000
18	Tamar River	South Esk River	Buffalo Brook	BUF 000
18	Tamar River	South Esk River	Dalrymple Creek	DLR 000
18	Tamar River	South Esk River	Dans Rivulet	DAN 000
18	Tamar River	South Esk River	Fingal Rivulet	FIN 000
18	Tamar River	South Esk River	Margisons Creek	MGS 000
18	Tamar River	South Esk River	Milly Brook	MIL 000
18	Tamar River	South Esk River	Newmans Creek	NMN 000
18	Tamar River	South Esk River	Nile River	NIL 000
18	Tamar River	South Esk River	River Tyne	TYN 000
18	Tamar River	South Esk River	South Esk River	SSK 000
18	Tamar River	South Esk River	St Marys Rivulet	STM 000
18	Tamar River	South Esk River	St Patricks Creek	SPC 000
18	Tamar River	South Esk River	St Pauls River	STP 000
18	Tamar River	South Esk River	Storys Creek	STO 000
18	Tamar River	South Esk River	Tower Rivulet	TOW 000
18	Tamar River	South Esk River	Williams Creek	WLS 000
18	Tamar River	Tamar River	Andersons Creek	ANC 000
18	Tamar River	Tamar River	Barnards Creek	BNC 000
18	Tamar River	Tamar River	Bouchers Creek	BOU 000
18	Tamar River	Tamar River	Cobblestone Creek	CBS 000
18	Tamar River	Tamar River	Cold Water Creek	CWC 000
18	Tamar River	Tamar River	Cormiston Creek	COR 000
18	Tamar River	Tamar River	Coulson Creek	CLS 000
18	Tamar River	Tamar River	Dido Creek	DID 000
18	Tamar River	Tamar River	Egg Island Creek	EGG 000
18	Tamar River	Tamar River	Flowery Gully Creek	FGU 000
18	Tamar River	Tamar River	Fourteen Mile Creek	FOU 000
18	Tamar River	Tamar River	Lady Nelson Creek	LAD 000
18	Tamar River	Tamar River	Lauriston Creek	LAU 000
18	Tamar River	Tamar River	Masseys Creek	MAS 000
18	Tamar River	Tamar River	Middle Arm Creek	MID 000
18	Tamar River	Tamar River	Newnham Creek	NEW 000

19	Piper-Ringarooma Rivers	Great Forester River	Great Forester River	GFO 000
19	Piper-Ringarooma Rivers	Great Forester River	Hogarths Creek	HOG 000
19	Piper-Ringarooma Rivers	Great Forester River	Pearly Brook	PRB 000
19	Piper-Ringarooma Rivers	Great Forester River	Stronack Creek	STC 000
19	Piper-Ringarooma Rivers	Great Forester River	Tuckers Creek	TUC 000
19	Piper-Ringarooma Rivers	Hurst Creek	Cox's Creek	COX 000
19	Piper-Ringarooma Rivers	Hurst Creek	Hurst Creek	HUR 000
19	Piper-Ringarooma Rivers	Little Forester River	Denison River	DNS 000
19	Piper-Ringarooma Rivers	Little Forester River	Denison Creek	DNC 000
19	Piper-Ringarooma Rivers	Little Forester River	Lisle Creek	LIS 000
19	Piper-Ringarooma Rivers	Little Forester River	Little Forester River	LFR 000
19	Piper-Ringarooma Rivers	Little Forester River	Lone Star Creek	LON 000
19	Piper-Ringarooma Rivers	Little Forester River	Shepherds Rivulet	SHP 000
19	Piper-Ringarooma Rivers	Little Forester River	Tobacco Creek	TOB 000
19	Piper-Ringarooma Rivers	Little Pipers River	Little Pipers River	LPR 000
19	Piper-Ringarooma Rivers	Pipers Brook	Pipers Brook	PPB 000
19	Piper-Ringarooma Rivers	Pipers River	Butchers Creek	BUC 000
19	Piper-Ringarooma Rivers	Pipers River	Mc Gowans Creek	MCG 000
19	Piper-Ringarooma Rivers	Pipers River	Pipers River	PPR 000
19	Piper-Ringarooma Rivers	Pipers River	Rocky Creek	RCK 000
19	Piper-Ringarooma Rivers	Pipers River	Second River	SEC 000
19	Piper-Ringarooma Rivers	Pipers River	Third River	THI 000
19	Piper-Ringarooma Rivers	Ringarooma River	Big Blue Lake	BBL 000
19	Piper-Ringarooma Rivers	Ringarooma River	Cascade River	CAS 000
19	Piper-Ringarooma Rivers	Ringarooma River	Dorset River	DOR 000
19	Piper-Ringarooma Rivers	Ringarooma River	Dunn Creek	DUN 000
19	Piper-Ringarooma Rivers	Ringarooma River	Federal Creek	FED 000
19	Piper-Ringarooma Rivers	Ringarooma River	Frenchs Creek	FRE 000
19	Piper-Ringarooma Rivers	Ringarooma River	Frome River	FRO 000
19	Piper-Ringarooma Rivers	Ringarooma River	Green Lake	GRN 000
19	Piper-Ringarooma Rivers	Ringarooma River	Hardwick's Creek	HRD 000
19	Piper-Ringarooma Rivers	Ringarooma River	Little Blue Lake	LBL 000
19	Piper-Ringarooma Rivers	Ringarooma River	Main River	MAI 000
19	Piper-Ringarooma Rivers	Ringarooma River	Maurice River	MAU 000
19	Piper-Ringarooma Rivers	Ringarooma River	Ringarooma River	RIN 000
19	Piper-Ringarooma Rivers	Ringarooma River	Sapphire Creek	SAP 000
19	Piper-Ringarooma Rivers	Ringarooma River	Shallamar Creek	SHL 000
19	Piper-Ringarooma Rivers	Ringarooma River	Weld River	WLR 000
19	Piper-Ringarooma Rivers	Ringarooma River	Yellow Lake	YLW 000
19	Piper-Ringarooma Rivers	Tomahawk River	Tomahawk River	TOM 000
19	Piper-Ringarooma Rivers	Waterhouse	Big Waterhouse Lake	BWL 000
19	Piper-Ringarooma Rivers	Waterhouse	Blackmans Lagoon	BLL 000
19	Piper-Ringarooma Rivers	Waterhouse	Little Waterhouse Lake	LWL 000
19	Piper-Ringarooma Rivers	Waterhouse	Oxbury Creek	OXB 000
19	Piper-Ringarooma Rivers	Waterhouse	Sheepwash Creek	SHC 000

DATE:_____ TIME (24hr):_____ PICKER:_____ HABITAT: _____

LOCATION CODE:_____ SITE NAME:_____

WEATHER: _____ CLOUD COVER: _____%

SAMPLING CONDITIONS	PICKING CONDITIONS:	AIR TEMPERATURE: _____°C
( ) Good	( ) Good	
( ) Average	( ) Average	RAIN IN LAST WEEK ?: YES / NO
( ) Poor	( ) Poor	

2a Habitat Assessment: ***A) Description of 10m sample area***

RIFFLE or RUN: Collected by:_____ Picked by:_____ Time taken:_____

Substrate Composition :

		Percentage Cover	
Bedrock	_____%		
Boulder	_____%	Algae	_____%
Cobble	_____%	Detritus	_____%
Pebble	_____%	Silt	_____%
Gravel	_____%	Moss	_____%
Sand	_____%	**> or < 100%**	
Silt	_____%		
Clay	_____%		
	= 100%		

COMMENT: _____

_____

_____

_____

Photo #: _____

Mean depth: _____ cm Residue preserved ? ( )

2b) *Description of sample area/s*

EDGE/BACKWATER: Collected by:_____ Picked by:_____ Time taken:_____

Substrate Composition :

		Percentage Cover	
Bedrock	_____%		
Boulder	_____%	Algae	_____%
Cobble	_____%	Detritus	_____%
Pebble	_____%	Silt	_____%
Gravel	_____%	Moss	_____%
Sand	_____%	**> or < 100%**	
Silt	_____%		
Clay	_____%		
	= 100%		

COMMENT: _____

_____

_____

_____

Photo #: _____

Mean depth: _____ cm Residue preserved ? ( )

Reference Information Ranked scale Examples

Estimated ranking scales (0) = 0% Bedrock

(1) = 1 - 10 % Boulder (>256 mm) >soccer ball

(2) = 11 - 25 % Cobble (64 - 256 mm) cricket ball - soccer ball

(3) = 26 - 50 % Pebble (16 - 64 mm) 5c piece - cricket ball

(4) = 51 - 75 % Sand (1 - 4 mm) < raw sugar

(5) = 76 – 100% Silt or clay (<1 mm)

Trailing bank vegetation:- ( ) ( ) ( ) ( ) ( )

RIPARIAN VEGETATION

(Tick ✓)	Left	Right
Nil (0)	( )	( )
Sparse (1)	( )	( )
Moderate (2)	( )	( )
Thick (3)	( )	( )

COMPOSITION

Native Vegetation _____%

Exotic Vegetation _____%

EXOTIC SPECIES (Tick if present ✓)

Blackberries ( )
Pines ( )
Bracken Fern ( ) (weed)
Gorse ( )
Willow ( )
Other _____( )

WIDTH OF RIPARIAN ZONE

(Tick ✓)	Left	Right
>40m	( )	( )
30m - <40m	( )	( )
20m - <30m	( )	( )
10m - < 20m	( )	( )
5m - <10m	( )	( )
<5m	( )	( )

LAND USE (Tick ✓)

	Left	Right
Native forest	( )	( )
Forestry	( )	( )
Native pasture	( )	( )
Grazing	( )	( )
Cropped	( )	( )
Urban	( )	( )

Other: _____
_____
_____
_____

	None	Some	Moderate	Heavy
EROSION:	( )	( )	( )	( )

DETAILS: _____

DAMS/WEIRS: upstream / downstream / none

POLLUTION: no evidence / potential / obvious

3 HABITAT DIVERSITY: All measurements over 100 m of stream length and within stream only.

A) Riffle area: ___%
Run area: ___%
Pool area: ___%
= 100%

B)	*STREAM WIDTH*	*BANK WIDTH*	*BANK HEIGHT*
0 m:	_____m	_____m	_____m
50 m:	_____m	_____m	_____m
100 m:	_____m	_____m	_____m

3 COARSE WOODY DEBRIS		*%*
None	No snags are visible at the measurement site.	
Few	Some visible branches in stream. Debris cover 10% or less of stream bed.	
Moderate	Visible branches and trees that have been relocated to be adjacent to the stream banks. Surface area of debris 30% or less of stream bed.	
Numerous	Large trees present all the way across the stream. Surface area of debris cover 30 to 50% of stream bed.	
Abundant	Numerous debris with surface area 50% or more of the stream bed. Large trees may be present right across the stream.	

3 AQUATIC PLANTS

% Cover over 100 m = _____

Composition:

EMERGENT:	None	( )	Low	( )	Medium	( )	High	( )
SUBMERGED:	None	( )	Low	( )	Medium	( )	High	( )
FLOATING:	None	( )	Low	( )	Medium	( )	High	( )

willows etc...)Native species are rare or absent. Agriculture and/ or cleared both sides

2. VERY HIGH DISTURBANCE

Riparian Veg Some native vegetation present, but is severely modified both sides by grazing or intrusion of introduced species. Native species severely reduced in numbers (species richness) and cover. Agriculture and/ or cleared both sides

3. HIGH DISTURBANCE

Riparian Veg Moderately disturbed by stock or through the intrusion of introduced species, though native species remain in reasonable numbers. Agriculture and/ or cleared one side; native vegetation on the other is clearly disturbed

4. MODERATE DISTURBANCE

Riparian Veg. Native vegetation present on both sides of the river. The intrusion of introduced species is minor and of moderate impact.

5. LOW DISTURBANCE

Riparian Veg. Native vegetation present on both sides of the river in generally good condition with few introduced species present. Any disturbance is minor.

6. VERY LOW DISTURBANCE

Riparian Veg. Native vegetation on both sides of the river in an undisturbed state. Introduced species are rare or insignificant. Representative of pristine conditions.

NOTES _____

4 PHYSICAL PARAMETERS

calibration:

TEMPERATURE:_____°C DISSOLVED 02:_____mg/l

ALKALINITY: _____ml H2SO4 _____% Sat

CONDUCTIVITY:_____uS/cm TURBIDITY: _____NTU

pH: _____ GAUGE HEIGHT:_____m

5 MAP BASED DATA (office based)

MAP SCALE: 1:25000 ( ) MAP NAME: _____
1:100000 ( )

GRID REFERENCE: NORTHING _____

DISTANCE FROM SOURCE_____ EASTING _____

ELEVATION: _____ STREAM CLASS: _____

CATCHMENT AREA: _____ BEDSLOPE: _____

DOWNSTREAM)

7 LANDOWNER / MANAGER

Name _____

Address _____

_____

Phone _____ FAX _____

COMMENTS: _____

_____

Access:

Permission required ( )

Permission granted verbally ( )

Written permission ( )

Notification before each visit ( )

Name of recorder.....

	CATEGORY		
Habitat Variable	**Excellent**	**Good**	**Fair**
1. Bottom substrate/available cover	Greater than 50% rubble, gravel submerged logs, undercut banks or other stable habitat 20, 19, 18, 17, 16	30-50% rubble, gravel or other stable habitat. Adequate habitat 15, 14, 13, 12, 11	10-30% rubble, gravel or oth stable habitat. Habitat avail- less than desirable 10, 9, 8, 7, 6
2. Embeddedness	Gravel, cobble and boulder particles are between 0 & 25% surrounded by fine sediment 20, 19, 18, 17, 16	Gravel, cobble and boulder particles are between 25 & 50% surrounded by fine sediment 15, 14, 13, 12, 11	Gravel, cobble and boulder particles are between 50 & 7 surrounded by fine sediment 10, 9, 8, 7, 6
3. Velocity/depth category	Slow deep (<0.3 m/s & >0.5m); Slow shallow; Fast deep; Fast shallow; habitats all present 20, 19, 18, 17, 16	Only 3 of the four habitat categories present (missing riffles or runs receive lower score than missing pools) 15, 14, 13, 12, 11	Only 2 of the four habitat categories present (missing runs receive lower score) 10, 9, 8, 7, 6
4. Channel alteration	Little or no enlargement of islands or point bars and/or no channelisation 15, 14, 13, 12	Some new increase in bar formation, mostly from coarse gravel; and/or some channel-isation present 11, 10, 9, 8	Moderate deposition of new coarse sand, on old and new pools partly filled w/silt; and/ embankments on both banks 7, 6, 5, 4
5. Bottom scouring and deposition	Less than 5% of the bottom affected by scouring and deposition 15, 14, 13, 12	5-30% affected. Scours at constrictions and where grades steepen, some deposition in pools 11, 10, 9, 8	30-50% affected. Deposits a scours at obstruction and be Some deposition in pools. 7, 6, 5, 4

Location Code:.....

	CATEGORY		
Habitat Variable	**Excellent**	**Good**	**Fair**
6. Pool/riffle, run/bend ratio. *(Distance between riffles divided by stream width)*	0-7 Variety of habitat. Deep riffles and pools 15, 14, 13, 12	7-15 Adequate depth in pools and riffles. Bends provide habitat 11, 10, 9, 8	15-25 Occasional riffle or be Bottom contours provide sor habitat. 7, 6, 5, 4
7. Bank stability	Stable. No evidence of erosion or bank failure. Side slopes generally <30%. Little potential for future problem. 10, 9	Moderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40% on one bank. Slight potential in extreme floods 8, 7, 6	Moderately unstable. Moder frequency and size of erosio areas. Side slopes up to 60% some banks. High erosion p during extreme/high flows 5, 4, 3
8. Bank vegetative stability	Over 80% of the streambank surfaces covered by vegetation or boulders and cobble 10, 9	50-79% of the streambank surfaces covered by vegetation, gravel or larger material 8, 7, 6	25-49% of the streambank surfaces covered by vegetat gravel or larger material 5, 4, 3
9. Streamside cover	Dominant vegetation is of tree form 10, 9	Dominant vegetation shrub 8, 7, 6	Dominant vegetation is gras sedge, ferns 5, 4, 3

Column Totals			

Score

From US EPA RBA Protocols 1989