The Water Handbook

A guide for management of small water supplies in Australian Aboriginal settlements

Robyn Grey-Gardner

CRC

DESERT KNOWLEDGE CRC

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The Desert Knowledge Cooperative Research Centre (DKCRC) is an unincorporated joint venture with 28 partners whose mission is to develop and disseminate an understanding of sustainable living in **remote** desert environments, deliver enduring regional economies and livelihoods based on Desert Knowledge, and create the networks to market this knowledge in other desert lands.

Thanks to Reg Kenny, Peter Kenny and Sunlight Bassini for the use of the photographs.

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Cover photo is Reg Kenny disinfecting at rainwater tank at Mpwelarre. Mpwelarre is a small settlement south of Alice Springs, near Titjikala. Mpwelarre created a water management plan in 2006, and manage their water supply. Photo by Robyn Grey-Gardner, November 2006.

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Contents

INTRODUCTION

This handbook is to help people working with, and living in small **remote** settlements to develop a water management plan. The focus is on **remote** settlements that are isolated from major or regional centres and have an Aboriginal population of one hundred or less and up to twenty dwellings. The population may be variable as residents leave the settlement for various reasons, such as fulfilling cultural obligations and accessing mainstream services.

The handbook will:

- share ideas and practical tips on establishing and maintaining safe water management practices for small water systems
- provide guidance in developing small settlement water management plans
- supplement information currently available (see Reference list).

This handbook is for:

- residents and people working with small and **remote** Aboriginal settlements.

When appropriate, specific water quality and risk assessment tools are recommended throughout the text. The glossary provides an explanation of the terms highlighted in bold within the text.

The planning process in this handbook draws from the *Australian Drinking Water Guidelines*' 'Framework for the Management of Drinking Water Quality', and expands the principles for holistic water management to include water quantity and the future plans of the settlement for sustainability.

The planning process is outlined in the flow chart for water management in Figure 1. The engagement and cooperation of all **stakeholders** throughout the process is strongly recommended.

Sufficient information should be provided in the early stages of water management planning so that participants develop confidence in the process and can make informed decisions. This creates the foundation for participants to build skills and understand their roles and responsibilities.

Each step should be completed before the next step is started. Within each step the process can, and should, be flexible. Developing locally-driven water management plans will mean adjustments to timelines, since new ideas will be generated along the way and unexpected events will be inevitable.

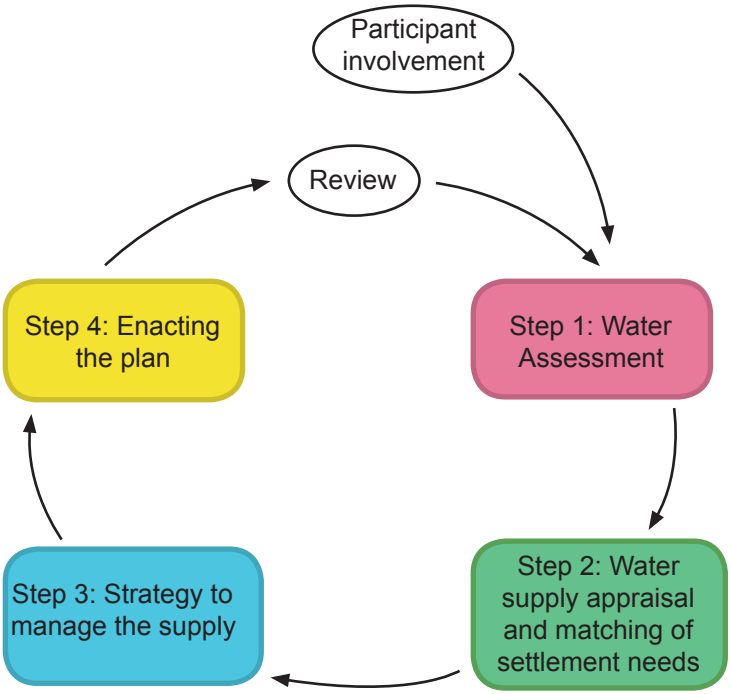


Figure 1: Flow chart for water management

The principles of risk management

The **risk management** approach is the accepted guiding principle in Australia and around the world for water management. In December 2004, the National Health and Medical Research Council (NHMRC) and the Natural Resources Management Ministerial Council released the *Australian Drinking Water Guidelines*, incorporating the 'Framework for the Management of Drinking Water Quality' (hereafter called The Framework). The Framework outlines a preventive approach to managing **risks** associated with the supply of drinking water and provides direction for the design and implementation of water quality management systems.

The **risk management** principle is based on the following steps:

- Understand the water supply system
- Identify **hazards**, hazardous events and sources of hazard
- Estimate the level of **risk** for each identified hazard or event
- Identify and plan **preventive measures** for each hazard or event
- Implement and monitor **preventive measures**.

The Framework is relevant to both large water supplies (i.e. a large urban supply) and small supplies (i.e. a relatively simple system for a small settlement with 50 residents and 8 houses). The Framework is extended in this handbook by using a locally-driven approach that emphasises the **preventive measures** and relies on the residents as managers of the water supply. The emphasis on reducing the **risks** and **regular monitoring** enables the residents themselves to be able to manage their water supply in most situations.

The principles of Sustainable Livelihoods

The Sustainable Livelihoods approach has been used successfully in international development projects since the late 1980s. The Sustainable Livelihood framework is a tool that can be used to identify the needs and priorities that the residents must consider for their water management plans.

The Sustainable Livelihoods pentagon can be used to identify all the issues that may affect a water management plan. The process enables participants to consider all the opportunities or constraints and make clear choices. The residents are central decision-makers and the water management plan can be negotiated with **stakeholders**. The Sustainable Livelihoods approach can enable participants to consider long-term aspirations and create adaptive strategies.

Stakeholders

People or organisations that have an interest in the water supply of the settlement are **stakeholders**. Small settlements rely on good networks and relationships. Involving the relevant **stakeholders** in the planning process will lead to more efficient and sustainable water management.

A settlement may have a range of non-government organisations (NGOs) or local government agencies that can assist with ongoing water supply management. Where practicable, involve the organisations since they may be able to provide expertise and additional support such as extra funds.

Consider the possible **stakeholders** relevant to the settlement such as:

- Residents
- Service delivery organisations (State/Territory essential services, regional resource agencies, water utilities, non-government organisations, consultants)
- Government agencies (Local or Shire council, State/Territory and Australian Aboriginal and Torres Strait Islander services, State/Territory public health department).

Map who should be involved and what everyone's contribution will be. This includes the roles and responsibilities of each stakeholder and the services or support that each one can contribute to the management plan. Identify any support networks that should be set up during the planning process. Consider the important links and any coordination necessary between the different services to create or affirm a strong support structure.

Duty of care

The *Australian Drinking Water Guidelines* and the public health department in each State or Territory provide guidance on water quality issues. The settlement residents or council have a duty of care to ensure the settlement water supply is fit for drinking. This responsibility includes monitoring (as per the management plan), and warning residents or visitors about the water when it may not be fit for drinking.

If the water provided at the settlement causes harm or injury to anyone, the settlement may be liable. For most small settlements, this responsibility will lie with their council. If there are any concerns about the water quality or if there are queries about the water supply, the councillors or residents must make independent enquiries and obtain appropriate advice.

TIP!

Projects in small settlements are more successful and sustainable if the participants voluntarily agree to participate and have significant input and influence from the start of the program.

STEP 1: Describe the water supply

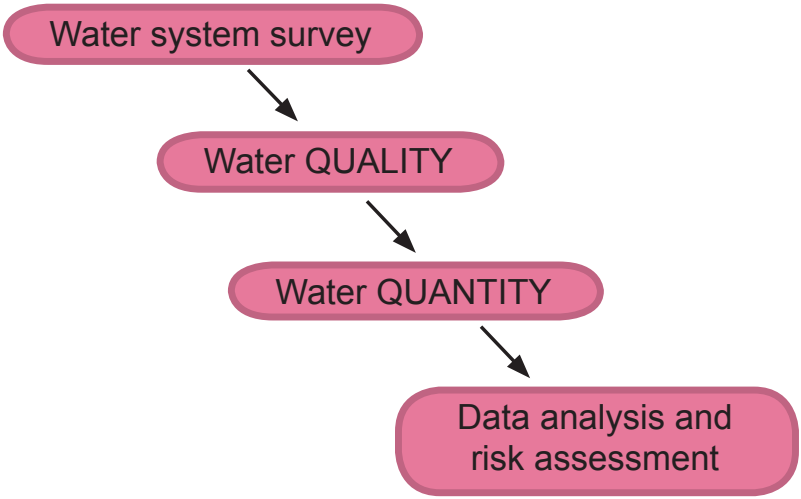


Figure 2: Flow chart for Step 1

Objective

Step 1 gathers the evidence for the management plan (see flow chart in Figure 2). The first task is a preliminary assessment of the water supply. This assessment will include:

- Water system inventory and **survey**
- Collation of water system design drawings, plans and water source data. (This will be available through state/territory government agencies.)
- Photographs taken at each point of the supply
- Water testing (if necessary)
- Assessment of the boundaries of the water supply (there may be additional water sources used by residents that are different from the main water supply, such as soaks or rivers).

1.1 Water supply survey

Table 1 outlines a checklist for a water supply survey. A checklist for the whole water system, including the distribution system, is in Appendix 4. Additional checklists can be found in the Community Water Planner and other resources listed in the reference list.

Record the water system information and carry out a basic **survey**. A **survey** will highlight the types of **hazards** to look for prior to completing the **risk** assessment.

Table 1: Water supply information

WATER SUPPLY INFORMATION		
Bores	**Rainwater tanks**	**Surface water such as rivers or soaks:**
Location	Catchment (size, age, condition/ description)	Catchment (size, geology and soils, topology and drainage patterns)
Registration number	Type, size and condition of storage tank	Rainfall, meteorology and weather patterns
Date drilled	Rainfall	Vegetation
Depth (total depth and water level in metres)	Demand	Animal populations (native, feral and domestic)
Casing construction, diameter	Water quality information	Water flow
Pump test data and water flow (litres per second)	Barriers (first flush devices, gutter guards, settling tanks)	Barriers (fencing)
Schematic of bores in region and strata information	Water treatment	Water quality tests and intended use
Water quality tests and intended use	Intended use	Historical contaminated sites
Historical contaminated sites		

1.2 Water quality

Water testing provides a snapshot of the water quality at the time of sampling. It can provide valuable information to contribute to an understanding of the entire water system and **hazards**. Water quality should be reviewed over time and following special events such as heavy rainfall or a long time without use.

The water supply and environment, including land use, will affect the constituents or contaminants in the water. Microscopic disease-carrying animals and bacteria are the greatest **risk** to drinking water safety. Chemical contaminants can occur with the priorities in **remote** Australia being arsenic, fluoride, selenium, nitrate and lead.

Consider the following:

- What is the water used for? If the water is not used for drinking purposes, it may only require a basic set of chemical and metal tests.
- How will the information be used?
- What are the potential **hazards** in the region, such as geology or land use, and how could they affect the water quality? Check for any possible contamination, like pesticides and herbicides in agricultural areas.
- What tests are priorities with the funds available?

A preliminary list of constituents for water quality testing is in Appendix 1. The logistics sheet for water sampling in Appendix 2 and the water sampling record sheet in Appendix 3 are provided to assist with sampling organisation.

Consider a re-test if:

- the accuracy of the results are questionable
- something has changed, such as the supply has been disinfected or flushed, and a re-test will verify the action has been effective.

TIP!

Walk along the water supply with the residents. Ask questions about the supply – the residents will know and understand a lot about how well the supply works, and may be able to provide historical context.

1.3 Water quantity

The amount of water a settlement needs each day will depend on:

- the infrastructure at the settlement
- residents' lifestyles
- environment and climate.

In arid regions, evaporation rates are high. Water consumption can be over 1 000 litres per person per day, particularly if it is used for air conditioning or watering gardens. The average household use in Australia is 260 litres per day, with approximately 160 litres per day being for household use. The minimum amount to meet drinking, cooking and hygiene requirements is about 100 litres per person per day.

Find out whether the water supply meets the current needs and plans for the settlement. Consider the following:

- Are there any periods when water is restricted? What is the cause of the restrictions?
- Is there sufficient storage to provide water in the case of technical breakdown (i.e. pump failure, or, in the case of a solar pump, extended cloudy periods)?
- Is there sufficient back-up for emergencies (i.e. fire fighting)?

A settlement can make better use of its water supply by reducing the overall or peak water use by:

- Increasing water system efficiency such as reducing leaks
- Reducing the amount of water used by each person (installing low flow showerheads and composting toilets, educating to raise awareness of water conservation, using air conditioning efficiently)
- Accessing alternative sources of supply (rainwater tanks, water reuse).

TIP!

If there is no accurate way to measure water use in the settlement, calculate the volume of the storage tank and estimate how often it is filled.

If possible, work out the average water requirements during each season and in peak and low periods.

Identify the causes for the high and low water needs.

1.4 Data analysis and risk assessment

Create a water management plan with the Community Water Planner (CWP) using the information gathered on the water system (see reference list). The CWP is a CD that creates a water management plan based on risk management principles. The CWP identifies **hazards,** ranks level of **risk** to each **hazard**, and lists corrective actions or repairs needed to secure the water supply. It also describes management activities and procedures to make sure the activities are working to protect the water supply.

To run the CD, you need to have a technical understanding of the water supply and be able to use computers. The CWP is recommended because:

- It was developed by the Australian Government and is a widely accepted protocol
- It creates a tailored water management plan with the capacity to store and update data
- It has checklists for data
- It emphasises preventive management procedures.

The CWP plan is a text document that can be larger than 20 pages long, depending on the size of the water supply. The CWP has a manual that describes the information needed to fill it out. This information is also covered in Appendix 4 of this handbook.

TIP!

Complete the water system assessment quickly and comprehensively.

Share the results from Step 1 promptly with participants.

STEP 2: Match community water needs and aspirations

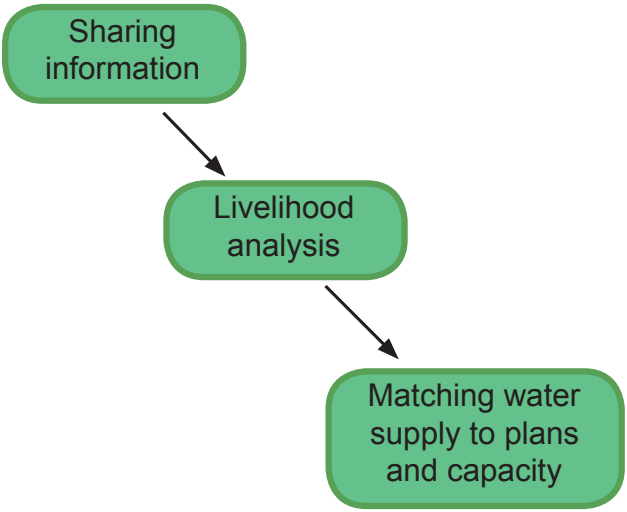


Figure 3: Flow chart for Step 2

Objective

Step 2 shares the information gathered during Step 1. The future plans for the settlement are identified using the Sustainable Livelihoods approach. The residents' water use needs and plans for the settlement are then matched with the features of the water system (see flow chart in Figure 3).

Determine the capacity for the water supply to meet the needs of the settlement. Consider the following points:

- The water quality required for each activity at the settlement
- The amount of water required for each purpose
- Additional water requirements for future plans.

2.1 Sharing information

Present the water supply information from Step 1:

- Water source information
- CWP draft management plan
- Draft schematic of the water supply
- Water quality test results.

Discuss the information from the water supply assessment with project participants. Provide participants with the opportunity to confirm information from their experience and understanding.

Schematic

A water supply schematic, such as in Figure 4, can be used to discuss water supply issues. Display sufficient technical information in the schematic for participants and **stakeholders** with varying levels of technical knowledge. Anticipate update requirements in the design – photographs, for example can show points in a water system but icons or basic drawings can stay relevant if parts are replaced.

The schematic should include all water sources such as dams or capped bores with an explanation of what water is currently being used and why.

TIP!

Allow sufficient time in Step 2 for authoritative decisions to be made. Ample time should be available for discussion between participants outside the meeting. Be prepared to be flexible. It may be necessary to return at a later date with more information.

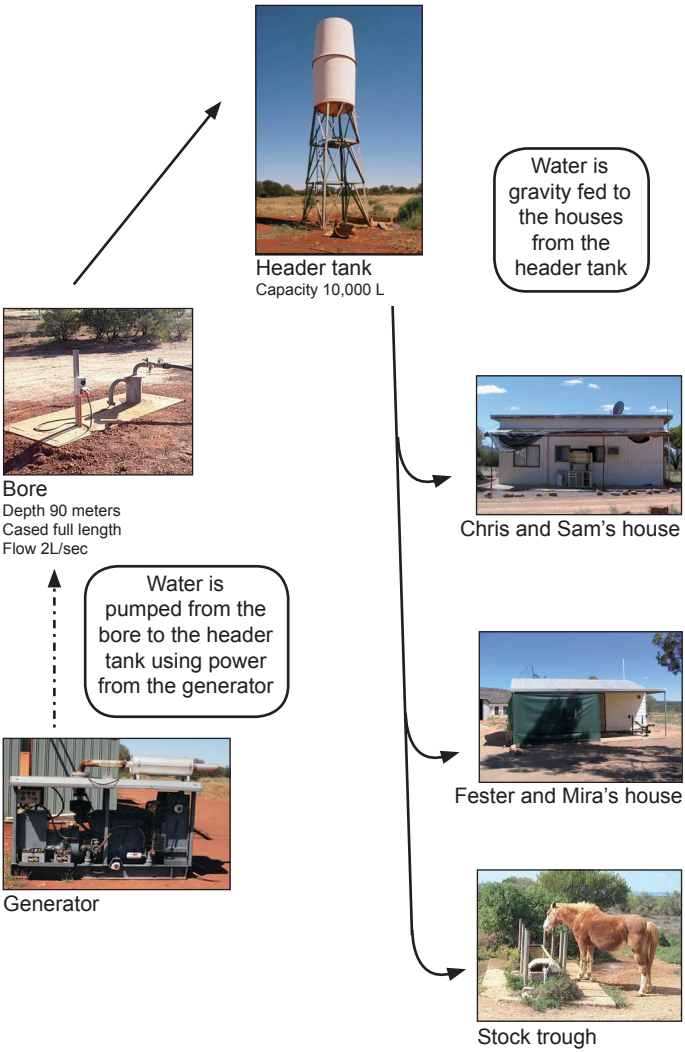


Figure 4: Example of simple water supply schematic

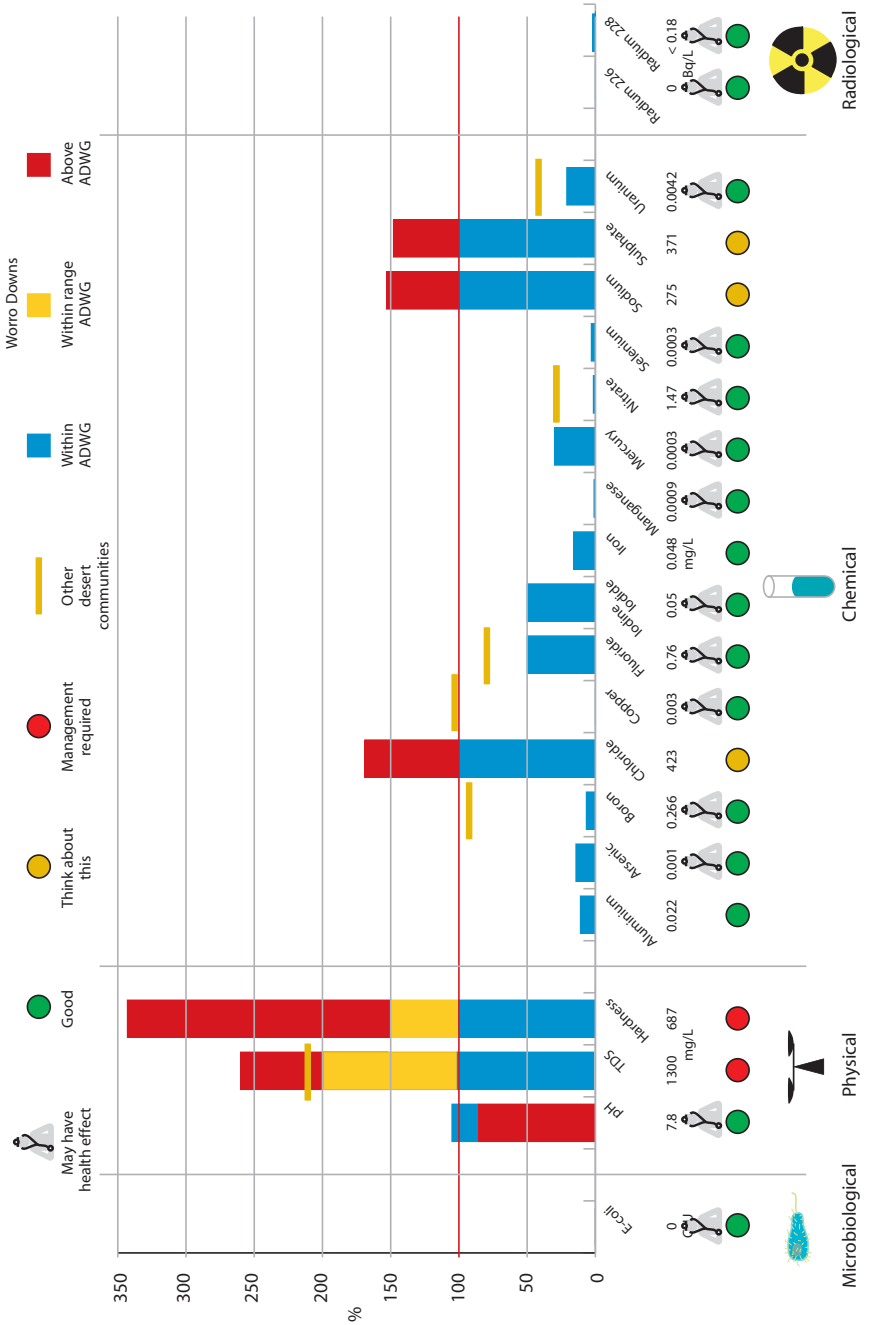


Figure 5: Example of water quality graph

Water quality data

It is valuable to share and discuss water quality information with participants. Take time to represent any complex water quality data simply and effectively. The water quality graph to the left in Figure 5 represents each water quality constituent as a percentage of the *Australian Drinking Water Guidelines*. Regional water quality is displayed so that participants can consider water management options in other settlements.

2.2 Livelihoods analysis

The Sustainable Livelihoods framework is a useful tool to engage participants to discuss water supply issues. Ensuring the approach is participatory is more important than worrying about particular tools.

The Sustainable Livelihoods assets pentagon is a valuable activity because:

- the topics for discussion are clear
- the activity is interactive and generates broad ranging discussion
- the finished product shows strengths and weaknesses in a visual way for participants who may have varying literacy and numeracy skills.

The pentagon represents five dimensions of assets that are required for any type of livelihood activity. The availability of each asset will affect how participants can make their plans happen.

The five dimensions are:

Natural	The water supply: availability, quality and quantity
Human	The skills, knowledge and ability to work, good health (mainly individuals)
Physical	The basic infrastructure including water supply equipment, maintenance materials, tools and equipment
Financial	The financial resources available including savings, grants, pensions, loans
Social	The quality of relationships and networks such as family membership in groups and wider institutions.

Appendix 5 contains a pentagon worksheet. The activity is a comparative assessment of each asset (Figure 6). The assets pentagon will emerge by representing each asset proportionately.

Imagine a line from the centre, aimed toward each pentagon point. Place a value or score on each asset, starting with the lowest (0) at the centre of the pentagon and increasing in value (100) toward the edge. The scoring of each asset will be defined by the participants' perceptions. Join the dots to create a pentagon shape such as in Figures 7 and 8.

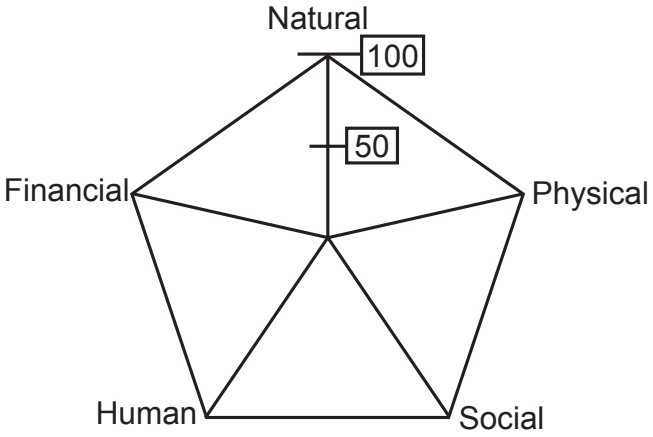


Figure 6: Sustainable Livelihoods Pentagon

Participants should define the maximum and minimum scores for assets, and any changes or improvements in assets. Where possible, the information should be clarified with other sources, such as water supply information or service providers.

The assets assessment is dynamic, and can fluctuate seasonally or slowly over time. It should be viewed in the current context.

TIP!

To discuss future plans, draw a timeline and plot anticipated activities.

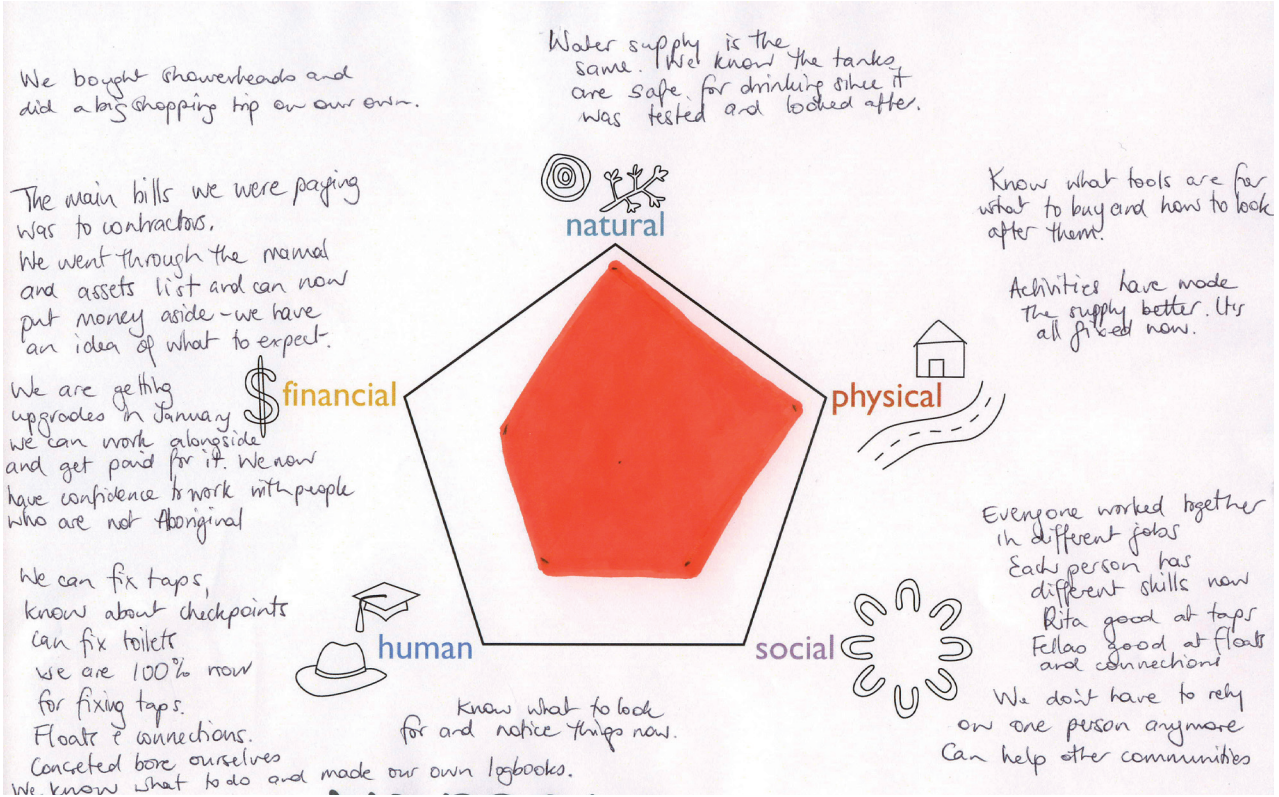


Figure 7: Example 1 of a completed response to Assets Pentagon

Key questions

During the pentagon activity, ask open-ended or semi-structured questions. Avoid questions that can be answered simply by a 'yes' or 'no'.

Consider questions such as:

- What do you use the water for?
- When there has not been enough water?
- What are your plans for your place? What would you like to see?
- What changes (if any) to the water supply are needed for your plans?
- Who knows most about the water supply?
- If something goes wrong, who would be able to get it working again?
- What plans do you have to cover the costs of the water supply? How many years will your plan last?

2.3 Matching water supply to plans and assets

The Sustainable Livelihood pentagon activity identifies the assets available to manage the water supply. Using this information, create an effective response. Table 2 outlines possible responses to improve assets. The pentagon, for example, may show that financial assets are available, but that infrastructure management – including recurrent costs – are not well understood. Financial planning that included recurrent costs for water supply infrastructure would strengthen the overall financial asset.

To **risk** manage the supply may involve changes in water quality, quantity, water treatment or management. Find options to deliver a water supply that is easily managed and safe for the purposes for which it is used.

Participants will have ideas to strengthen their assets or management strategies. Negotiate all management options. Be realistic and keep participant expectations within the resources available.

TIP!

Encourage participants to tell stories of when there were problems with the water supply, such as restrictions or equipment breakdown. It is an insightful and often compelling way to understand the assets and resources available to the residents.

Table 2: Responses to assets pentagon

LOW ASSET	EXAMPLE OF RESPONSE OR ACTIVITIES
NATURAL	Manage water demand, water treatment, identify new water source
HUMAN	Skills development
FINANCIAL	Asset management strategies, grant application
SOCIAL	Build local and regional networks, strengthen stakeholder engagement
PHYSICAL	Hire equipment, borrow equipment, link skills development activities to building or improving infrastructure

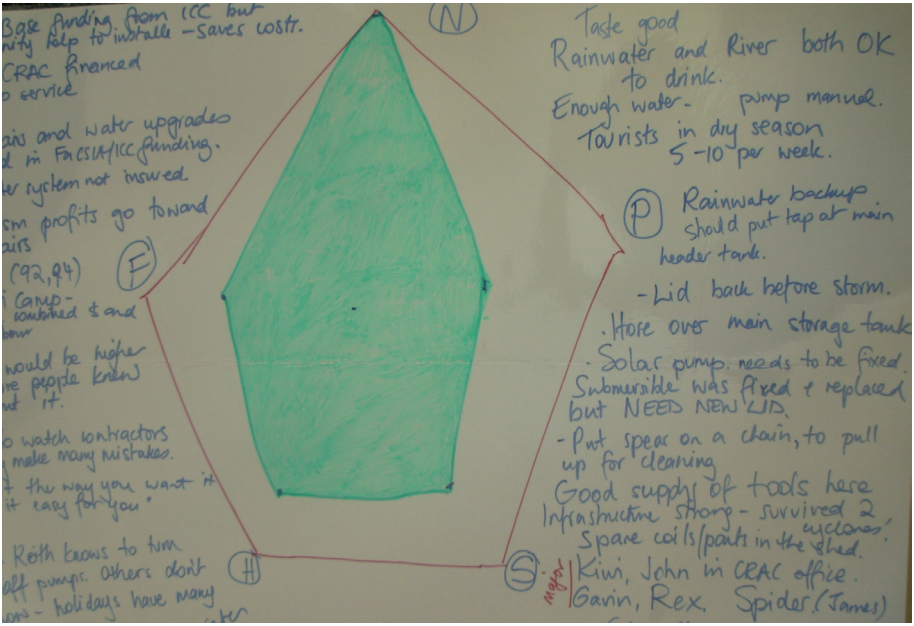


Figure 8: Example 2 of a completed response to Assets Pentagon

STEP 3: Strategy to manage the water supply

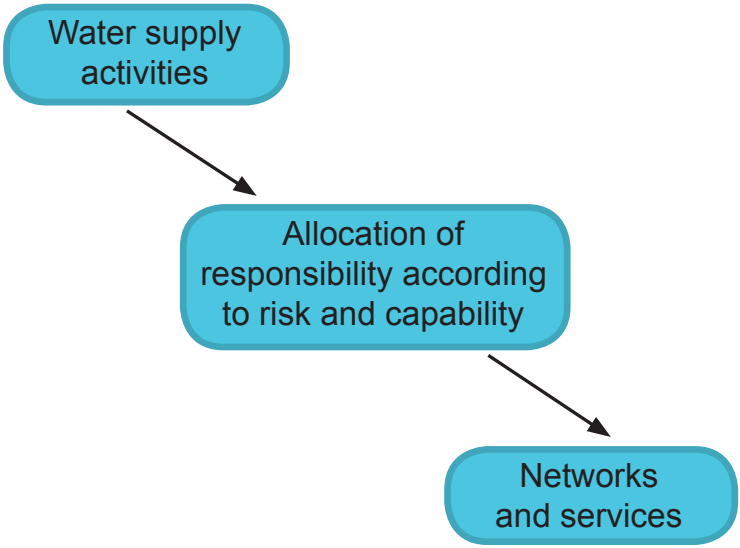


Figure 9: Flow chart for Step 3

Objective

The aim of developing the strategy is to match the responsibilities, operation and management requirements of the water supply with the capabilities of the participants (see flow chart in Figure 9).

3.1 Water supply activities

The CWP plan will outline any repairs needed to secure the water supply. The residents should be central in the water supply repairs or activities. If the residents need to learn extra skills, it is a great opportunity to include on-the-job training. Additional repairs or upgrades, such as installing treatment systems to address specific water quality issues, should be carefully considered with advice from the **stakeholders**.

Develop a monitoring program detailing procedures for each **critical control point** of the water supply using the CWP plan. The monitoring program may include water sampling, although for small **remote** settlements it is generally expensive and logistically difficult. If **preventive measures** are carried out regularly and the system is secure, there should not be any need to regularly sample the water.

The *Australian Drinking Water Guidelines* has information on what water quality characteristics should be measured, where to sample from and how often. Think about the practicalities of water sampling:

- What is the level of **risk** to the residents?
- Are there water quality issues that need monitoring?
- Will a hand-held test kit provide the information needed?
- Is the cost of sampling value for money compared with the potential **risk**, or would other activities be better value for money?
- Will the samples get to a laboratory within 24 hours?

Water sampling is usually required more frequently for microbiological (bacteria) than for chemical constituents. The microbial quality of a water supply can change quickly and can have immediate health effects. Chemical quality of water is usually slow to change (unless there has been a chemical spill or contamination) and usually the health effects are less immediate.

Figure 10: Reg and Peter Kenny from Mpwelarre build a fence to protect their bore. December 2007

3.2 Allocation of responsibility according to risk

Step 3 matches the capability of participants to manage the water supply using the **risk** based framework. The **risk** matrix in Figure 11 outlines the degree of **risk** and suggests the scale of **stakeholder** involvement to respond in a situation. The certainty of an event has three categories (on the y axis):

High	Once a day or once a week
Moderate	Once a month or once every six months
Low	Once a year or once every five years.

The severity of the consequences are categorised from insignificant to catastrophic and refer to the potential to cause harm to people. The certainty of an event is classified as:

Insignificant	Relatively insignificant or an undetectable impact
Minor	Potentially harmful to a small population
Moderate	Potentially harmful to a large population
Major	Potentially lethal to a small population
Catastrophic	Potentially lethal to a large population.

Figure 11 suggests that water management responsibility for lower **risk** and certainty may lie with settlement residents (green area in Figure 11). An example could be checking for cracks forming in the cement apron around a borehead. Water management activities that have a high **risk** with catastrophic consequences (red area in Figure 11) will usually need assistance from State and Territory government agencies. An example could be a seasonal cyclone that damages a septic tank, spilling harmful bacteria into the water supply. Create examples for the settlement to describe moderate risk situations and identify the best response for each circumstance.

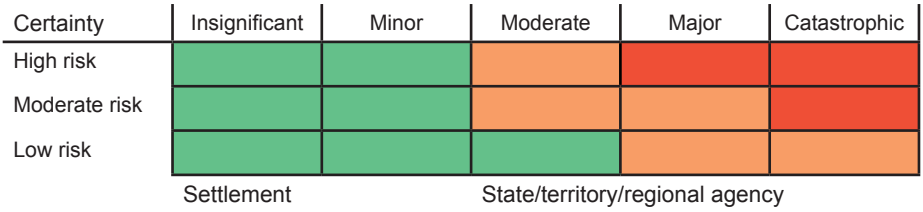


Figure 11: Risk and responsibility matrix

Understanding management capability

The planning process will draw out the right level of responsibility for the residents and **stakeholders**. The amount of responsibility taken by residents and key agencies will be informed by:

- who carries out the water supply operations and repairs
- monitoring program design
- realistic expectations for support services to respond (i.e. timeliness).

All participants and **stakeholders** should know who can be contacted for general advice or in an emergency. Table 3 outlines examples of self reliance with respect to the severity of consequences. Table 4 summarises the minimum level of water management responsibility for a settlement.

Table 3: Level of self reliance for severity of consequences in risk matrix

Level of self reliance	Example	Relationship to severity of consequences in risk matrix
LOW	Substantial external support for all water supply activities	Unable to manage events with insignificant consequences
LOW to MEDIUM	Substantial external support required for most water supply activities	Able to manage events of insignificant consequences
MEDIUM	Some support required for some activities and specialist services	Able to manage events with minor consequences
MEDIUM to HIGH	Some support required for specialist activities	Able to manage events with major consequences
HIGH	External support rarely required except for emergencies	Able to manage/prepare for events with catastrophic consequences

Table 4: Example of settlement level responsibilities and actions

Activity	Responsibility	Action
Water quality monitoring	Inspections and field testing, following management plan	Investigate any faults and disinfect/treat water as required
Water use monitoring	Read water meters	Implement restrictions as required
Preventive measures	Weekly, monthly and annual monitoring of water system	Conduct small repairs as required
Cyclical maintenance	Check operation of system infrastructure	Repair, replace small parts as required

3.3 Networks and services

The management plan should specify the roles and responsibilities of residents and **stakeholders**. Include the contact details for support services in the management plan contact list (Appendix 7). It is critical that **stakeholders** have been involved in the development of the management plan and confirm their ability to provide support when required.

Any external factors that may affect the plan should be considered, such as:

- timelines for grant applications
- settlement population fluctuations
- funding for support agencies and services available.

TIP!

Write agreements between stakeholders in the management plan as a statement; for example: 'Wadimalkarra resource agency will provide the white truck for carting water from January 2009 to December 2010'.

The statement should have a start and a finish date, and define the terms of the agreement.

Key questions

Consider the following to check the responsibility levels are correct:

- What attention has been given to supporting the settlement, and under what conditions will support be needed?
- Have all **stakeholders** been engaged?
- Are residents and stakeholders accountable for their part of the agreement?
- Are the settlement residents aware of their legal responsibilities for the provision of water?
- What structures are in place to ensure the **stakeholders** continue to work with the settlement residents?

Figure 12: Sunlight Bassini repairs the water pipes at Port Stewart

STEP 4: Enacting the plan

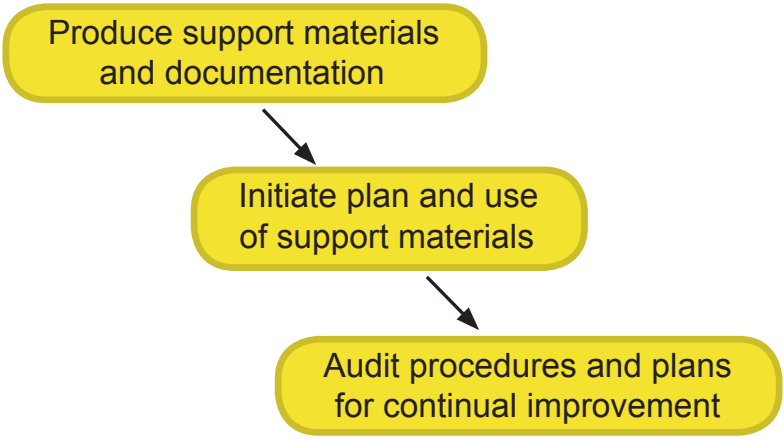


Figure 13: Flow chart for Step 4

Objective

Step four activities implement the water management plan by documenting it, initiating action, and planning audit procedures (see flow chart in Figure 13). To work in the long term, the management plan will need:

- a structure that will provide support
- accountability
- responsive decision making.

The tasks in Step 4:

- production of support materials
- training and capacity building
- summary of water data
- photographs of each point in the water supply system
- flow diagram of the water supply including the storage, distribution and usage points.

4.1 Produce support materials

Develop resources to describe the management activities. Manuals, posters or log books may be created to record management procedures (such as the meter reading chart in Appendix 6). The participants should be free to make whatever materials suit their circumstances, such as a painting or mural.

The resources can illustrate the schematic created during Step 2 (in Figure 4). The schematic can include routine maintenance tasks such as the weekly management tasks described in Figure 14.

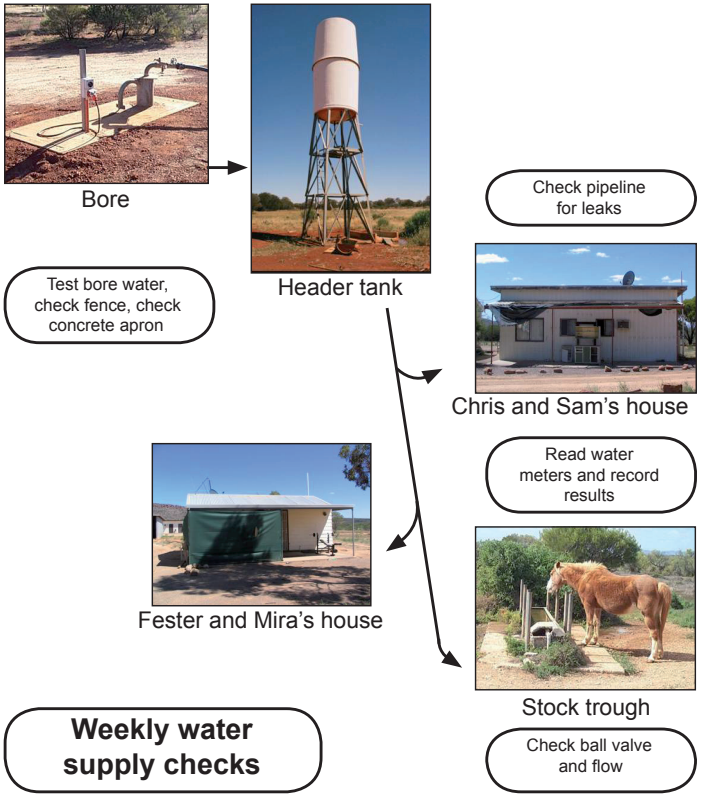


Figure 14: Water supply schematic with management activities

4.2 Initiate plan

Confirm that all **stakeholders** are aware the water management plan is completed, and that they understand their roles and responsibilities. All residents and **stakeholders** should have a copy of the final plan and other information that was shared in Step 2.1 (water supply information, CWP management plan, water supply schematic and water quality test results). The final plan should have contact details of all **stakeholders**. An additional contact sheet for recording new or changed details is provided in Appendix 7.

4.3 Audit procedures and plans for continual improvement

Plan a system for annual review. An audit will check whether the management plan is working properly, and will inform the plans for continual improvement. It is also an opportunity to renegotiate any agreements with **stakeholders**.

The water supply will change over time, and the people involved will probably change too. Store the water supply information at the settlement, as well as somewhere else that is also safe and accessible.

Keep the information updated, such as replacing photographs in the schematics. Check the NHMRC website (where the *Australian Drinking Water Guidelines* are) to keep abreast of any news or recent issues in water management. Re-creating a livelihoods pentagon each year may provide important feedback on the progress and changing issues at the settlement.

TIP!

Celebrate the completion of the plan with an event like a BBQ. The event can be an opportunity to bring stakeholders together. It can also define the annual audit date.

Glossary

Critical control point: A point, step or procedure at which control can be applied and which is essential to prevent or eliminate a hazard or reduce it to an acceptable level.

Hazard: A biological, chemical, physical or radiological agent that has the potential to cause harm.

Preventive measures: Activities that ensure that the water supply system is protected from contamination.

Remote: A settlement that is located in regional Australia with very restricted accessibility of goods, services and opportunities for social interaction.

Risk: The likelihood of a hazard causing harm in exposed populations in a specified timeframe, including magnitude of that harm.

Risk management: A systematic evaluation of the water supply system, the identification of hazards and hazardous events, the assessment of risks and the development and implementation of preventive strategies to manage the risks.

Small water supply: A water system that is separate from a large scale water supply and generally unregulated.

Stakeholders: The group of people who share a common interest – in this case the essential services and water supply management at the settlement.

Survey: A review of water sources, facilities, equipment operation and maintenance of a water system to evaluate its ability to produce and distribute safe drinking water.

Reference list

Water supply management plans and manuals

Grey-Gardner R 2008, *Remote Community Water Management*, DKCRC Research Report 27, Desert Knowledge Cooperative Research Centre, Alice Springs, Available online: http://www.desertknowledgecrc.com.au/publications.

The Guidelines for Australian Drinking Water Quality with fact sheets for all water quality constituents:

NHMRC 2004, *Australian Drinking Water Guidelines*, National Health and Medical Research Council, Canberra, Available online http://www.nhmrc.gov.au/

The Community Water Planner

NHMRC 2005, *Australian Drinking Water Guidelines Community Water Planner – A tool for small communities to develop drinking water management plans*, National Health and Medical Research Council, Canberra. Information on how to order copies is available online http://www.nhmrc.gov.au/

Survey sheets and information on small water supplies

The World Health Organization *Guidelines for Drinking Water Quality*, and Small Community Water Supply Management, Available online: http://www.who.int/water_sanitation_health/en/

Ideas for cross cultural practices like running workshops and display of information

Walsh F and Mitchell P 2000, *Planning for Country, cross cultural approaches to decision-making on Aboriginal Lands,* Jukurrpa Books, IAD Press, Alice Springs, Australia.

Information about Sustainable Livelihoods

Key Sheets for Sustainable Livelihoods, Department For International Development (UK) and Overseas Development Institute 2004, available online: http://www.keysheets.org/

Appendix 1: Preliminary water quality test parameters

Metals	Abbrev.	General chemical	Abbrev.	Microbiology	Abbrev.
Aluminium	Al	pH		*E.coli*	
Antimony	Sb	Electrical conductivity	EC	Heterotrophic Plate Count	HPC
Arsenic	As	Total Dissolved Solids	TDS		
Barium	Ba	Alkalinity			
Beryllium	Be	Hardness	CaCO3		
Boron	B	Chloride	Cl		
Bromine	Br	Fluoride	F		
Cadmium	Cd	Nitrate	NO3		
Chromium	Cr	Nitrite	NO2		
Copper	Cu	Calcium	Ca		
Iodide	I	Magnesium	Mg		
Iron	Fe	Sodium	Na	**Radionuclides**	Abbrev.
Lead	Pb	Potassium	K	Radium 226	Ra 226
Nickel	Ni	Silica	Si	Radium 228	Ra 228
Manganese	Mn	Sulphate	SO4		
Mercury	Hg	Turbidity			
Molybdenum	Mo	Colour			
Selenium	Se				
Silver	Ag				
Tin	Sn				
Uranium	U				
Zinc	Zn				

Appendix 2: Water sampling logistics

Preparation

Pack:

- Sampling gear: matches, gas torch, methylated spirits, thermometer, watch/clock, sample bottles (with spares), esky and ice packs.
- Bottle packaging information sheet
- Water supply schematic with sampling points marked
- Contact details for laboratory and Freight Company

NB: Before you leave, phone and check that the microbiological laboratory staff know your estimated time of arrival and the number of samples you are expecting to bring.

The sampling run

1. Minimise the sample transit time from the field to the lab. If possible, make water sampling the last thing you do before you leave the settlement.

2. Always sample at the same points. If it is the first sample run, record each tap or sample point clearly so that repeat samples may be taken from the same point.

3. Start at the end of the distribution system and work backwards towards the source. This pattern maximises the opportunity to get representative samples of the water. (By sampling at the bore and following the distribution system down, you may simply be sampling the same 'piece' of water; that is, if there is a spike in the supply and you start at the bore, you may be following it along the system).

4. Record the sampling details on the bottle label and keep a copy for your own records in a book. The sample should have the location (i.e. Mulga Flat Bore No 1 RN4563), date, time and temperature. Write notes about any observations; for example, initial flow was brown in colour and had a smell like rotten eggs.

5. *If you are running late or have fewer/more samples than anticipated, ring the microbiological laboratory and inform them as soon as possible so they can be prepared.*

Appendix 3: Water sampling

DATE	SAMPLE POINT	TIME	TEMP (˚ C)	OBSERVATIONS

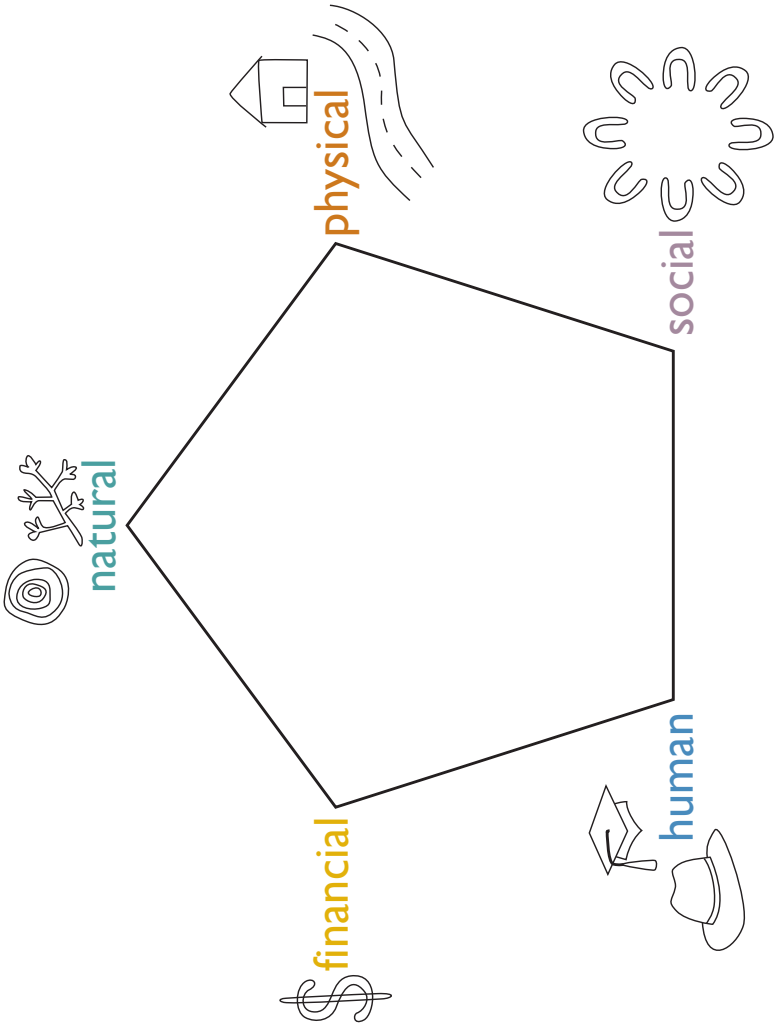
Appendix 4: Water supply checklist

Place _____

Date_____ **By** _____

General information	Details	
Population size	Number of permanent residents	
	Number of temporary residents	
Dwellings	Number of permanent dwellings	
	Number of temporary dwellings	
Reticulation system	Number of dwellings connected to the supply	
	Number of dwellings not connected to the supply	
Amount of water supplied	Kilolitres per year	
	Litres per day per person	
	Litres per day to community	
Annual rainfall	High rainfall season average	
	Low rainfall season average	
Water supply	**Details**	
Water source	Location/distance from settlement	
Extra source	Location/distance from settlement	
Storage facilities	Header tank size	
	Storage tank size	
Treatment system	Operating procedures	
	Chemicals stored	
	Type, make and year	
Distribution system	Pumps	
	Pipe material	
	Leaks	
Observations	(rubbish lying around/erosion)	

Appendix 5: Sustainable Livelihoods Pentagon



Appendix 6: Meter reading record sheet

DATE	SITE	METER READING	NOTES

Appendix 7: Contacts

NAME	ADDRESS	PHONE	MOBILE