

Central Queensland

Water quality target setting and monitoring process

1. Introduction

While no written comment has been received by Fitzroy Basin Association (FBA) regarding unacceptability or otherwise of water quality targets having been set in *Central Queensland Strategy for Sustainability – 2004 and Beyond*, FBA seeks to lay to rest the perceived disquiet concerning the current unquantified target and provide a clear statement regarding the approach and methodology being adopted by FBA to set water quality targets.

The purpose of this paper is to explain

- Why quantified targets for water quality have not yet been set in Central Queensland
- What approach/strategies have been adopted to set targets in the future
- What actions are currently being taken, and will be taken in the future, to address pressures on water quality
- What time frame might reasonably be necessary to set quantified targets
- How the approach reflects requirements of the Reef Water Quality Protection Plan (RWQPP)

2. Background and challenges

To gather information on condition and trend of the region's natural resources in preparation for setting targets and planning activities to address pressures on those assets, FBA commissioned the development of an information paper, the Central Queensland Information Paper. During its development, data on the quality of the region's surface waters was interrogated for information on condition and trend. Information was provided with the suggestion of using the target setting process from the National Water Quality Management Strategy, based on water quality objectives.

There are no local reference sites in Central Queensland, thus information regarding locally relevant trigger values for the various uses of water is unavailable. Default trigger values are meaningless, because for at least some parameters and values, water quality at or beyond these values does not have the same effect in this system as it does in the systems for which the values were developed.

During the regional target setting and plan development process conducted by FBA and the subregions in the winter of 2003, it became apparent that the information presented did not allow specific, measurable, achievable, or relevant targets for water quality to be set. Huge ranges in data values combined with small sample numbers and most data relating to ambient water quality rather than quality of water during high flow periods meant that no meaning could be obtained in order to set a quantified target.

3. The approach

In light of these information difficulties, FBA intends to use the process described in this paper to set quantified water quality targets. The regional community has committed to setting these targets as soon as technically achievable, and has assigned

the highest priority to the exercise. In the absence of quantified water quality targets, the regional community has set qualified targets as set out below.

Aspirational targets

By 2050, the region's waterways sustain marine and freshwater resources with no net decline and, where required, an improvement in regional river health and water quality

By 2050, the region's water resources are used efficiently, and managed to sustain ecological process, human and industrial consumption

Resource condition targets

A measurable improvement in water quality at reference sites to be determined, or measured by other means, within 15 years

Maintain EC levels consistent with ANZECC guidelines until defined salinity targets are set

Management targets

Progressively set and refine catchment targets based on best available information for levels of salinity, nitrogen, phosphorus and sediments / suspended particulate matter, with indicative targets in one year, refined targets within 3 years, and confirmed targets within 5 years

Identify and establish strategic sites, including in high risk catchments, for event based water quality monitoring within 6 months of funding

Improve understanding of processing capacity of estuary, bay and floodplain, within 12 months of funding, in order to set end of valley water quality targets

Collect event based water quality data for a representative range of soil types, hill-slopes and management practices by June 2005 and ongoing

Engage communities in high risk catchments in monitoring and action for improvements in water quality (in conjunction with A109) within 6 months of funding

In order to enrich what has hitherto been a data poor information environment, FBA has adopted the use of various models, principally EMSS, SERM, and SedNet, the function and purpose of which is described in attachments. These models, while requiring data for accuracy purposes, can add value to existing data, and thereby "compress" the time required to set targets when compared with using a purely data gathering and interpretation approach. Using the model approach data gathering is aimed at providing strategic data for improving the accuracy of models rather than to determine condition and trend on its own.

Figure 1 below diagrammatically depicts the proposed approach, and shows how FBA's activities enrich and build on activities of other parties, including researchers and levels of government, to integrate and add value.

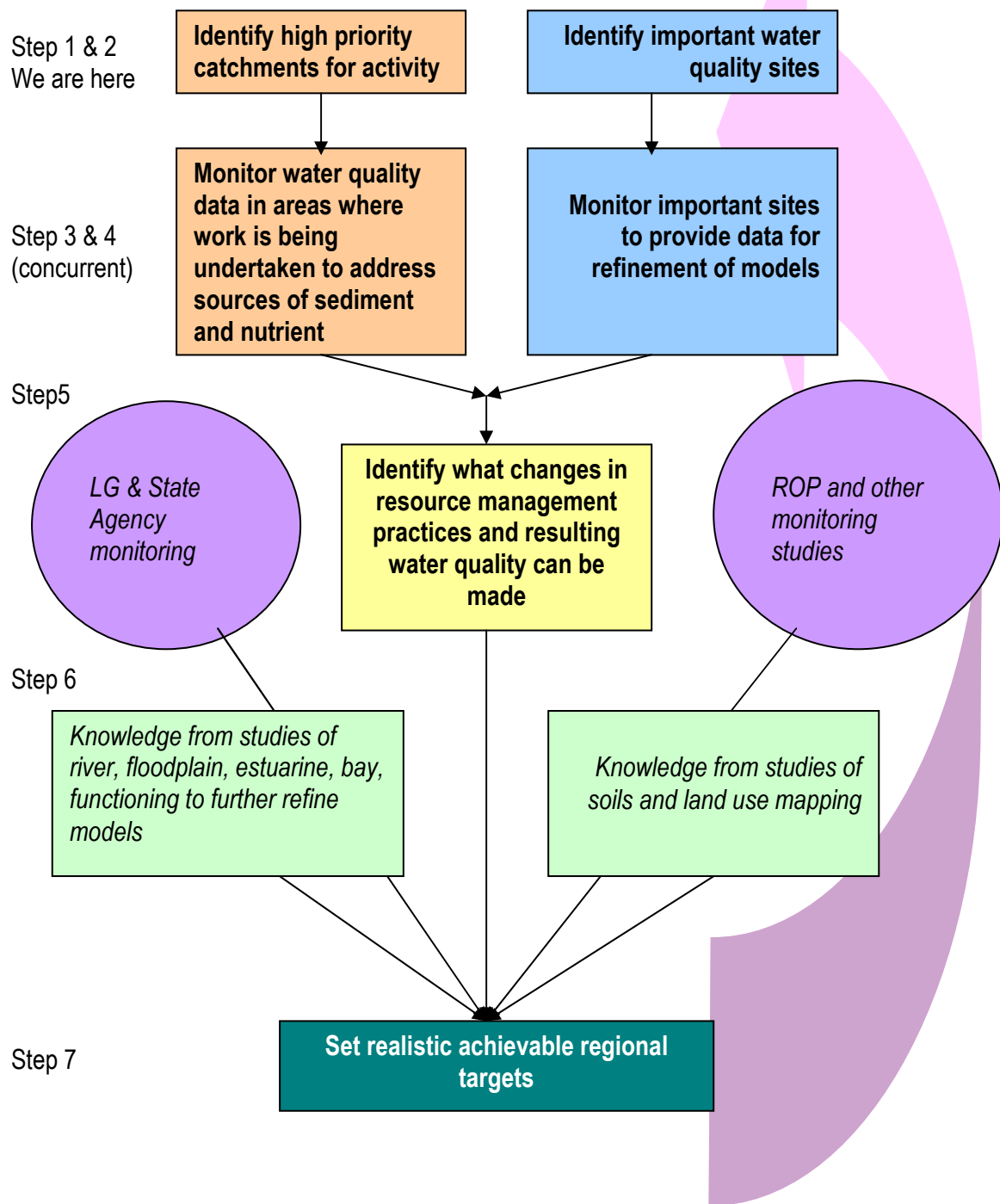


Figure 1: Target setting approach

The approach encompasses the following elements and will allow us to set achievable targets in a shorter time frame than might otherwise be the case.

- Identify priority catchments and implement Sustainable Landscapes program
- Monitor in priority catchments to quantify effect of management practice change on resource condition
- Implement research studies to fill critical knowledge gaps regarding the effect of soil attributes and condition, management practices, and system function on sediment delivery

- Monitoring of critical points along the stream system to improve model capacity and accuracy
- Synthesize data from relevant sources (as described above and including ambient water quality monitoring data from state and local government) to extrapolate learnings from priority catchments through model outputs to determine what is achievable with respect to improvements in regional water quality
- Set targets
- Track progress and review

4. Actions to achieve improved water quality

It is important to recognise that targets, or the setting of targets, achieves no improvement in water quality without actions being taken to address the causes of decreased water quality. The *CQSS – 2004 and Beyond* contains a number of targets and attendant actions which, when implemented, will address these causes. These actions are the ones that, even if quantified targets for water quality had been set, are instrumental in improving the quality of water delivered to regional streams. In particular, attention is drawn to the following sections:

- 3.4.1 Sustainable Landscapes:** this section details actions to develop and implement property and catchment management planning, the major environmental focus of which will be reduction of sediments and nutrients transported to streams. Landholders will be encouraged to plan for climate change, which has implications for levels of grazing pressure and other agricultural activity in maintaining ground cover.
- 3.4.2 Soil condition:** this section contains the target for, and actions to address ground cover, and will focus on grazing and cropping land management, these land uses being the most extensive uses in the region.
- 3.4.3 Weeds and pest animals:** a major focus of weed management is the retention of desirable biomass, which creates a higher level of ground cover and thus reduces transport of sediment and nutrients to streams.
- 3.4.6 Soil salinity:** increased dryland salinity will leave areas of land vulnerable to increased erosion, from both water and wind. Movement of salt through the regolith will eventually deteriorate the quality of groundwater, and its subsequent intrusion into streams will further deteriorate in stream water quality. Actions to address salinity focus firstly on mapping of priority areas for intervention with particular emphasis what might affect regional groundwater flow systems. Local flow systems will be picked up through property and neighbourhood catchment planning.
- 3.4.7 Acid sulphate soils:** the major focus of this section is on mapping of areas with potential acid sulphate soils, and the implementation of State Planning Policy 2/02 which seeks to avoid disturbance of acid sulphate soils in development and thereby avoiding acid run-off into coastal

waterways.

- 3.4.8 Mining:** through implementation of Environmental Authorities governing extractive industries, this section focuses on reducing off-site impacts of mining, particularly as these relate to water quality.
- 3.4.9 Forest practices:** this section contains actions to increase the use of forestry as an option for agricultural production. A spin-off is that targeted forestry can help to address water balance problems relating to movement of salt in groundwater, thereby reducing the risk of saline groundwater intrusion into streams.
- 3.5.1 Remnant vegetation:** in protecting remnant vegetation, further decreases in water quality resulting from reduced groundcover may be avoided.
- 3.5.2/3 Conserving species and Estuary, reef, and coastal habitat:** these section focus on preservation and restoration of habitat, including wetlands. Good water quality is a requirement of species and communities in these sensitive areas. Additional actions respond to improving buffering capabilities of these areas.
- 3.5.4 Riparian zones, instream habitats, and freshwater wetlands:** the integrity and function of these areas are important in maintaining and improving the quality of water entering streams. Actions focus on increasing our knowledge of and improving the condition these areas

Social and Economic sections These sections relate to the human, social, and financial capital aspects of improving condition of all natural resources, including water.

More 70% of total funds requested by FBA under the National Action Plan and Natural Heritage Trust Extension will be spent on activities related strongly to improving water quality. In addition, these actions will be undertaken in strategically important locations with respect to improving water quality. That is to say, following approval of the Regional Investment Strategy (RIS), FBA will do all it can with respect to addressing decreased water quality given the knowledge that exists. Under Priority Action Projects in Central Queensland, approximately \$4 million is in the process of addressing pressures on water quality.

5. Local water quality targets

These targets will be set as part an iterative process in small catchments where investment is targeted as part of the RIS. Once catchments have been identified (Step 1 in Fig.1), the following process will be used. Impact on water quality is one criterion that will be used to identify priority catchments. Please note that the process will be conducted with stakeholders e.g. landholders, government, etc.

- a. Identify catchments based on EMSS model outputs, groundtruthing of outputs, social and economic data, local knowledge, and other criteria (including Protect, Maintain, Restore hierarchy)
- b. An assessment of actual practice changes will be made: e.g. currently 40% of cropped catchment area is under CTF; 30% of grazed area has greater than 50% cover consistently

- c. Potential change identified
- d. Using EMSS and SedNet, identify sources of sediment and nutrient and potential water quality improvements from change indicated in b
- e. Using social and economic impact techniques, quantify costs associated with that change
- f. When balance is struck between what can be achieved at a cost that can be borne, set targets for local catchments
- g. Develop and implement monitoring program (Step 3 in Fig. 1) incorporating event based water quality monitoring to track progress to, and review targets

6. Regional water quality monitoring and modelling

Among other inputs described in this paper, regional water quality targets will be set, and progress toward targets tracked, using output from various modelling tools, (SERM, SedNet, and EMSS), to inform decision-making. Although these models are able to give some direction now, lack of data at an appropriate scale and attribute and with adequate sample sizes leaves the output with unacceptable error rates for target setting at this time. The most important output in EMSS to date is a map of potential sediment hot spots to provide a layer into decisions regarding catchments targeted for activities. During the process of producing this output, critical gaps in data have been identified. These gaps are described in the accompanying paper, *An integrated monitoring, modelling and reporting framework for event based water quality in the Fitzroy Catchment*. One of the purposes of the regional water quality monitoring program is to provide data in critical gaps (Step 2 in Fig. 1) to improve accuracy of model outputs.

Over the next three years, data gathered from the regional monitoring program (Step 4 in Fig. 1) as well as data and information gathered from other studies and monitoring programs will provide data into the models and to add to the understanding of the system. Steps involved include

- a. Using EMSS outputs, the Digital Elevation Model (DEM), Land Use mapping, SedNet, identify critical points for water quality monitoring (see accompanying papers)
- b. Gather data from agreed points via agreed mechanisms
- c. Integrate water quality data with regional scale ground cover, other land condition, and other appropriate monitoring
- d. Refine models and strengthen linkages between models (EMSS, SERM, and SedNet) to improve “range to reef” understanding of cause and effect of land use, and to improve understanding of delivery, transport, and processing mechanisms

7. Information from other sources

While the two processes outlined above are being implemented, additional studies will be undertaken to provide input (Step 5 in Fig. 1). These include

- a. Resource Operations plan and Water Resource Plan monitoring activities
- b. Studies on functioning of estuarine, floodplain, and riverine areas and their impact on water quality and the dynamics of near shore areas (Step 6 in Fig. 1)

- c. Studies on land use and effect on sediment and nutrient mobilisation (Step 6)
- d. Improved resolution of land use mapping and mapping of land use practices (Step 6)

State government monitoring programs provide a great deal of data, and although some is collected for purposes which may not be consistent with the needs of this program, evaluation for this purpose is an important component. As well, local government collects water quality information at raw water intake sites for water treatment plants. Data from these sources may also become available.

8. Bringing it all together

Information gathered through the Sustainable Landscapes program will be integrated with information from the Regional Water Quality Monitoring program, research studies, and other monitoring programs mentioned above to quantify answers to questions of cause and effect and to develop a picture of what can be achieved with respect to changed practices and what will result with respect to water quality. Included in this process is the temporal element of what improvements can be achieved in what time frame for both practices and water quality.

With improvements in understanding of the system's functioning and its condition and trend, the region should be in a position to set water quality targets (Step 7 in Fig. 1). We need to keep a broad view of what these targets might look like, as progress toward them may need to be measured by management practices, and models will be critical in determining the meaning of gathered data.

Ongoing monitoring of resource condition in light of activities undertaken and changes to land use and management practices is the essential part of adaptive management and is a most important trigger element of CQSS2 review.

9. Targets to set targets

The *CQSS – 2004 and Beyond* water quality target M28 states that water quality targets will be progressively set over 5 years. Some progress toward setting targets other than that related above will be made within one year, to give indicative targets. This progress refers to modelling of relative water quality improvements on other improvements in ground cover etc, and is a “back to front” approach to targets setting, in much the same way that it is proposed that local water quality targets will be set. This approach involves incorporating other biophysical targets relating to sediment and nutrient transport into a model that can forecast what improvement might be likely if those targets were to be achieved. CSIRO has offered to collaborate with FBA to see how effective this approach might be. It is important to recognise that large error rates will apply and that it will be a step along the way, rather than a definitive end point.

In addition to gathering further data (described above) to provide more information, other studies concurrent with this approach will enrich the knowledge base at a greater rate than data alone, through refinement of models. It is likely that *relative* targets may be able to be refined within a shorter time frame than five years, possibly around three years. FBA will keep a very close watch on information updates and is

committed to setting targets as soon as is reasonably possible. In the meantime, investments in improved water quality will be made.

10. Alignment with Reef Water Quality Protection Plan

The Strategy in the RWQPP of most interest to this discussion is Strategy H: Priorities and targets. Actions and their relevant timelines are detailed below, together with FBA's actions in that respect.

1. *Develop water quality targets for the Reef catchment waterways with a major focus on*
 - a. *Improving water quality*
 - b. *Investing in remedial action that ensures adequate protection and rehabilitation of wetlands, riparian, and other vegetation important to water quality*

Completed by 1 July 2005

FBA has set a qualified targets (see p.2 "Resource Condition target") for water quality in the *CSS2 – 2004 and Beyond*, which has been submitted for accreditation. This paper explains the process and rationale for setting a quantified target within the next five years, and the belief that significant progress may be made within three years. As detailed in Section 4, substantial investment has already been made in improving water quality, and more than 70% of funds requested in the RIS will fund actions to address pressures on water quality.

2. *Incorporate the water quality targets established by the Regional NRM bodies into the evaluation process of the RWQPP*

Completed by 1 July 2005

Current water quality targets may be incorporated now. Further targets resulting from the implementation of the strategies detailed in this paper can be incorporated as they become available.

3. *Identify waterways, riparian areas, and wetlands that are in good condition and should be preserved to protect water quality*

Completed by 1 July 2005

Part of the process to be used to identify which small or neighbourhood catchments should be targeted for activities related to NHT2 and NAPSWQ will be to identify which waterways, riparian areas, and wetlands are important in protecting water quality. The hierarchy of Protect, Maintain, and Restore is an important feature of identifying priority areas. Criteria are currently under development, and will be finalised prior to implementation of the RIS, which is hopefully long before July 2005.

4. *In particular with Regional NRM Bodies identify subcatchment hotspots responsible for delivering disproportionate quantities of sediment, nutrient, and pesticides to the Reef*

Completed by 1 July 2005

This has already been done with respect to sediment and nutrient using the EMSS and SedNet models. The output from EMSS is able to define the hotspots at approximately 700 square kilometre catchments. Further refinements will be available as more data is gathered, however, the sediment hotspot map will be a key criterion in determining which catchments are considered priorities for investment.

5. *In partnership with Regional NRM Bodies make wetland and riparian rehabilitation a high priority in high-risk Reef catchment areas*

Completed by 1 July 2005

These areas and actions to address pressures on or protect them are already a Very High priority in the *CQSS – 2004 and Beyond*. Over \$3 million is requested for relevant activities and much of the \$2.5 million in the Priority Action Project has been spent on protecting and restoring these areas.

11. Conclusion

1. The system with which we deal to set water quality targets is large, variable, and complex. Simple strategies will not provide solutions to complex problems
2. While quantified load targets have not been set, no written direction has been given that the relative target R25 for water quality set in the *CQSS – 2004 and Beyond* does not fulfil the requirements of RWQPP's Strategy H Point 1
3. FBA is committed to setting targets for water quality in a more quantified format than the current target and has designed a multi-faceted approach using technically appropriate methods and strategies
4. Monitoring and data gathering exercises allowed for in the RIS to support target setting will have the main objective of refining models
5. The *CQSS – 2004 and Beyond* is well aligned with requirements of the Reef Water Quality Protection Plan
6. More than 70% of current and future expenditure through FBA addresses pressures on water quality.

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