Goulburn Broken Water Quality Strategy

Addendum to Draft Strategy

June 1997

Goulburn Broken River Environment and Water Quality Committee

Contents

1. Introduction

The Goulburn Broken River Environment and Water Quality Committee (REWQC or River and Water Committee), and its predecessor, the Water Quality Working Group, prepared the Draft Goulburn Broken Water Quality Strategy. This was released for public comment in July 1996. The community was invited to make comment on the draft strategy before the end of September 1996. Responses to the Draft Strategy, and negotiations with key stakeholders, have been taken into account in the preparation of this addendum to the Draft Strategy.

This document

- reviews responses made to the Draft Strategy which was released for public comment on July 1996
- amends the Draft Strategy in light of the responses received and the River and Water Committee's assessment of these responses.

This document, the Draft Goulburn Broken Water Quality Strategy and relevant Background Papers make up the Goulburn Broken Water Quality Strategy (Final Version).

It is our intention, once a Government Response to the Strategy has been received, to prepare a Final Strategy document which will incorporate changes made to the draft WQS.

2. Goulburn Broken Regional Catchment Strategy (RCS)

The Goulburn Broken Catchment and Land Protection Board has prepared a Regional Catchment Strategy (RCS). The Board has adopted a vision for the Catchment Strategy which:

"Protects and enhances the catchment's land and water resources to improve the Region's social well being, environmental quality and productive capacity in a sustainable manner".

The RCS has a River and Water Quality Program which comprises a series of components which address downstream water quality (both within and outside the Goulburn Broken catchment). This Water Quality Strategy is a major initiative of the Catchment Strategy.

The components of the RCS's River and Water Quality Program are:

- Water quality
  comprises a series of projects which address downstream water quality (both within and outside the Goulburn Broken catchment). The Water Quality Strategy is a major initiative of the Catchment Strategy.

- River and Stream Management
    - Stream Management. This sub program has as its objective "to improve the condition of 3000 km of stream to good or excellent environmental rating, while maintaining the environmental condition of streams currently rayed good or excellent.
    - Floodplain Management. The objective is to "ensure development in flood prone areas is appropriate with the nature of the flood plain.
    - Regional Drainage. The objective is to "manage regional drainage to minimise impacts on the environment and infrastructure".

3. Consultation Process

The Draft Strategy was released for public comment in July 1996. Media releases publicised the preparation, and availability, of the Draft. As well as preparing a full draft, a shorter 8 page version was produced to aid public understanding of the Strategy. Once the strategy was released more than 500 copies were distributed to relevant groups and individuals, both within and external to the catchment. Within the catchment, copies of the full Strategy, and summaries, were distributed to all the natural resource management groups known to us. A letter was sent with the strategy inviting comment.

During preparation of the Draft over the preceding 3 years a wide range of public consultation processes have occurred. These included:

- workshops during preparation of each issues paper
- AEAM workshop
- cost sharing workshop
- opportunities to comment on Issues Papers

3.1 Responses to Draft Strategy.

A total of 27 responses to the Strategy were received from the following groups and organisations:

Respondent No:	Name	Location
1	Lower Broken Ck Pumpers Association	Picola
2	Municipalities Against salinity of Northern Victoria (MASNV)	Shepparton
3	Fisheries Victoria (DNRE)	East Melbourne
4	Shire of Campaspe	Echuca
5	Mid Goulburn Regional Water Board	Seymour
6	Upper Goulburn Waterways	Yea
7	Morice Holland	Picola
8	Coliban Water	Bendigo
9	Broken Catchment Landcare Network	Benalla
10	Boweya Lake Rowan Landcare Group	Boweya/Lake Rowan
11	Broken Creek Improvement Landcare Group	Nathalia
12	Goulburn Broken Environmental Alliance	Shepparton

13	Goulburn and Broken River Water Services Committees	
14	Rochester Water Services Committee	Rochester
15	Murray Valley Water Services Committee	
16	Australian Trout and Salmon Farmers' Association	Alexandra
17	Murray Darling Association	Albury
18	Local Government Catchment Project	Euroa
19	EPA NSW	Albury
20	Goulburn Valley Water	Shepparton
21	Irrigation Committee	Shepparton
22	Ovens Water	Wangaratta
23	Lower Goulburn Waterway Management Authority	Shepparton
24	Peter Kelliher	Girgarre
25	EPA Victoria	Melbourne
26	NRE	Melbourne
27	NRE Northern Irrigation Region	Tatura

The responses included 268 detailed responses, each of which has been considered by the River and Water Committee. A summary of these responses and the REWQC response to them is given in Appendix 2. The responses received were categorised as follows:

E endorsement
C change strategy
A agreement - no need to change strategy
O refer elsewhere
N note comment - no change to strategy
I implementation issue - no need to change strategy
D/X disagree with comment; no change to strategy

Category	Number	% of Comments
E	82	30
C	57	21
A	21	8
O	1	0
N	75	27
I	28	10
D/X	19	4

NB - some responses fitted two categories.

3.2 Categories of responses.

Each response was categorised as follows:

3.2.1 endorsement

Many of the responses are taken to be endorsement of the draft Strategy. In some cases this endorsement is conditional, for example EPA Vic. Respondees will have to judge if their conditions have been met.

3.2.2 Implementation Issues

Many responses raised issues which are best resolved during Strategy implementation. This Strategy does not intend to deal with these issues in the Strategy document. Rather they will be worked through as implementation proceeds. Some need to be dealt with quickly, for example, irrigation program implementation and the respective roles of the Irrigation, Dryland and River and Water Committees of the Catchment Board.

3.2.3 Points of Agreement

Many responses could be dealt with by reference to information often to be found elsewhere, either within the draft strategy document or in the more detailed Background Papers. Given that the draft summarised many detailed reports it was not possible to include the level of detail necessary to satisfy this type of response.

3.2.4 Noted.

This type of response was noted but did not warrant, or result in, a change to the Draft Strategy.

3.2.5 Changes to the Draft

A number of responses have resulted the need to change the Draft Strategy or, alternatively, clarify what the draft actually meant to say. See Section 5 of this document for more detail.

3.2.6 Refer Elsewhere

Comments in this category were not directly relevant and are referred to other groups for attention.

3.2.7 Disagree

The REWQC did not agree with the response. No change to the Draft resulted.

4. REWQC Responses to Comments and Changes to the Strategy.

(Note - this Section amends the Draft Water Quality Strategy and references to Sections, Actions, etc, are those in the Draft).

4.1 The Preferred Strategy

After reviewing the responses to the Draft Strategy the River and Water Committee confirms that the preferred Strategy remains the Strategy outlined in Part B of the Draft Strategy document. The preferred strategy was developed from consideration of the scenarios outlined in Chapter 8 of the Draft and CMSS modelling of the assessed likely, or preferred, adoption and implementation rates of BMP. The assessment of these adoption and implementation rates was made by the WQWG and REWQC. Further detail of the CMSS modeling process can be found in Background Paper "Evaluation of Nutrient Reduction Scenarios" and a subsequent smaller paper "Assessing the Preferred Scenario".

Amendments to the draft strategy are detailed in the sections below.

Overall we expect implementation of the targets for nutrient management BMP and other aspects of the strategy reduce potential catchment P loads by 65%. This potential reduction will be achieved by improvements, of the following magnitude, in nutrient outputs from the major sources in the catchment:

- dryland 20%
- irrigation drains 50%
- sewage treatment plants 80%

Improvements from other contributors are also expected.

4.2 Timeframe.

The draft strategy set a 20 year timeframe for implementation. However it must be recognised that there will be an ongoing requirement for extension, research, monitoring and regulation after the 20 year implementation period to ensure that gains are maintained.

4.3 Why be concerned about blue green algal blooms?

Discussions with NRE highlighted the need for the Strategy to be concerned with public health issues associated with blue green algae.

Add the following text to Section 3.1.

Blue green algal blooms are a problem because they are often poisonous. Between half to two thirds of all blooms contain toxins. Three main types of toxins have been identified:

- **hepatotoxins** cause liver damage and gastrointestinal symptoms
- **neurotoxins** cause muscle tremor, staggering, paralysis and respiratory arrest in animals. Neurotoxins produced by Anabaena circinalis have been identified as paralytic shellfish poisons.

- **endotoxins** contact irritants produced by most species of blue green algae can cause skin rashes, eye irritation, allergic reactions and gastroenteritis.

These toxins lead to

human health concerns

- drinking water
- recreational use of water
- agricultural produce consumed by humans

impacts on agricultural produce

- crops and pastures
- animal industries
- risks to export markets
- security and safety of agricultural supply water

ecological concerns.

- impacts on flora and fauna, especially in stream.

This Strategy aims to minimise the health risks associated with blue green algal blooms by reducing the risk and impact of blooms by managing inputs of nutrients, especially P, to our waterways.

4.4 Sec 1.2 Policy Background.

Victorian State Environment Protection Policy - Waters of Victoria.
add the following:

However SEPP (WOV) differs from the other strategies listed above (on page 13 of the Draft) - SEPP express in law the community's expectations, needs and priorities for using and protecting the environment

4.5 Objectives and Priorities - What we want to Achieve

The Strategy has to satisfy two sets of objectives. The first set are objectives which reduce risk and impacts of blue green algal blooms within the Goulburn Broken catchment. It is our view that this set of objectives can be readily achieved.

The second set of objectives reduce the risk and impact of algal blooms in the River Murray downstream of the Goulburn Broken catchment. The bulk of activities proposed in the GBWQS are aimed at achieving this set of objectives. From our perspective this is the most critical need for us, as a catchment, to meet.

The preferred Strategy developed by the REWQC will satisfy both sets of objectives.

Section 4.1 amend objectives to:

The overall objectives of the Strategy are to:

- **minimise blue green algal outbreaks within the Goulburn Broken catchment thereby reducing risks to public health, industry and water users**
- **minimise nutrient contributions to the River Murray (and reduce the risk that our nutrients will cause or contribute to algal blooms downstream)**
- **foster regional development**
- **enhance the riverine environment**
- **minimise/optimise water treatment costs.**

To achieve these objectives we will initially concentrate on:

- phosphorus reduction activities, especially those which can quickly achieve cost effective reduction of nutrient loads reaching the River Murray
- P reduction over the summer, low flow period to reduce the risk of algal blooms within the GB catchment
- P load reduction. Within most of the Goulburn Broken catchment nutrient concentrations in waterways are not a major issue, but the nutrient loads carried by the stream flows are very important.

Program focus

Irrigation vs dryland

A number of responses commented on the apparent undue emphasis of the strategy on nutrients from irrigation areas at the expense of dryland nutrient sources. This is not our intention. In terms of our priorities irrigation drains contribute loads over the critical summer period when algal blooms are more likely and we have therefore initially focussed on that source. Irrigation drains are also identified as a major nutrient source within the catchment.

We do recognise that dryland areas are significant sources of nutrient loads, especially in high flow periods in late winter and early spring, and the dryland program focuses on management of these loads, especially by management of sediment in, or close, to waterways.

We anticipate that improvement in loads from irrigation areas can be made relatively quickly, while load reduction from dryland areas will be a more gradual, slower process, dependent on seasonal conditions.

Phosphorus Management

A number of responses suggested that the strategy was limited in its scope by concentrating on nutrient management, especially phosphorus management. Some responses felt the strategy should be called a Nutrient Management Strategy rather than a water quality strategy. The REWQC has considered this criticism before.

We continue to emphasis the statement on p 7 of the Draft:

This strategy focuses initially on managing the nutrients phosphorus (P) and nitrogen (N) to reduce the incidence of blue green algal blooms. Other water quality issues will be tackled over time.

We see the water quality strategy dealing with the big issues (blue green algae and nutrients) now, and then moving on to other water quality issues as listed in Section 3.7 and Action 1.10. The Strategy does deal with turbidity via stream bed and bank stabilisation issues in the Dryland Program.

4.6 Sec 4.3 Overview

Reword first dot point to:

- "Reducing nutrient loads from irrigation drains as farmers **continue** to adopt farm reuse systems, **improved irrigation management** and drain diversion and **G-MW continues to improve channel system management".**

4.7 Principles

The draft Strategy presented a set of principles by which our objectives would be achieved. These principles are presented below in priority order.

- **Implementation of an integrated and coordinated approach**. Many of the actions required in this strategy can be implemented by a number of existing groups in the catchment. There is no point setting up a new group to implement this strategy, although strategy oversight and coordination is essential. Many of the activities proposed which aim to manage nutrients will result in reductions of other pollutants "at no extra cost", for example vegetated filter strips will reduce sediment inputs to streams as well as giving other environmental benefits.
- **Best Management Practice Approach**. All contributors of nutrients in the catchment will be expected to adopt best management practices for nutrient management.
- **Concentration on phosphorus management**. The strategy will concentrate on phosphorus reduction and management as the means to reduce the risk and impact of blue green algal blooms. However, opportunities to reduce other nutrients, such as nitrogen, will also be pursued, when they are cost effective, can be associated with phosphorus management *and can be shown to reduce the risk of blue green algal blooms.* Other water quality issues will be managed as they become evident, as knowledge develops and *once we have made progress on nutrient management*.
- **Summer nutrient load and concentration** reductions are the first priority to reduce the risks and impacts of blue green algal blooms. At the same time, a longer term program will be implemented aimed at getting all nutrient contributors to undertake works which will reduce nutrient loads and concentrations year round.
- **Cost effectiveness**. The implementation of nutrient management actions will only be considered where it is cost effective. Cost effectiveness may be influenced by considering a broader range of benefits than simple nutrient reduction.
- **Sub catchment approach**. Local communities will be asked to play a lead role in the preparation and implementation of local plans for nutrient management

- **No nett increase**. New developments in the catchment cannot increase nutrient loads leaving the catchment. A minimum requirement is that no nett increase in nutrient loads is expected.
- **Minimising impacts**. Any discharges to streams should not have significant adverse impacts on local receiving streams.
- **Adaptive approaches**. The scientific base for managing algal blooms and nutrients is incomplete. The strategy will be adaptive and use new information as it becomes available. This may mean the strategy approach will change over time, indicating the need for flexibility.
- **Non structural measures.** Where practical, use of planning schemes, codes of practice, guidelines and best management practice (BMP) will be the preferred long term method of strategy implementation.
- **Nutrient balance and sustainability**. In implementing nutrient management activities, resource managers will adopt nutrient balance and sustainability principles.
- **Cooperative approach**. In the first instance the preferred approach is cooperative. However, if adoption rates drop, or nutrient management is not being achieved, a range of regulatory measures will be considered. *Where deliberate illegal discharge of effluent occurs (such as wastewater or dairy effluent) then regulations should be enforced.*
- **Monitoring and Accountability**. Monitoring programs will be implemented to ensure that the desired outcomes of the strategy are actually achieved.
- **Assign Responsibility**. Responsibility to carry out specific actions will be clearly assigned.
- **Equity.** One in, all in. All sectors in the catchment will be required to achieve appropriate nutrient management targets. No one group will be singled out.

(Significant adverse impact in the Minimising impacts principle needs to be defined by the REWQC in conjunction with relevant authorities - see new action 1.19).

We recognise that nutrient and water quality issues are limiting development. The Wastewater for Industry Report, for example, found that "many existing wastewater and disposal facilities require extensive upgrading to meet current effluent quality criteria or to ensure sustainability. Such upgrades are necessary to ensure that Australia's "clean green" image abroad is maintained, to assist growing local tourism, and to enhance the environment and amenity of the region."

We also recognise the current Government's emphasis on growth and development can be achieved by being smarter with the way we manage our natural resources.

4.8 Priority Actions

The River and Water Committee, after consideration of the Actions listed in the Draft Strategy, Strategy Objectives and Principles has developed a list of priority actions to be carried out as quickly as possible. From this a three year work plan has been developed (Appendix 4). However, we emphasise the need to carry out **all** actions listed in the strategy.

Actions with the highest priority are listed below. A full list of actions and their priority appears in Appendix 3.

Priority		Action
VH	1.1	GB Board will assign responsibility for strategy implementation to the REWQC The Board will ensure that all its activities recognise water quality considerations in implementing their programs.
VH	1.11	Ensure provision of information about nutrient management BMP to resource managers.
VH	1.12	Monitor relevant research and disseminate information to stakeholders
VH	1.17	Apply benefit:cost analysis, currently being developed, before implementing major nutrient management works.
VH	1.20	REWQC will establish a process to review and refine nutrient management BMP and ensure that these BMP are compatible with other BMP
VH	1.2	REWQC to oversee and coordinate strategy implementation. Works implementation coordination - responsibility assigned to Irrigation and Dryland Board committees. formal links will be developed between these Committees.
VH	1.21	Make information about best management practices widely available by publishing information recently documented.
VH	1.3	Day to day coordination of strategy implementation will be the responsibility of the Goulburn Broken Water Quality Coordinator, who will be employed by Goulburn Murray Water on behalf of the REWQC. The coordinator will provide executive support to the REWQC.
VH	1.6	Implement cost sharing arrangements with secondary beneficiaries.
VH	2.2	Use the Waterwatch program as the strategy's community education tool. Future source of local funds for Waterwatch needs to be determined.
VH	3.8	Develop local, or sub catchment, plans to address water quality issues in priority areas. These are (not ranked): • catchment to Lake Nillahcootie • catchment to Lake Eildon • mid Broken River (Nillahcootie to Caseys Weir) • Broken Ck • catchment to Lake Mokoan • lower Goulburn River (downstream of Goulburn Weir) • local catchment to Goulburn Weir Pool • lower Broken River (below Caseys Weir) • catchment to Greens Lake/Lake Cooper • other, more local, areas contributing nutrients directly to waterways. • blue green algae hot spots. Provide technical and extension support for implementation of these plans.
VH	4.1	Achieve new drainage diverters to reduce annual drain flows by 64 000 ML, especially in Deakin Drain, Broken Ck and MV Drain 6. Offer an incentive to construct storages for diverted water.
VH	4.14	Finalise methodology for allocating new diversion licences. Implement this over the irrigation region.
VH	4.16	Define requirements for reuse systems to remain blue green alae free.
VH	4.17	Continue development and implementation of the Broken Ck Weir replacement program
VH	4.4	80% (5360) of irrigation farms with functioning reuse systems. Increase rate of adoption by 40 per year.
VH	4.4A	All reuse systems will be used effectively by encouraging installation of electric power
VH	4.5	All dairy effluent systems managed in accord with best management practice. No farm directly discharging dairy effluent to drains. Implement an extension program to achieve this.
VH	4.9	adoption of nutrient management BMPs by all sectors of the farming community

VH	4.19	Drain management plans prepared.
VH	5.1	Install approx 550 km of filter strips along rivers and streams by increasing the rate of implementation of river management works by 25% and the rate of farm works by 25%
VH	5.14	Land managers will report on their adoption and implementation of BMP, including relevant Codes or Guidelines.
VH	5.18	Encourage resolution of the Water Act requirement for diversion licences.
VH	5.2	Develop and implement a program of river management works so that the rate of implementation is increased in priority areas by 25%
VH	5.4	Develop and implement sub catchment nutrient management plans for the high priority catchments listed above in 3.8
VH	6.1	All STPs with the equivalent of zero summer discharge or tertiary treatment to <2mg/L TP for the summer period. Priorities - Shepparton, Mooroopna, Seymour, Benalla.
VH	6.7	Support adoption and implementation of the Northern Victorian Wastewater Management Strategy.
VH	8.3	Fish Farms - research, adopt and implement BMP for improved feed formulations, feed management techniques, pond sediment and waste management. All farms will adopt these BMP.
VH	9.1	Investigate local water quality concerns associated with septic tanks at Kinglake, Toolangi, Flowerdale, Wandong, Merrigum, Tungamah ($30K each), and others as they arise.
VH	9.3	Implement action to overcome local water quality concerns.
VH	12.1	Continue VWQMN, MSOM, EPA salinity and MDBC monitoring. This will be coordinated in the catchment by the REWQC.

4.9 Program 1 Coordination and community Involvement

Many of the aspects of this strategy link into the implementation of the Shepparton Irrigation Region Land & Water Salinity Management Plan. It is essential that there is close co-operation between the various groups implementing the SIRLWSMP and whatever procedures are put in place to implement the Nutrient Management Strategy. This is not addressed in the strategy and as implementation is already occurring these formal links need to be put in place as a matter of urgency. Similarly, the water quality management activities of the Dryland and Public Lands committees of the Catchment Board need coordination.

Amend Action 1.2 to include "develop formal links with Catchment Board's Committees."

New Action 1.18 The REWQC will prepare a Final Strategy document incorporating the changes to the Draft Strategy resulting the Government response and this addendum.

New Action 1.19 REWQC to define Significant impact in conjunction with relevant authorities

Action 1.15 requires the REWQC to overview reporting of blue green algal blooms.

Add the following text to Section 4.5 Program 1.

Algal blooms are managed at two levels - local and regional. Local algal blooms are managed by the local water manager (eg a bloom on Lake Mokoan is the responsibility of GMW as the local water manager). Regional algal blooms (blooms

with the potential to affect two or more contiguous water bodies eg Lake Mokoan and the Broken River) are managed by GMW as the appointed catchment convening agency, with the emergency response to the bloom determined by an agreed emergency response plan. In its role as catchment convening agency GMW has a role to notify various agencies and authorities, including CALPB/REWQC, of the occurrence of algal blooms

4.10 Approaches to Target Setting, Best Management Practice (BMP) and Nutrient Reduction.

The strategy approach is to use the adoption of best management practices to achieve nutrient management and reduction. Certain BMP reduce nutrient levels by a predicted amount. A target for the level of adoption of the BMP can be adopted which gives a predicted desired level of nutrient management or reduction. Monitoring the rate of implementation and adoption of these best management practices will be a useful performance measure. Traditional measures, such as monitoring stream nutrient concentrations and loads, will be required to check that the predicted reductions actually occur.

For the time being the REWQC intends to continue with the use of adoption rates of BMP as the approach to target setting. In the long term, as scientific knowledge improves, the targets for nutrient (especially P) concentrations and loads need to be set which will give satisfactory reductions in the risk and impact of blue green algal blooms.

New action 11.4 Support research to establish nutrient load and concentration targets.

A number of submissions endorsed the BMP approach to target setting, but the issue of the process of deciding what are acceptable BMPs was raised. We accept that BMP are an evolving concept and that BMP will always change and improve as we learn and adapt. A number of submissions noted the need for a process to review BMP.

There is a strong need to have one set of best management practices for irrigators. These should incorporate those that relate to salinity control, productivity **and** nutrient management. If each group comes up with a different set of BMPs there will be a great deal of confusion and consequent reduced adoption. It is also important to note that rising watertables and salinity is still the most important issue to this catchment, environmentally and from a production point of view. The salinity plan whilst needing to be cognisant of nutrient implications, still needs to be the major concern.

However salinity management activities cannot allow water quality to degrade - ideally salinity activities will improve water quality especially nutrients.

New Action 1.20. REWQC will establish a process to review and refine nutrient management BMP and ensure that these BMP are compatible with other BMP.

The REWQC has recently overseen the documentation of BMP nutrient management for irrigated and dryland agriculture (Rendell McGuckian (1996)).

New Action 1.21 Make information about best management practices widely available by publishing information recently documented.

4.11 Flow issues

A number of responses commented on the fact that the strategy did not set out to address flow issues. We deliberately did not set out to address flow issues as we see these being dealt with via other processes. However the impact of flows on stratification and BGA bloom formation has recently been reported on by Bormanns and Webster (1996). Flow management may have an impact on bank stability and thus may be dealt with as part of a process stabilising stream banks.

New Action 1.22 Review flow issues as part of strategy implementation.

Other submissions suggested the links between flow and water quality should be investigated. The relationship between flow and concentration is recognised from the point of view that we are focussing action on reducing nutrient inputs (ie loads) over summer (ie low flow periods) when these inputs will have large impacts on concentrations.

4.12 Roles and responsibilities

The responsibility columns in the Action tables are meant to convey

- *primary responsibility* responsibility for ensuring the action is carried out
- *secondary responsibility* organisations which will be able to assist carrying out the action.

Allocation of responsibility does not necessarily imply funding or implementation responsibility.

4.13 Program 3 Planning/Non structural

Recent proposed changes to Municipal Planning Schemes and changes at a statewide level mean that *Action 3.2 is no longer relevant*.

Change Action 3.2 to read: *The REWQC will work with local government to achieve water quality improvements via the planing process.*

4.14 Program 4 Irrigation Drainage

The REWQC accepts that much of the improvement in irrigation management, which is necessary for reducing the nutrient contribution from the irrigation region, is already happening with encouragement from the salinity program. For many of the actions proposed REWQC is looking for an acceleration of these activities and the Water Quality Strategy is about acceleration of activities. In many instances additional investment is required which can't be justified for salinity reasons.

Clarification.

Implementation of on farm BMP will lead to reductions in the loads of nutrients entering drainage systems. Implementation of drain management BMPs will lead to reductions in the load of nutrients leaving the drain.

This program is expected to reduce P loads from irrigation drains by 50% by a combination of farm and drain nutrient management activities.

Action 4.1 includes construction of large strategically located storages to reduce the impact of short duration drain high flows in summer.

Action 4.17 - Broken Ck Weir replacement. The need for this Action has been queried. Replacing the weirs in Broken Ck will enable GMW to manage flows and outfalls to the Murray in a more effective manner. The current condition of the weirs is such that it is impossible to manage creek flows to prevent considerable outfall losses. It is anticipated that weir replacement will reduce flows, and associated nutrient loads, to the Murray by 25% (19 t of P in a normal year) over the irrigation season. The weir replacement program proposed in this Strategy is an acceleration of the 30 year GMW asset replacement program and will see the weirs replaced over 3 years. The estimated cost of P removal under this action is $3.30/ kg of P removed, which compares favourably with other nutrient management options in irrigation areas. Improved flow management will result in the need for GMW to release more channel water into the Creek to maintain supply to customers and is expected to result in better water quality in the Broken Creek. The proposal has been the subject of an exhaustive environmental and social impact program.

Action 4.5 Dairy effluent - extension *and enforcement* are required.

Action 4.8 Amend to *Resolve institutional arrangements about responsibilities for drain management, including both arterial and community surface drains.*

Drain management plans are required to be prepared for each drainage catchment. These plans will review all sources of all nutrinets to drains and lead to action to address nutrient sources on sub catchment by sub catchment basis. Preparation of these plans will resolve many of the nutrient management issues required under this program.

Action 4.19 Prepare drain management plans for all drainage catchments. Priorities will be as listed in Action 4.1

4.15 Program 5 Diffuse - dryland sources

This program is more appropriately named the ***Dryland sources*** program as it is intended to address those diffuse and point nutrient sources within the dryland areas of the catchment. This includes public land (generally forested, but also includes significant areas of military land (Puckapunyal)) and private land (agricultural, areas of remnant vegetation and pine plantations).

Within this program the nutrient management emphasis is on stabilising sediment sources, especially those sediment sources close to streams and waterways. The activities of waterway management authorities will be critical to the success of this program and the REWQC supports the extension of waterway management districts to cover the entire catchment.

New action 5.16 REWQC supports the extension of waterway management districts to cover the entire catchment.

Stable waterway bed and banks will help reduce turbidity, sedimentation and the amount of P moving in waterways as well as giving considerable environmental benefits.

It has also been pointed out that it is important to maintain the condition of existing stable waterways and riparian zones.

New Action 5.17 Ensure maintenance of existing stable waterways and riparian zones .

The costing of actions to fence and stabilise eroding stream banks and establish filter zones included provision for off stream watering points. Recent work by Goulburn Valley Environment Group (1996) has produced useful extension and technical information outlining the design of off stream watering systems and investigated farmers attitudes towards riparian zone protection. An impediment appears to be the Water Act requirement for a Diversion Licence to pump water from streams. GMW is working with the VFF, Water Bureau and others to resolve this issue.

New Action 5.18. Encourage resolution of the Water Act requirement for diversion licences.

The issue of limited stock access to streams was also raised in responses. The REWQC accepts that limited stock access and grazing of filter areas may be desirable to maintain these areas in good condition.

Priority localities for action in the dryland are outlined in Action 3.8. These are based on an assessment of blue green algal risk and impact. Further work on developing relationships between nutrients and flow using existing data indicates that some catchments are relatively high P generating catchments. Work to refine these relationships is in progress. This was identified as a research and information gap in Chapter 9.4 and should be a high priority. These identified catchments will become priority areas for investigation of why they are high contributors and for development of action plans to address P sources.

New Action 5.20 Target identified high P generating catchments for investigation and works.

Research in the Murrumbidgee (Olley 1995) indicates subsoil gully erosion in the upper tributaries to be a major source of sediment and nutrients to waterways. If this

relationship holds in the Goulburn Broken this will enable better targeting of actions to control sediment and nutrient movement in the priority catchments listed above and on p 32 of the Strategy. Investigations to determine which catchments fit these criteria, as a prelude to developing local area plans, is urgently required.

New Action 5.19 identify catchments contributing excessive amounts of sediment and P

Drainage issues Uncontrolled drainage and catchment clearing in dryland areas has led to an accelerated rate of inflow of sediment and nutrients to our streams. Stronger emphasis and higher priority need to be given to institutional and legislative arrangements for the control and management of drainage activity. The Goulburn Broken Regional Catchment Strategy addresses broad regional drainage issues and it is appropriate that associated nutrient issues be dealt with via the RCS process.

New Action 5.21 Address nutrient issues associated with drainage as part of implementation of the RCS.

4.16 Program 6 Sewage Treatment Plants

The submission from the EPA argues that the WQS is not consistent with current Government policy in that the strategy outlines a 20 year requirement for STP to achieve full water reuse on land or equivalent. The EPA advised:

"Consistency with Government Policy.
The Government has accepted the recommendations in the Working Group Report on Effluent Standards and Compliance for Waterways. In the forward to the report the Government advised it would be looking for considerable improvement in water authorities environmental performance over the next 3 to 5 years. ...In addition the report required the development of a position paper on effluent management. EPA Publication 473 Managing Sewage Discharges to Inland Waters proposes that existing plants which plan to continue to discharge to waterways (after having demonstrated that discharge to land is not practical or environmentaly beneficial) should upgrade treatment within 5 years. Minimum standards for effluent quality are proposed.
The timescale of twenty years for the upgrade of STP is therefore not acceptable. The premise that investment by the water authorities in the management of their systems is solely related to nutrients is also incorrect. There are a range of other parameters which must be addressed in the upgrade of treatment systems.
The argument that STP do not have a significant impact on downstream communities because of the overall impact of other nutrient sources neglects the impact of pollutants from STP on particular sections of receiving waters."

The Mid Goulburn Regional Water Authority (supported by other Urban Water Authorities in the catchment) contends:

"One issue is of serious concern - the longer term discharge from sewage treatment plants. The five year target of zero summer discharge or equivalent is reasonable and supported and will be met by Mid Goulburn. The 20 year target of full wastewater

reuse or equivalent is inappropriate and fails to satisfy the strategy objectives of cost effectiveness and equity. The cost of these works does not appear to have been included in the total strategy costs.

Comparing costs it would cost $25 M to remove the first 38 t of P ($660 kg P removed). To remove the next 10 t of P will cost a further $25 M ($2400/kg removed). Removal of the last 10 t is not cost effective."

MGRWB 80% can be removed for $4.5M; 100% for $15M

The Urban Water Authorities have also pointed out that the Northern Victorian Wastewater Management Strategic Plan (NVWMSP; Section 6.5 of the Draft) proposes a strategy to better manage STP discharges, and this is being discussed with the EPA. Adoption of this strategy may accelerate achievement of the proposed P reduction targets, currently indicated in the Draft Strategy, and would be an excellent result for the Water Quality Strategy and the catchment.

The REWQC position on this matter is:

Our emphasis is on global picture - all other things being equal, the sensible thing is to achieve nutrient reductions where it is cheapest. It makes sense for the catchment community, which has to fund the bulk of works, to spend its scarce resources in areas where we get the best result. We have been through an extensive process of identifying key nutrient sources and the cost of managing the outputs from these sources. Our process has shown that while STP are an important nutrient source, we stand to make the best gains, in terms of water quality improvements, from action to reduce nutrients from irrigation drains. Of course, other nutrient sources, including STP, will have to make improvements over the timescale proposed in this strategy.

If UWA can meet other water quality criteria set by EPA (BOD, SS, E. coli) and achieve substantial nutrient reduction (especially P), especially by implementing the NVWMSP, we contend this is an excellent result for the catchment. The REWQC is committed to ensuring that discharges, from any source, do not have significant adverse impacts on local waters, and has added this to the list of principles which will guide strategy implementation.

Tertiary treatment of sewage effluent may not give equivalent to full land disposal. It will probably only give 80-85% reduction. Effluent from a tertiary treatment plant will have TP <2 mg/L. Our concern is with nutrient loads. Climatic conditions in upper catchment rule out full land disposal as a sensible option. In these situations tertiary treatment is sensible.

Revise Action 6.1 - 5 year target - zero summer discharge or tertiary treatment to <2 mg/L TP (for the summer period).

Revise Action 6.2 - 20 year target - full wastewater reuse on land, or tertiary treatment of discharges to < 2 mg/L TP. This is to be an indicative target to be reviewed every 5 years - we don't have enough technical information to justify a hard

20 target. Five year reviews will allow us to look at feasibility, economics, relativity of importance of sources, etc.

New Action 6.6 Establish a 5 yearly review process to investigate the indicative 20 year target for the Sewage Treatment Plant Program..

New Action 6.7 Support adoption and implementation of the Northern Victorian Wastewater Management Strategy.

4.17 Program 7 Urban Stormwater

The Urban program does not recommend the retrofitting of stormwater treatment options. There are a range of complementary measures which minimise waste and reduce contamination of stormwater in the first place which could be recommended - this includes street sweeping. The high cost of traditional infrastructure improvements may provide the impetus to devise more creative alternatives.

The Shire of Moira is currently investigating its urban stormwater infrastructure and its impact on the environment.

Action 7.3 only includes the cost of preparing stormwater management plans. Costs of implementation are not included because management options are site specific and can only be determined after detailed investigation. Implementation of this action will give an unquantified improvement in nutrient loads, and will improve other water quality parameters, such as litter.

4.18 Program 8 Intensive Animal Industries

A detailed response from the Australian Trout and Salmon Farmers Association indicates that actual nutrient loads from fish farms is more likely to be in the range of 29 t of P and 113 t of N per year.

REWQC accepts these figures and accordingly Table 11 and Graph 3 are amended

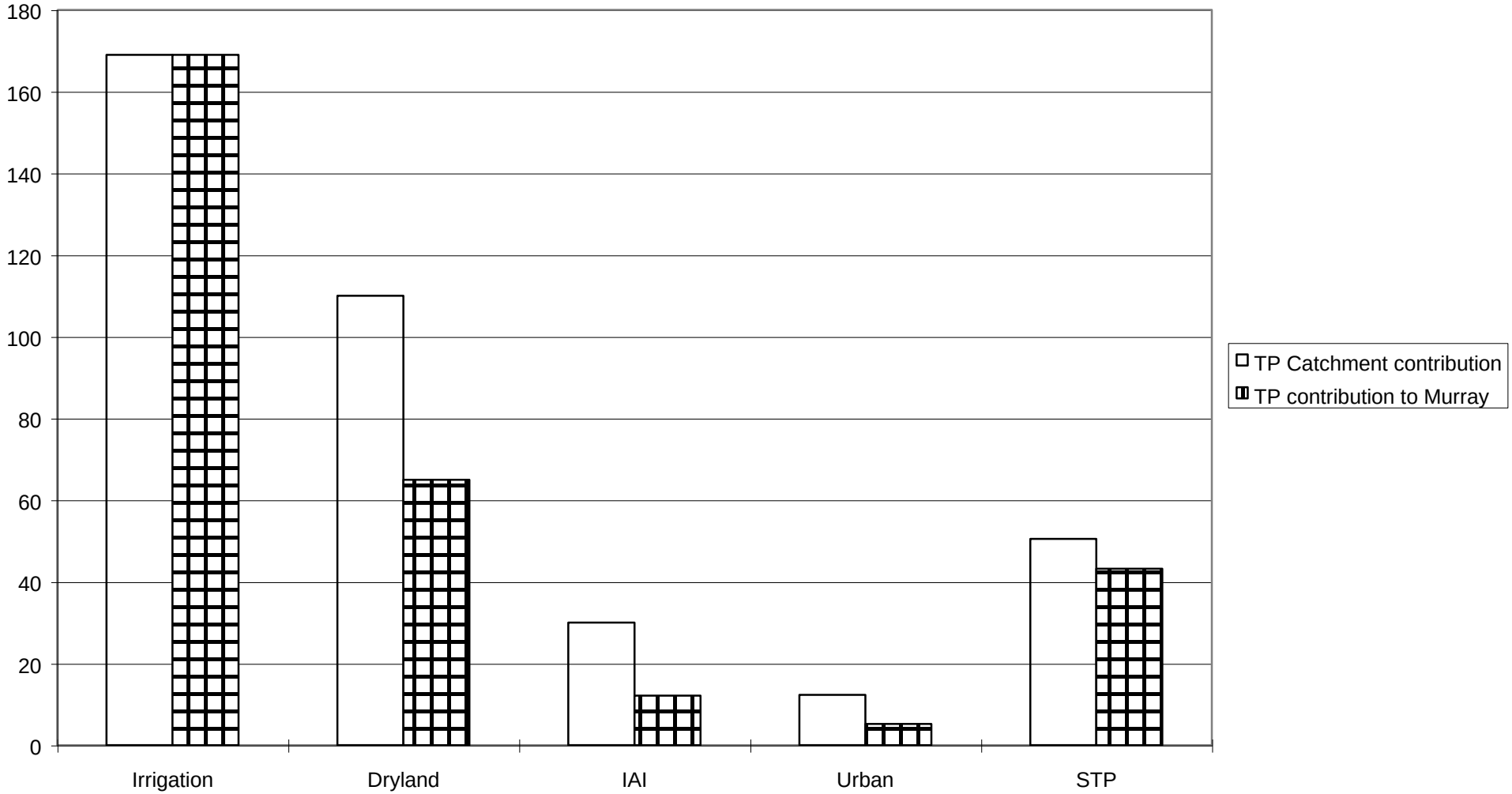
This emphasises the requirement for the industry to manage its nutrient loads. Once STP loads are managed, and we expect considerable improvements within about 5 years, nutrient loads from fish farms will be a very significant catchment source, which must be managed. REWQC will be looking to the industry to make significant improvements on current loads. The ATSGA response indicated that it is making this effort.

Revised Table 11:

Source	Total catchment contribution (tonnes)		Contribution to the Murray (tonnes)	
	TP	TN	TP	TN
Irrigation	169	619	169	619
Dryland	110	1866	65	1100
IAI	30	141	12.1	58
Urban	12.3	70	5.2	29.6
STP	50.5	184.5	43.2	158
Total	371.8	2880.5	294.5	1964.6

nutmurr.xls

Graph 3 - Goulburn Broken TP Sources and Contributions to the River Murray - "Typical" Year.



4.19 Program 9 Local Water Quality Issues

Septic tank problems at Colbinabbin have been brought to the attention of REWQC.

Amend Action 9.1 to include Colbinabbin

Priorities for Action 9.2 to include Broken Ck and Lake Benalla.

It has been argued that local water quality issues do not "qualify" for funding because they are simply local issues. However REWQC is of the view that these local issues represent, in toto, a significant regional water quality issue. Action to address local issues will lead to overall improvements in regional water quality.

New Action 9.3 - Implement actions to overcome local water quality issues.

4.20 Program 10 Other Water Quality Issues

The relationship between turbidity, suspended sediment levels and nutrients was raised in a number of submissions. This is addressed in Actions 5.19 and 5.20 and Sections 5.16 of this Addendum. Regional assessment of these other water quality parameters is required and should be done on a similar basis to the regional assessment of TP and TN as shown in Section 3.2 and Map 5 of the Draft Strategy. This assessment will form the basis for development of more detailed action plans to address additional water quality issues identified.

Action 10.5 Assess other water quality parameters on a catchment basis and present the results in a mapped format.

4.21 Program 11 Research and Investigation

It has been suggested that some attempt to set research priorities should have been made. Research issues are listed in Chapter 9 of the draft. The research priorities are reflected by the priorities for actions listed in Section 5.8 above.

4.22 Program 12 Monitoring and Evaluation and Reporting

GMW is the organisation responsible for monitoring nutrient loads from drains.

The REWQC accepts that monitoring of management of infrastructure (eg reuse systems) constructed to manage nutrients, is essential and is included in the scope of Action 12.4.

5. Physical Implementation Targets

The Table below outlines the physical implementation targets (or quantity of BMP) required over the life of the Strategy.

Program	Action	Quantity/target	Expected outcome.
Non structural	Adoption by developers of urban stormwater BMP	all new developments	unquantifiable reduction in potential nutrient loads.
	development of Local Area Plans	10+	
Irrigation	Drain diversion	extra 64 000 ML diverted	Approx 32 t of P removed from drains per year
	part of 4.1	128 large storages constructed (assumes 50 ML storage filled 10 times per year)	
	4.2	553 diversion licences metered	
	Increase rate of preparation of WFP	40 extra plans per yr	
	80% of irrigation farms with functioning reuse systems.	1360 extra functioning reuse systems installed.	109 kg TP/yr per system reduction to drain (potential)= 148 t (assuming 50% reuse)
	4.4 electric power to reuse pumps	1990 pumps	
	All dairy effluent systems managed in accord with best practice	100 farms	3 t TP reduction.
	Replace Broken Ck weirs	8	~15 t of P reduction
Dryland	5.1	550 km of filter strips installed.	Combined with 5.2 it is estimated that reduction of approx 29 t of TP will be achieved.
	5.2	Increase rate of implementation of river management works by 25%	
STP	6.1	Zero summer discharge at all plants	4.5 t TP reduction per year.
	6.2	Full wastewater reuse to land or equivalent at all plants	46 t TP reduction per year.
Urban Stormwater	Municipal Stormwater management strategies	all Shires	unquantified
Intensive Animal Industries - Fish Farms		All fish farms using BMP	unquantified

6. Costs of Strategy Implementation

Tables 10 and 10A of the Draft Strategy have been revised in light of suggested changes to costing and cost sharing. More detail on the cost sharing is shown in Appendix 5.

In summary the revised cost of strategy implementation is estimated as:

Table 10: Summary of Costs and Cost Share.

Program		Capital $,000 (discounted over 20 years @ 8%)					Capitalised O&M (discounted over 20 years @ 8%)				
		Total	FG	SG	Reg	Ind	FG	SG	Reg	Ind	Total
1	Coordination and community involvement	1552	600	600	375	0					
2	Community education	2560	543	543	461	1013					
3	Planing/non structural	1180	435	435	269	42					
4	Irrigation drainage	57459	7576	7576	641	43168				17419	17419
5	diffuse	17923	6140	6140	5642	0				3830	3830
6	Sewage	23529	3922	3922	15686	0			2450	2450	4901
7	Urban stormwater	758	262	262	233	0					
8	IAI	212	65	65	0	83					
9	Local issues	263	88	88	88	0					
10	other WQ issues	481	240	240	0	0					
11	Research and Investigation	14496	4832	4832	0	4817					
12	Monitoring evaluation and reporting	2383	725	1026	632	0					
Grand total		122796	25427	25729	24027	49123			2450	23699	26149
%			21	21	20	40				100	100
Total Cap+O&M		150470	25427	25729	26477	72837					
Tot %			16.9	17.1	17.6	48.4					

FG - Federal Government = Basin community and Australia (downstream communities)

SG - State Government

Region - Regional Catchment Community

Ind - individualss

Table 10A: - Costs and Proposed Cost Share

	Discounted Cost over 20 years.		
	4%	6%	8%
Capital	159	139	122
O&M	40	32	26
Total*	202	173	148
Cost share (%)			
FG	16.7	16.8	16.9
SG	16.9	17.0	17.1
Reg	18.8	18.2	17.6
Ind	47.6	48.1	48.4
Total Catchment contribution (Regional + ind)	60.4	66.3	66.0

* Note rounding errors.

7. What is now Underway

Since the preparation of the Strategy a number of important processes/studies have occurred. These activities are important from the perspective of Strategy implementation and highlight the importance the catchment community place of Strategy outcomes. Activities underway include:

Streamside Management

The Catchment Board is to oversee a Review of River Frontage Licences as a precursor to implementing reforms to the administration of these licences. The Goulburn catchment has been selected as one of two pilot areas to develop the methodology for the Study. The Review will result in improved management of river and stream frontages.

The Broken River catchment has been selected as a pilot for the development of an Index of Stream Condition. The pilot is now completed. Implementation of the index will give a picture of the environmental condition of streams in the catchment.

Irrigation drainage

Goulburn Murray Water - Central Goulburn Water Service Committee is developing and trialing methods of increasing the diversion of water from the Deakin Main Drain.

Urban Stormwater

The Shire of Moira has engaged consultants to prepare an Urban Drainage Strategy, which amongst other things will investigate stormwater quality issues and solutions in towns within the Shire. It is expected that Council will adopt development and implementation strategies which emphasis reduction of potential pollutants at their source.

8. Erratum

p17 Reference to Harris (1996). This should read **Harris (1994).**

9. References

Bormans M., Webster I. (1996). Modelling the Dynamics of the diatom Aulacoseria sp. and the Blue Green Anabaena in Relation to River Flow. CSIRO Centre for Environmental Mechanics Technical Report No 127.

Goulburn Broken Catchment and Land Protection Board. (1996). Catchment Strategy Draft and Addendum December 1996.

Goulburn Valley Environment Group. (1996). Farmer Attitudes to Riparian Area Protection: Fencing, Watering Systems and Management. Goulburn Broken Catchment. Goulburn Valley Environment Group.

Goulburn Valley Environment Group. (1996). Manage Your Banks.

Olley J. (ed). (1995). Sources of Suspended Sediment and Phosphorus to the Murrumbidgee River. CSIRO Division of Water Resources Consultancy Report No 95-32.

Rendell McGuckian (in association with Farmanco). (1996). Documentation of Best Management Practices for Nutrient Management in Dryland and Irrigated Agriculture. Consultant Report prepared for Department of Natural Resources and Environment.

10. Appendix 1 - List of Background Papers

Assessing Blue Green Algae Risks and Impacts in the Goulburn Broken Catchment - Discussion Paper. 1995.

Assessment of Water Quality Data Against EPA Preliminary Nutrient Guidelines. Feb 1996.

CMPS&F Environmental (b), (1995). Investigation of Nutrients from Urban Stormwater and Local Water Quality Issues in the Goulburn Broken Catchment. Issues Paper No 1. Goulburn Broken Water Quality Working Group. (Also 8 and 2 page summary).

CMPS&F Environmental (c), (1995). Dryland Diffuse Sources of Nutrients in the Goulburn Broken Catchment - Issues Paper No 2. Goulburn Broken Water Quality Working Group. (Also 8 and 2 page summary).

CMPS&F Environmental (d) (1995). Investigation of Nutrient Loads from Sewage Treatment Plants in the Goulburn Broken Catchment. Issues Paper No 4. Goulburn Broken Water Quality Working Group. (Also 8 and 2 page summary).

Cost of Strategy Implementation and Proposed Cost Sharing for Activities.

Cost Sharing Principles for Nutrient Control in the Goulburn Broken Catchment. 10 Nov 1995.

Cottingham P. (1994). Development of a Nutrient Management Strategy for the Goulburn and Broken Basins - Inception Report. Report No 113. State Water Laboratory.

Cottingham P., Amenta V., and Lidston J. (1995). The Occurrence of Algal Blooms and a Review of Nutrients in Surface Waters in the Goulburn and Broken River Basins. Water Ecoscience Report Number 36/95. ISBN 0 7306 8707 4.

Developing Cost Sharing Principles for Nutrient Management and Reduction - Workshop - VCAH Dookie. 22 September 1995.

Economic Analysis of Options Considered in Consultancies. August 1995.

Goulburn Broken Water Quality Project Summary/Register. June 1995.

Goulburn Broken Water Quality Strategy - Report of Second AEAM Workshop - 16 December 1993. Doug Small. 1994.

GH&D (1995). Nutrient Loads from Intensive Animal Industries in the Goulburn Broken Catchment - Issues Paper No 3. Goulburn Broken Water Quality Working Group. (Also 8 and 2 page summary).

HydroTechnology, (1995)(b). Nutrients in Irrigation Drainage Water in the Goulburn Broken Catchment - Issues Paper No 5. Goulburn Broken Water Quality Working Group. (Also 8 and 2 page summary).

Impact of Implementation of Management Options (The "With Scenario"). 1995.

Issues Paper Responses - Summary. 16 Nov 1995.

O'Shannassy K., Cottingham P., Dunn R., (1994). The Use of Decision Support Systems to assess Nutrient Export from the Goulburn Broken Basin. Water EcoScience.

O'Shannassy K. Background Paper. Evaluation of Nutrient Reduction Options (9 Jan 1996).

O'Shannassy K. Background Paper. Assessing the Preferred Strategy.

Relative Importance of In Stream Sediment Movement compared to other Diffuse Sources - Discussion Paper. 1995.

Setting Limits, Objectives and Priorities for Water Quality and Nutrient Management in the Goulburn Broken Catchment - Discussion Paper.

Sources of Nutrients in the River Murray from the Goulburn Broken Catchment. 1995.

The Do Nothing Scenario - Water Quality in the Goulburn Broken Catchment. 1995.

11. Appendix 2 - summary of Responses received and REWQC comments.

Responses to the Draft Goulburn Broken Water Quality Strategy.

Responses were received from:

Respondent No:	Name	Location
1	Lower Broken Ck Pumpers Association	Picola
2	Municipalities Against salinity of Northern Victoria (MASNV)	Shepparton
3	Fisheries Victoria (DNRE)	East Melbourne
4	Shire of Campaspe	Echuca
5	Mid Goulburn Regional Water Board	Seymour
6	Upper Goulburn Waterways	Yea
7	Morice Holland	Picola
8	Coliban Water	Bendigo
9	Broken Catchment Landcare Network	Benalla
10	Boweya Lake Rowan Landcare Group	Boweya/Lake Rowan
11	Broken Creek Improvement Landcare Group	Nathalia
12	Goulburn Broken Environmental Alliance	Shepparton
13	Goulburn and Broken River water Services Committees	
14	Rochester Water Services Committee	Rochester
15	Murray Valley Water Services Committee	
16	Australian Trout and Salmon Farmers' Association	Alexandra
17	Murray Darling Association	Albury
18	Local Government Catchment Project	Euroa
19	EPA NSW	Albury
20	Goulburn Valley Water	Shepparton
21	Irrigation Committee	Shepparton
22	Ovens Water	Wangaratta
23	Lower Goulburn Waterway Management Authority	Shepparton
24	Peter Kelliher	Girgarre
25	EPA Victoria	Melbourne
26	NRE	Melbourne
27	NRE Northern Irrigation Region	Tatura

Summary of Responses

Respondent No:		Summary of Response	Category	REWQC Response
1	1	entirely in agreement to have water in the creek (Broken) suitable for our and society in general to use safely	E	Endorsement
1	2	water quality problems in the lower Broken Creek is an overall catchment problem	A	Agree - fits in with local area plan approach in strategy..
1	3	Weirs should be retained and upgraded so as to control flows for irrigation and balance the water quality.	A	in line with strategy
1	4	drainage water should be restricted from entering the drains, thence Broken Ck, other than rainfall events.	A	Agree that this is the ultimate aim, but it isn't being achieved at present.
1	5	support incentives for farmers to construct reuse systems and incentives for pumps to divert drainage water.	E	endorsement of strategy
1	6	Seek representation on the Broken Ck Water Quality and Environmental Reference Committee	O	Refer to the Reference Committee for decision.
2	7	MASNV will be willing to work with the catchment board and the other organisations in the implementation of the strategy. MASNV supports the programs outlined in the strategy	E	Endorsement
2	8	A regional planing amendment will be unnecessary due to the inclusion in all planing schemes of suitable responses that address relevant nutrient management issues. New schemes are being developed. You will need to liaise with MASNV, LGCP and municipalities to ensure water quality issues are uniformly addressed.	C	Note - this requires a change in the strategy approach to fall in line with new proposals
2	9	Effectively addressing development proposals for nutrient impact will require timely and responsive technical advice to be fed into the planning process. development of appropriate assessment guidelines would greatly benefit the process.	A	Agree. BMPs need to be developed. Monitoring of implementation Is needed - discuss with local government how this might be achieved. An implementation issue.
2	10	Land capability information is a vital component of new planning schemes, but availability depends on funding.	I	implementation and funding issue
2	11	Support the development of performance based or differential rating system as a means of encouraging better land management. cost sharing implications need to be carefully examined.	N	Note. rating systems may be more relevant to GMW for drain management.
2	12	Point sources of urban stormwater to irrigation drains are recognised as contributors to the larger problem. COGS are looking at methods to reduce P loads leaving Merrigum and Moira Shire is looking at improved management of the Wunghnu stormwater system.	E	Endorsement. Shire of Moira is also developing an integrated urban stormwater management plan for all towns in the Shire. We encourage other shires to do the same (Action 7.3). Stormwater may be important for other water quality parameters and we encourage management of these.

2	13	Responsibility for Community Surface Drains appears to rest with local government for schemes rated under the Local Government Act. MASNV has some concerns with long term management of these drains and is keen to work with the Board to resolve these issues.	I	Note. Implementation issue.
2	14	Urban stormwater management will become a larger consideration in new subdivisions through the new planing schemes. Developments that are sensitive to water quality concerns will be encouraged.		See 2/12
2	15	In existing urban areas, MASNV agrees that non structural methods, especially education will be the key to reducing urban nutrient loads.	E	Endorsement
2	16	MASNV will encourage and work with shires on ways to reduce nutrient loads from septic tank served towns. The cost of upgrading septic systems on small communities must be kept in mind.	E/I	Endorsement and implementation issue
3	17	Measures in the strategy, while not top priority for fisheries management, are acknowledged as improving aquatic habitats and are endorsed by Victorian Fisheries. A number of directions are relevant for the protection and enhancement of instream habitats.	E	Endorsement
3	18	Would like to see more emphasis on frontage vegetation and stabilisation	C	Note. Highlight and endorse role of waterway managers. Done is Sec 6.4 - add to Sec 4.5 Program 5.
3	19	Considerable scope for input to strategy implementation from both Departmental staff involved in fisheries management and research from anglers. The Victorian Inland Fisheries Strategy offers a channel for communication.	I	implementation issue
3	20	Carp take advantage of degraded habitats and the most economical and effective carp control is habitat restoration and reestablishment of native fish species.	A	Agree that habitat restoration is important for nutrient management (filter/buffer strip). Link with 3/18 and CALPB Biodiversity Strategy.
4	21	Shire is well aware of the importance of good water quality.	E	Endorsement
4	22	The main area where Council can influence land use is through its planning controls. The new scheme due to go on exhibition in mid October will contain strict performance measures in relation to environmental issues such as off site drainage.	I	implementation issue
4	23	Council is also encouraging the preparation of whole farm plans which facilitate water reuse.	I	implementation issue
4	24	Council's Local Laws also impact on drainage and require that roads not be used as corridors for milking cows getting to and from the dairy.	N	Noted
4	25	Council is investigating the suitability of the "Patho Plains" (west of Echuca-not in GB catchment) for intensive animal industries.	N	Noted
4	26	Shire is currently investigating the overall quality of stormwater discharges to rivers and identifying steps to improve quality.	I	Implementation issue - seek further detail.
4	27	Council agrees in principle with the strategies put forward in the draft	E	Endorsement - funding an implementation issue.

		strategy. However it needs to be recognised that Council is constrained by funding.		
4	28	Action 3.2 - regional amendments will no longer be possible under proposed new planning provisions.		see 2/8
5	29	Overall, the Board consider the strategy sets out a pragmatic and appropriate approach to reducing nutrient loads. The Board specifically supports the following components (net listed here).	E	Endorsement
5	30	One issues is of serious concern - the longer term discharge from sewage treatment plants. The five year target of zero summer discharge or equivalent is reasonable and supported and will be met by Mid Goulburn. The 20 year target of full wastewater reuse or equivalent is inappropriate and fails to satisfy the strategy objectives of cost effectiveness and equity. The cost of these works does not appear to have been included in the total strategy costs. Comparing costs it would cost $25 M to remove the first 38 t of P ($660 kg P removed). To remove the next 10 t of P will cost a further $25 M ($2400/kg removed). Removal of the last 10 t is not cost effective. MGRWB 80% can be removed for $4.5M; 100% for $15M	C	Tertiary treatment may not give equivalent to full land disposal. It will probably only give 80-85% reduction. Effluent from a tertiary treatment plant will have TP <2 mg/L. Our concern is with nutrient loads. Climatic conditions in upper catchment rule out full land disposal as a sensible option. In these situations tertiary treatment is sensible. See also EPA comments 25/223. Revise - 5 year target - zero summer discharge or tertiary treatment to <2 mg/L TP (for the summer period). 20 year target - this is to be an indicative target to be reviewed every 5 years - we don't have enough technical information to justify a hard 20 target. 5 year reviews will allow us to look at feasibility, economics, relativity of importance of sources, etc. Need a review process. The smart thing is to achieve nutrient reductions where it is cheapest. Current indications from UWA are that in 5 years the 5 year target will be well exceeded and that they will have achieved something like 80+% of the 20 year target. Emphasis is on global picture. Costs of works were included in the total strategy costs. Costs were taken from the Issues Paper. Costings appear low because the works were pushed out to the end of the life of the strategy Affirmed by REWQC on 13/11.
5	31	In regard to equity, urban communities would be required to fund the removal of 96% of their P contribution, while irrigation farmers would only have to reduce loads by 50%. The reduction in loads from other sectors is even less.		
5	32	The Board believes the strategy should be amended to specify the long term objective should be the introduction of appropriate tertiary treatment to reduce P concentrations in any discharges to less than 2 mg/L and total loads from sewage plants should be reduce by a minimum of 80% over the next 20		see 5/31

		years.		
5	33	A BMP approach to targets setting is proposed. BMP is continually changing. Does the BMP apply for nutrient reduction activities or overall business profitability? This needs to be clarified and the establishment of concentration and load targets should have a high priority.	C	Agree that establishment of concentration and load targets should be a high priority. Loads are the target unless there is good reason to reduce concentrations. BMP are an evolving concept, not an absolute - what are BMPs today will not necessarily be next year or in 2010. BMP will always change and improve as we learn and adapt. We must not penalise early adopters who have implemented current BMP only to see the change later on. Action : need to resolve what is a reasonable adoption period. See 14/104
5	34	Irrigation drainage currently contributes 169 t of P and the strategy calls for this to be reduced by 50%. This is considered insufficient relative to other sectors and the need to reduce loads discharged to the River Murray.	N	We consider 50% of irrigation drain loads achievable. It is very difficult to compare irrigation drains with STP due to variables such as rainfall events, contributors, management, technology, etc.
5	35	Some activities proposed seem to have only minor relationship to water quality, and should be included in some other program. EG GIS storage tools, land capability mapping, catchment characteristics mapped and accessible.	N	These are important tools in helping monitor, publicise, implement and target the strategy. They are an important part of an integrated approach.
5	36	Mid Goulburn supports the adoption of the strategy(as amended). It would encourage REWQC to ensure funding is directed to programs that deliver tangible benefits and that coordination and other administrative costs are minimised.	E	Endorsement
5	37	Mid Goulburn is committed to upgrading its STP to reduce discharges of nutrients. The Board's program should reduce P loads from Board properties by over 80% over the next 5 years.	E	Endorsement
6	38	The adopted WQS will provide and important reference point and considerable support for this Authority's (UGWA) roles, functions and programs which are aimed at restoring and improving the stability and health of rivers and streams in the Upper Goulburn. The Authority's own Strategic Plan is compatible with the WQS.	E	Endorsement.
6	39	The WQS is heavily, and narrowly focussed toward nutrient management and should be called a Nutrient Management Strategy. This would form an integral part of an overall WQS addressing other WQ issues.	D/C	REWQC has dealt with this criticism before and have been quite up front about it (see P 7). We see the water quality strategy dealing with the big issues (nutrients) now, and then moving on to other water quality issues as listed in Section 3.7 and Action 1.10. The strategy does deal with turbidity via stream bed and bank stabilisation activities - this could perhaps be more explicit.
6	40	The Strategy focus has been given to irrigation areas. Insufficient emphasis has been given in the strategy text to the major nutrient load derived from the upper catchment dryland areas. Perhaps this is because of the complexity of the problem and the lack of hard data.	N	The major nutrient load in summer is from irrigation drains - in line with our principles we have therefore initially focussed on that source. We have recognised that the dryland is a major source, especially in winter in spring but these loads are usually tied up with very large flows and are therefore much more difficult to deal with, but we have emphasised more cost effective options. Lack of technical data has been a problem - strategy encourages more relevant research. *Have a look at the wording of the text*
6	41	River Management programs are a highly cost effective way of improving all		See 3/18

		aspects of water quality and river health. The benefits of these programs are acknowledged, yet they appear to get little recognition or prioiritisation in the overall strategy.		
6	42	Many of the programs in the WQS are already key priorities of WMAs.	E	Endorsement
6	43	Whilst the WQS does not address stream flow and flow management issues it must recognise and acknowledge these to be major issues that impact significantly on water quality. The fact that stream flow and flow management on major or minor streams is not addressed in any detail in the strategy is seen as a major deficiency that needs to be rectified as early as possible.	C	We clearly did not set out to address flow issues as we see these being dealt with via other processes. Flow management may have an impact on bank stability and thus may be dealt with as part of a process stabilising stream banks. Review flow issues as part of strategy implementation see 19/33. Impact of flows on stratification and BGA bloom formation needs investigation and has recently been reported on Bormanns/Jones
6	44	agree that appropriate non structural (planning measures) are a highly cost effective means of protecting water quality. This issue needs to be tackled as a matter of urgency.	E	Endorsement. Implementation
6	45	The document correctly, but very briefly, notes that dryland areas are the major source of nutrients entering waterways during late winter early spring. The strategy ... supports river and land management programs in the dryland to stabilise erosion. Given the size and erosion problems in the catchment the Authority believes that the funding requirements in the strategy to be understated.	I	Agree that the figures may be understated and should be reviewed as better information comes to hand..
6	46	Uncontrolled drainage and catchment clearing in dryland areas has led to an accelerated rate of inflow to our streams. Stronger emphasis and higher priority need to be given to institutional and legislative arrangements for the control and management of drainage activity. Drainage is one function being considered as an additional responsibility for WMAs.	I	Agree. Institutional arrangements are to be reviewed as part of implementation of the Regional Catchment Strategy.
6	47	Despite evidence and research that shows urban drainage not to be a major source of nutrients it is a vitally important program that needs to be addressed.	E	Endorsement. urban program does address the issue of stormwater, but only where it is cost effective.
6	48	Water quality monitoring programs are generally focussed on major streams. Waterwatch monitoring needs to be encouraged.	E	Endorsement
6	49	In Table 10 (summary of costs and cost sharing) it appears no account has been taken of the various stakeholder's ability and willingness to pay.	X	We developed cost sharing guidelines, and as well used guidelines developed at a State level. These guidelines take into account ability to pay issues along with responsibility to pay (polluter pays principle). We can however be sympathetic to circumstances.
6	50	The costings provided under Program 5.1 and 5.2 and Table 10 - Program 5 need to be more closely examined and further developed. The basis for the costings could well understate the extent of the problem. It is assumed the costs in the WQS are in addition to river management programs already existing.	C	see 6/45. The strategy costing did not include existing budgets - it should have
6	51	The current cost sharing basis for river management programs in the Upper Goulburn is not split evenly between the three parties (Fed/State/Local) as	E	endorsement. The proposed cost sharing for this program is split 1/3,1/3,1/3.

		suggested. The local community is currently contributing nearly 50% and the State 50%. The Federal Government is providing minimal input. This needs to be addressed.		
6	52	WMA have/are seeking approval to expand their districts to embrace all waterways in the catchment. This action should be strongly supported.	C/A	Agree
6	53	The WQS gives passing reference to the way WM programs improve many aspects of water quality, but fails to adequately address the broader benefits of these programs. Over the years WMAs have developed and worked to strategies for sub catchments, specific river reaches and waterway issues. These need to be integrated into an overall catchment based strategy for waterway management that aims to protect, restore and maintain a healthy ecologically sustainable river system.	N	Note - Broader aspects are recognised in cost sharing principles and in Section 4.1 - Objectives. This can also be included as part of a broader River and Water Strategy coming from the Regional Catchment Strategy.
6	54	The Board believes it is well placed to assist implementation of the WQS.	E	Endorsement
7	55	Carp in Broken Ck have been very bad for water quality and bank erosion.	N	Note
7	56	As more drainage water has reached Broken Ck water quality has deteriorated.	N	Note
7	57	The Muckatah Drainage Scheme has a lot to commend it for any future drainage schemes and should embrace retardation basins and reuse systems before the drain outfalls. Drains should be used to cater for flows resulting from rainfall events - not to take excess irrigation runoff. Reuse systems should be installed and incentives offered for installation of pumps	E	Endorsement
7	58	Shepparton Drains 11 and 12 are a real concern. They have a capacity of 2400 ML/day. Murray Valley Drain 13 also needs a good look at.	A	Agree. These are listed as priority catchments on P31
7	59	Dairy sheds, holding yards, etc near streams need to reviewed.	A	Agree. Review these
7	60	Irrigators need to understand they must make every effort to contain their irrigation run off and they need to plan how they will do this.	A	Agree
7	61	All weirs on Broken Ck should be renewed.	A	Support in principle, subject to further study, which may show that not all weirs need renewing.
8	62	Coliban Water agrees with the objectives and principles of the strategy, particularly those relating to implementation and cost effectiveness. The principles demonstrate a practical and sensible approach to achieving the objectives.	E	Endorsement.
8	63	Action Program 6 also appears sensible and realistic, especially in the acceptance that large investments and long time frames are needed by water authorities to achieve targets.	E	Endorsement
8	64	Cost sharing principles also appear reasonable, but it is a little difficult to determine why the stakeholder contribution for capital works for the identified P sources should range so greatly from 31% (urban stormwater) to 75% (irrigation drainage).	C	This (stormwater) program also has very little capital expenditure. Overall however, the different cost sharing splits reflect the degree of difficulty of implementing the program, what was considered as part of the strategy, together with the cost sharing principles.

8	65	In an overall sense the draft strategy is well presented and based on sound principles and sets some realistic targets. Its major weakness is the lack of any quantification of the benefits of spending something in the order of $147M on nutrient reduction.	E	Endorsement. Agree. See section 5.1 and action 1.17
9	66	We endorse the overall strategy and look forward to the support of the board to carry out all recommendations	E	Endorsement
9	67	Landowners are still relatively cash strapped and will be looking to the general community to help them implement works on ground.	A	Incentives are needed, and proposed in the Strategy, to accelerate works on the ground.
9	68	The fast deteriorating water quality of the Broken River, especially turbidity, would indicate that this strategy be finalised and implemented as soon as possible	E	Endorsement
10	69	Generally we thought the strategy was very thorough, however three items are raised for your consideration: • the control of streambank erosion due to wave action generated by speed boats • commercial harvesting of European Carp to aid reduction in numbers • if a waterway is fenced out to help improve water quality the farmer whose stock previously had free access to that water should not have to pay for stock water drawn from the now fenced water way.	C	Speed boat bank erosion - we don't think this is a major problem in the Goulburn Broken catchment. Carp harvesting - Goulburn Valley Environment Group has a NLP project underway looking at tis Waterway fencing - the issue of access to water is being addressed by GMW, GMW Water Service Committees, VFF and Water Bureau and AVRMA.
11	70	The release of the strategy is a major step in the right direction toward the control of nutrients entering waterways.	E	Endorsement
11	71	We strongly disagree with the strategy of using the Broken Ck as a giant recycle to reduce nutrient reaching the River Murray. This management strategy may contravene the Flora and Fauna Guarantee Act. The proposed new weirs will result in the need for less freshwater to be supplied to the creek and with the potential for less drainage water entering, there is a potential for concentration increases.	I	Implementation of Action 4.17 and other irrigation Program actions should result in less drainage water in the Ck. This will require more channel water being added to the creek system to satisfy irrigation demand. Other environmental aspects along Broken Ck are being dealt with via planning processes. Flow -> Stratification?
11	72	There is great potential to develop in line nutrient stripping into drainage channels.	N	Note. Current review of potential for nutrient removal from rural drainage systems using wetlands will give direction
11	73	Farmers should be made aware of incentives if the adoption of BMP are to be implemented.	A	Agree
12	74	Keen to be involved with the development of a worth while strategy which reflects the fundamental principles of cost sharing. The recognition that the polluter should also pay in an important tenet to be followed.	E	Endorsement
12	75	Wary about the employment of "Tradeable pollutant rights".	I	Details of tradeable pollution rights still to be developed - Action 3.10.
12	76	Limited stock grazing access to streams needs to gain coverage - the need is not mentioned.	A	Accept - helps stabilise banks. Should be part of BMP
12	77	Should also encourage a change in water management practices. More devotion to irrigation scheduling will mean less runoff. Farmers should	C	Accept encouraging change in water management practices. Do not agree that more devotion to irrigation scheduling will necessarily mean less runoff -

		avoid flood irrigation wherever practical. Water is the principle vector for nutrient movement.		scheduling only looks at when to apply water. Avoidance of flood irrigation is not practical in the Goulburn Valley.
12	78	Off stream watering systems should be "marketed" as part of the document - should rate highly.	A	Agree - part of the filter strip package.
12	79	Preference should be given to the maintenance of riparian zones rather than the employment of constructed buffer strips.	C	Change strategy. Agree. Leaving this out was an oversight - we need to manage what we've got as well as repair areas. Need to define buffer/filter strips. Mention review of WF occupations.
12	80	The importance of riparian biodiversity needs to be highlighted in the strategy. Stable waterways bed and banks will help reduce turbidity.	A	Agree. See 12/81
12	81	Water quality can be dealt with methodically, biodiversity can't wait. Greater attention to biodiversity could yield significant improvements in water quality.	C	Biodiversity being addressed in Regional Catchment Strategy. Looking for win win situations.
12	82	Should look at overall impact of GB catchment on the Murray River.		See Section 3.3 Table 9.
12	83	Prefer avoidance of the term BMP. What may now be BMP may not rate as such in the future.		See 5/33
12	84	Communication of the need for change does not rate highly enough	N	WQS is a document for change. Need to be clear who we are targeting. We have key players involved. Action 2.1 - Communication Strategy addresses this.
12	85	Strategy should concern other water quality parameters, not just N and P in the context of BGA blooms. The beneficial uses of some of the water resources in the catchment are limited by the elevated concentrations of other parameters and the presence of human pathogens.		See 6/39
12	86	Contend that catchment revegetation measures have the potential to provide for passive water quality protection. A change in catchment runoff could lead to reduced runoff. The focus of the document is too much on nutrients and avoids the issue of changed water use.	D	This was addressed by Charles Thompson during preparation of the Loddon Strategy. He looked at establishing perennial pasture over the entire catchment - this resulted in an estimated 10% reduction in nutrient loads. In the Goulburn Broken the dryland salinity management plan proposes establishing perennial pasture or trees on 90 000 ha of high recharge (5% of the dryland catchment). Assuming a 10% nutrient load reduction due to revegetation this would result in a catchment load reduction of approx 1% This will be useful but there are more important sources to concentrate on.
12	87	Document needs to consider nutrient export during periods of excess rainfall or drought. Reliance is placed on wet and dry years rather than such periods of excess flow or flow deficit.	N	We called wet years excess flow years and dry years flow deficit years.
13	88	Data is vague due to scale of maps	N	note - other information is available
13	89	drainage schemes will make it worse	N	noted
13	90	"large" volumes of biocides - too subjective - we have small amounts compared to other countries		
13	91	Forest land is just as much as source as other land	N	noted
13	92	too much water from irrigation is allowed to run off farms into drains - drains are not designed for this purpose and should only be used in an	A	agree

		emergency- better management is necessary		
13	93	irrigation areas are causing the problem. There is a need for more drains, farm plans with recycling dams and better management	E	agree, endorsement
13	94	hard and fast rules are not the answer. It needs good management , well advertised in a way which will inform farmers of methods to reduce the effects of water quality	E	endorsement
13	95	other catchments may not follow suit and place the Goulburn Broken at a disadvantage	E	endorsement
13	96	accept the need to set management rates but, a high level of publicity is necessary to make the public aware of better practices-this may be difficult	N	noted
13	97	dryland farmers should have a whole farm plan	E	endorsement
13	98	plans should be flexible to allow for changes in culture and drainage should be suitable	E	endorsement
13	99	higher catchment area need different types of plans and funding should be available as part of the strategy	E	endorsement
13	100	poorer operators on drains should be targeted - support for tariffs on drains to encourage use in times of high flow.	I	implementation issue
13	101	full support for dairy waste not to enter directly to drains - filter strips to be encouraged	E	endorsement
13	102	reafforestation with pines may have an effect on water resources and turbidity of water resulting from poor harvesting practices	N	noted
13	103	In carrying out the strategy the following points should be taken into consideration: flexibility education not force the economics will determine the success	E	note, endorsement
14	104	Who decides what are best management practices? Lowering of P loads by whatever means should be acceptable.	C	Change - need a process to review BMP - a BMP Coordination and Review Committee (or is this a role for REWQC or TSG)? BMP currently decided by evolving industry best practice - see earlier comments 5/33
14	105	A major consultation program should take place during development of Program 3	E	endorsement - process proposed in strategy
14	106	GMW should be the responsible body for monitoring drains for nutrient loads and establishing the source of supply [of these nutrients].	A/X	Responsibility for monitoring goes with management responsibility - cost an issue
14	107	Standards need to be developed for filter strips. Unless they are adequate they will not work.	I	Agree - implementation and research issue and need to develop BMP
14	108	Tradeable pollution rights should be retained in the same drainage system.	I	Consider as part of developing tradeable pollution rights
14	109	The cost of the strategy is an added cost to the viability of the area. Revenue from production would have to increase considerably to cover costs		What are they saying?

15	110	Response to the strategy has been positive and supportive of implementation programs. The strategy will bring positive community support and awareness of future water quality issues. Recommend that the strategy be implemented and offers its support to the strategy in any way possible.	E	endorsement
15	111	Of particular concern to Murray Valley is the fact that Broken CK features at the top of exceedence of guidelines for TN and TP.	N	note
15	112	Murray Valley WSC can play an important role in implementation of Program 4 Irrigation Drainage.	E	support and endorsement
16	113	Calculation of nutrient loads - more likely to be 29 t of P and 113 t of N per annum	C	accept this - change figures accordingly
16	114	Concerned about emphasis on fish farms- it seems inconsistent that fish farms should warrant special attention. See response for further detailed argument.	D	Fish farms are a small but significant source. Accepting the figures presented by industry indicates the source has potential to be the third most significant source after drains and dryland once STP implement changes. Fish farms are not being singled out - they are being asked to adopt BMP; the same as other sectors.
16	115	Fish farmers must do everything in their power to protect rivers in the catchment and the development of fish farms must be tightly controlled but appropriately controlled. We believe legislative control of water extraction and limitations on the concentrations of nutrients returned to water gives the regulating body all the power it needs to control nutrient loads from fish farms. Less emphasis needs to be accorded to on farm management issues such as feed conversion rations, water treatment designs, feed quality, maximum allowable production etc.	C	WE are looking for load management.
16	116	The industry must: continue to improve the quality of fish feed. management practices must be reviewed and a Code of Practice based on BMP should be prepared. use overseas experience as a guide bring together fish farmers for education sessions new licences should only be issued to operators who have experience or training in aquaculture undertake research to eliminate confusion relating to the potential increases of production in the Goulburn Broken involve the EPA in working to settle problems with licences and enforcement. Also attached a copy of a submission to the Victorian Aquaculture Strategy Discussion Paper.	E	Agree and welcome this statement from the industry
17	117	The MDA is concerned not only by the high costs involved with the strategy, but the capacity of all the players to finance the proposed schemes is not addressed in the document		see 6/49

17	118	The role of nutrients in stream ecology must be better understood before committing large financial investment	E	Endorsement. We've recognised this - see implementation principles, but we must act now and adapt as we learn
17	119	The cost effectiveness of the strategy is based on BGA effects- the causes and effects of BGA are still unclear and need further research.		see principles. Strategy recognises uncertainty and need for adaptive management.
17	120	The effect of carp is noted but is not considered in the strategy. While the research on carp is on going, there is enough evidence that their feeding habits mus have an impact on nutrient loads.		see Action 10.1, Section 3.7. Awaiting research results.
17	121	MDA believes there is still a question mark over the causes of BGA blooms. Other causes (other than P) have been identified		see 17/119
17	122	Strongly support the need for community involvement, especially in education and awareness.	E	Endorsement
17	123	MDA is a strong advocate for the treatment of stormwater and wastewater to acceptable levels before returning them to our waterways.	E	Endorsement
17	124	MDA acknowledges the long term objectives and supports the aims of managing our waterways to improve water quality.	E	Endorsement
18	125	Action 3.1 and 3.2 - regional amendments may not be possible due to proposed changes in planing schemes. Regional amendments have often been implemented as local amendments		See 2/8
18	126	Action 7.4 needs clarification - local government does not have the resources to carry out a monitoring role, but where it has a demonstrated problem it would certainly be involved.		LG has an important role in managing stormwater, therefore it must have an important role in monitoring impacts.
18	127	Action 3.12 - rating concessions investigations is not feasible.		See
18	128	Other actions that list municipalities as responsible agents (3.3, 7.2, 7.3,8.1,8.3,9.5) are reasonable, but they will be constrained by the resources available.	N	Note
18	129	Congratulations on a well presented document. I found it concise, logical and easy to use.	E	Endorsement
19	130	Possibly include reference to MDBC Natural Resource Management Strategy and Salinity and Drainage Strategies	C	Check and use if relevant
19	131	The evidence, for which of the two major macronutrients (P and N) limit phytoplankton growth is still equivocal ... the picture is more complex than previously thought.	N	Agree, but until the picture is completely clear, we are comfortable with the strategy direction. See also 17/119
19	132	Information on the number of blue green and non blue green algal blooms would improve the clarity of Section 3.1.	N	Refer to Inception Report
19	133	There is limited discussion on the links between flow and water quality. Given that the strategy intends to deal with other water quality issues in a later process it is suggested that looking at the impacts of flows, at least from a water quality perspective should be pursued in the strategy.	C	See previous comments on flows. refer 6/43 this was the basis of UGWA comment
19	134	Inclusion of water quality monitoring sites along the Murray is an important	N	We know our contributions to the Murray. MDBC are monitoring at Yarrawonga

		part of the Strategy.		and Torrumbarry.
19	135	The Strategy would benefit from listing all water quality monitoring variables that are measured at sites.	N	Refer Background Papers.
19	136	It is recommended that the Strategy list the site names that have been assessed in Table 6. It would be beneficial to note if the same data sets have been used in Tables 2, 3 and 6.	N	Refer Background Papers.
19	137	The Strategy would benefit from inclusion of the location of major storages and irrigation drain monitoring points, in map form, possibly on Map 4.	C	Some drain monitoring sites were missed on Map 4. Details of sites is listed in Issues Paper 5.
19	138	Inclusion of water quality data indicating the condition of the River Murray, upstream and downstream of the Goulburn River and Broken Ck entry points is recommended.	N	This data does not exist, but might be useful. Request MDBC to consider this.
19	139	Inclusion of trend analysis information for McCoys and Rices Weir sites may help clarify nutrient trends.	C	Good idea. These two sites have a long length of record. Ask MDBC to supply.
19	140	Time frames for Graph 2 and Table 9 differ. Recommend include coverage of the same time frame if possible.	C	Agree. I did not have the data in this format when the Strategy was prepared. Ask Peter Cottingham if he has the Graph 2 data in monthly format. The data prepared by Peter up to 1990 was derived from regression equations. Data post 1990 is from Rowan Barling reports on drain monitoring and is derived from flow/concentration records. Where the data does overlap there are substantial differences, which is why I didn't use it in the strategy.
19	141	Graph 2 indicates that there is an increase in TP load between 1983 to 1992. However later data or data earlier than 1983 is not included in this graph and may help explain this matter.	C	Data does not exist pre 1983. Graph certainly appears to show an increase, but this may be due to increased flows or some other factor. The graph probably should include annual flows. The point of the Graph was to show the variability of nutrient loads, but a number of people have commented on the apparent increasing trend. See 19/140
19	142	The importance of the strategy for the River Murray would be enhanced by inclusion of load data from sites along the Murray, and specifically above and below junctions of Goulburn and Broken Ck.	N	As noted above data at river junctions is not available. We have information about loads in the Murray at Torrumbarry, and load data could be easily produced for Yarrawonga but we specifically did not include information about loads in the Murray as we feel these would only cloud discussion. P does not behave in a conservative manner.
19	143	Including data on sediment load within the Murray at Echuca would also be beneficial. This highlights the importance of floods in sediment transport.	N/I	Sediment load work is mentioned in Section 3.7. Importance of floods (major flow events) in moving sediment and nutrients is acknowledged in Issues Papers and Background papers. Issue is briefly addressed in Section 6.4. We need to check on the fate of nutrients in sediments- current research via NEMP will answer this question
19	144	The strategy appears to concentrate heavily on nutrients and only devotes pages 25 and 26 to discussion of other water quality issues. It is important that there be more discussion of these water quality variables.		see 6/39
19	145	Also water quality improvement options can reduce more than one water quality problem at a time.	E	Refer to discussion in Sec 4.1

19	146	The strategy would also benefit by including 1. information of condition of waterways in terms of salinity and turbidity 2. discussion on the issue of salinity management plans 3. brief assessment of past and present biocide monitoring 4. assessment of bacteria and viral data available 5. water quality indicating the decline in pH 6. some discussion on biochemical and chemical oxygen demand.	N	Have purposefully not included this detailed information (if it is available); which isn't to say its not important , just that we focussed on BGA and P
19	147	Inclusion of preliminary benchmarks using data from McCoys Bridge and Broken Ck may be of value.	C	Good idea. May not include these in final strategy but should be developed quickly.
19	148	It is not apparent how improved measures of nutrient load estimation will occur.	C	Refer to Review of VWQMN
19	149	Document would benefit from discussion on how nutrient loads can be potentially reduced by upgrading weirs on Broken Ck	A/C	Agree.
19	150	Page 32 ...Research in Murrumbidgee indicates subsoil gully erosion in the upper tributaries to be a major source of sediment and nutrients to waterways. This empathises the need for greater discussion on the water turbidity issue and inter relationships with nutrients.	C	Have another look at Section 6.4 and 3.7. However this is unlikely to change the Strategy direction for dryland sources. NEMP research will also address this.
19	151	EPA NSW commends the broad range of initiatives and actions included in the Strategy	E	endorsement
19	152	to improve community ownership and awareness it is recommended the Annual Report be circulated to MDBC and to cross border authorities.	A	Agree. This already occurs. See action 1.7. "Community " can be very broadly interpreted.
19	153	The strategy includes nutrient management into whole farm planing. Turbidity, salinity and pesticide management should also be included.	I	Liaise with Farmsmart
19	154	The action Tables may be improved by including goals and performance indicators. The use of performance indicators will improve assessment and review of the strategy.	C	The adoption of BMP is the performance indicator. Need a specific table showing what adoption levels we are seeking.
19	155	The strategy would be easier to understand by including information on the location of Murray Valley Drain 6 and Deakin Drains	N	Refer to Issues Paper 5.
19	156	Graph 4. It may be useful to consider other pollutants such as turbidity, pesticides, BOD and salinity that can be reduced by these programmed works. Some of the costs for TP reduction can be apportioned to reductions in these other parameters and the costs for TP reduction reduced.	D	The point of the exercise was to asses the relative cost effectiveness of TP/TN reduction and to ensure that we focussed on works which are cost effective for TP management. It was difficult enough to get information about cost effectiveness of TP/TN reduction without going to other parameters.
20	157	While not directly represented, the Working Group was open to GVW views and we felt these were noted during the process. We also commend your efforts in attempting to produce a viable, workable strategy.	E	Endorsement.
20	158	GVW has committed to substantially reducing P levels in our discharges. Experts in the field are clearly indicating P should be reduced in preference to N in freshwater systems. We concur with this view. We note the strategy focuses on P reductions.	E	endorsement

20	159	GVW supports the strategy to achieve zero summer discharge (or equivalent) for sewage treatment plants. The 20 year target is also endorsed. Water authorities are already well advanced to achieving these targets.	E	endorsement, but subject to clarification of what this actually means - see earlier comment.
20	160	GVW supports a greater accountability for irrigation drainage outputs and agrees with the strategy's thrust to appoint a responsible authority for management of irrigation drainage.	EC	Endorsement. Change Strategy - resolve management responsibilities for Community Surface Drains. Action 4.8 to include CSD
20	161	Other water quality issues (turbidity, biocides, etc) need to be addressed systematically in the near future or otherwise the catchment community will focus only on the major issues looked at to date. Turbidity also warrants a regional assessment.	E	Endorsement. It is possible to produce a map showing regional assessment of turbidity along with other WQ parameters (see 19/146).
20	162	It is essential to ensure all major players in the catchment contribute to nutrient monitoring in areas where these impacts may occur. This data is fundamental to measuring whether expenditure on nutrient control is having any effect. Absence of such data may also lead to inequities in sharing the cost for nutrient control.	A	Agree.
20	163	The coordination of data gathering is an important component in the monitoring program. The strategy indicates this will be carried out by the REWQC. GVW supports this.	E	Endorsement.
20	164	Important to support research to understand the nature of nutrient reductions required so that money is best targeted.	E	Endorsement
20	165	... this raises issues of adequacy of BMP and the mechanisms to ensure BMP are adopted. There is no certainty that BMP adoption will result in nutrient reduction.	E	Highlights need for monitoring, adaptive management and regular strategy review.
20	166	It is important that the strategy is able to be reviewed and adapted to current research information.	A	Agree. Action 1.8 addresses this.
20	167	GVW strongly endorses the view that waste minimisation at source is very desirable.	E	Endorsement
20	168	GVW also supports the strategy of waste minimisation in domestic premises.	E	endorsement
20	169	Communicating the strategy is crucial to its implementation. Focus must be placed on communicating the strategy to rural landholders and municipalities.		See response
21	170	Many of the aspects of this strategy link into the implementation of the Shepparton Irrigation Region Land & Water Salinity Management Plan. It is essential that there is close co-operation between the various groups implementing the SIRLWSMP and whatever procedures are put in place to implement the Nutrient Management Strategy. **This is not addressed in the strategy and as implementation is already occurring these formal links need to be put in place as a matter of urgency.**	I	Partly covered in Action 1.1 and 1.2 although exactly how this will work is still to be determined.

21	171	**PART A** This is generally a good succinct introduction to the issues.	E	
21	172	**Chapter 1** We strongly endorse the importance of the irrigation region in the catchment.	E	
21	173	**Chapter 3** "Black water event": there appears to be no evidence that this might not have occurred under natural conditions.	N	
21	174	In general, we would endorse the principles outlined in Section 4.1. However, the following qualifications are suggested: i)Where deliberate illegal discharge of effluent occurs (such as wastewater or dairy effluent) then regulations should be enforced. ii)Sub-catchment communities should be asked to **play a lead role** in the preparation and implementation of local plans for nutrient management. iii)In some cases within the catchment winter loads are important. iv)What is a non structural measure? Incentives and extension/education would also apply here.	C	1 Change 2 current wording looks OK to me 3 review wording of summer nutrient load section to ensure this point is picked up 4 incentives and extension are often about actively getting works on the ground. Non structural measures will achieve results passively.
21	175	We support the implementation timeframe of 20 years and would like to see an acceleration if possible. However, there will be an ongoing requirement for extension, research, monitoring and regulation after the 20 year implementation period to ensure that the gains are maintained.	C	Good point needs to be recognised up front
21	176	Irrigation Committee endorses the concept of an integrated strategy with defined targets as described. We strongly endorse the requirement for a long term commitment from **all** sectors of the community.	E	
21	177	The document needs to recognise that a lot of the improvement in irrigation management, which is necessary for reducing the nutrient contribution from the irrigation region , is already happening with encouragement from the salinity program.	C	Agree
21	178	The overview might be best rephrased as follows. "Reducing nutrient loads from irrigation drains as farmers **continue** to adopt farm reuse systems, **improved irrigation management** and drain diversion and **G-MW continues to improve channel system management".**	C	Accept
21	179	We would endorse the concept of priority actions and agree with those listed in the draft strategy.	E	
21	180	There are a number of quite large tasks with the cost defined as `cost met elsewhere'. The `elsewhere' needs to be defined to ensure that it will, in fact, be agreed to by the bearer of the cost. The cost in fact may be elsewhere in the nutrient strategy. This should be defined.	?	

21	181	**Program 1:** Coordination and Community Involvement The role of Irrigation, Dryland and Public Lands Committees in the Actions 1.1 and 1.2 is unclear and there is no indication as to how these issues will be resolved.	I	see 21/170
21	182	There needs to be some consideration, probably in this section, about how research will be initiated and conducted and what it will cost. Perhaps as a starting figure the existing level of research will at least need to be maintained.		
21	183	There needs to be some consideration of who has responsibility for action if an algal bloom occurs (even if it is just restating what occurs) at present.	C	include a para on this
21	184	We endorse the proposal to expand the existing community education systems to include nutrient management. In relation to Action 2.7 you should recognise existing systems and develop these - don't set up new ones.	C	This is our intention - see principles; change wording
21	185	We endorse the actions and sentiments expressed in this Section.(3) The whole farm planning process in irrigation areas **already** takes into account nutrient management issues.	E	?
21	186	The strategy needs to recognise that while planning provides the framework for best practice - management is still the key.	N	
21	187	Irrigation Committee strongly endorses the actions targeted under this section (4 irrigation drainage) as we see success in this area is critical to the continued implementation of our surface drainage strategy.	E	
21	188	Most of the proposals are complementary to our program for implementing the land and water salinity management plan. The implementation of both strategies will need to be fully linked.	E	See 21/170
21	189	Irrigation Committee has already adopted a policy that all properties which outfall directly to a river or stream should outfall through a reuse system and a well constructed and maintained outfall.	N	
21	190	The strategy needs to outline the major improvements in regional drain design and construction that have already occurred and will continue to occur which minimise nutrient outfall from the regional drainage system (reduced level of service, retardation basins, wetland design).	C	Worth mentioning see p 69. Perhaps there is a need for a section on what is happening - this could be done in Part C.
21	191	The cost of reuse systems and drainage diversion **will** be an impediment to their construction. However, in enough cases the benefits will outweigh the cost.	N	Need more information to be sure about this.
21	192	The strategy needs to talk about the potential difficulty in increasing diversion whilst implementing the sub-surface drainage program of the SIRLWSMP.	C	Indirectly covered on p30,31,32
21	193	Action 4.3 Increasing the number of whole farm plans by 25% will require an increased	N	We've costed tis at $250K/yr

		expenditure of at least $200,000/year		
21	194	Action 4.4A Effective management of reuse systems will require **development** and extension of best practice **as well as** provision of electric power.		
21	195	Action 4.5 Dairy Effluent - extension **and enforcement** are required.	C	let's be up front about enforcement
21	196	Action 4.16 Need to develop a method of handling a blue green algae outbreak if it does occur in a reuse system.	N	Partly covered in 4.16
21	197	**Programs 5-8** Irrigation Committee endorses these programs.	E	
21	198	**Program 9** - Local Water Quality issues Irrigation Committee endorses the targeting of local water quality issues as a very important part of our strategy. Broken Creek is mentioned in the text but not in the actions. There should be a specific action for Broken Creek.	EC	Broken Ck issue should have been included in Action 9.2
21	199	Should we include the activities of the Waterway Management Authorities in the Goulburn River and Broken River in this section (Section 9)? How do you include the apparent widening charter of these authorities into this strategy.	N	It just happens that BRMA is conducting the Lake Benalla study and it is appropriate the BRMA complete it.
21	200	**Program 10** - Other water quality issues. This should include some consideration of the sodium absorption ratio and the issue of transmission of animal disease organisms.	N	The intent of this section is to investigate issues covered in Section 3.7. SAR is a new issue
21	201	**Program 11** - Research and Investigation Irrigation Committee supports a strong R&I component for the strategy	E	
21	202	**Program 12** - Monitoring The strategy needs to incorporate additional monitoring within the drainage system. This will cost. How should this be funded? The strategy needs to develop a policy on the intensity of monitoring.	I	IC/REWQC working on this now
21	203	Action 12.4 Monitor adoption - needs to be linked with the SIRLWSMP monitoring which already co-operates with G-MW	I	Strongly agree
21	204	**Chapter 5** The Irrigation Committee reinforces the importance of having a sound basis for cost sharing in the strategy and generally endorses the principles outlined in this chapter. However we, need more information on individual parts of the cost share formula to comment in more detail on this section	N	See background papers
21	205	**Chapter 6** It is worth noting the tremendous investment of $162.6 million by the	N	

		irrigation community in improved land and water management in the first 6 years of the implementation of the SIRLWSMP. This has happened because they have been involved in identifying the issues, the solutions and how they should be implemented. Most of the expenditure has been directed to better and more efficient use of land and water. This type of activity will continue and will have a major impact on reducing nutrient outflow from the SIR. It is important to highlight again that the surface drainage strategy proposes a very different drainage system to that which is already in place.		
21	206	**Chapter 7** There is a strong need to have one set of best management practices for irrigators. These should incorporate those that relate to salinity control, productivity **and** nutrient management. If each group comes up with a different set of BMPs there will be a great deal of confusion and consequent reduced adoption. It is also important to note that rising watertables and salinity is still the most important issue to this catchment, environmentally and from a production point of view. The salinity plan whilst needing to be cognisant of nutrient implications, still needs to be the major concern.	N	See 5/33, 14/104
21	207	**Chapter 8** The Irrigation Committee endorses the strategy to adopt the 'preferred strategy' as the most realistic option.	E	
21	208	**Chapter 9** - R&I This would be better if some attempt to set priorities was made. However, this is probably an issue that needs to be done on a catchment basis considering the other research priorities **and** involving the catchment community.	C	Priorities need to be set for program activities H, M, L or A, B, C
21	209	In conclusion the Irrigation Committee believes that in general the nutrient management strategy as defined in the draft document is an excellent base. It is absolutely imperative that implementation be co-ordinated with the implementation of the SIRLWSMP. It is particularly important that change in attitude and farm practice is tackled in a co-ordinated manner. My Committee is committed to shouldering the responsibility for seeing this done in the SIR.	E	
22	210	The document is very welcome as it is the first time an overall picture is available of the overall nutrient sources in the Goulburn Broken	E	
22	211	The objectives for STP to obtain zero summer discharge within 5 years and to obtain a zero discharge or equivalent within 20 years is supported by Ovens Water and we consider this target to be achievable.	E	
22	212	The strategy would appear to be at odds with the current Government direction and we believe this is an issue which needs to be addressed in view	N	see 5/30

		of the significant financial implications for Ovens Water.		
22	213	Ovens Water will continue to work towards full reuse to land or equivalent at Benalla and Yarrawonga, however clarification of the time frame has been raised as a significant issue.	N	
22	214	At Benalla we are currently revisiting the options which are available through a community consultation process. We shall advise you in due course of the outcomes of this program.	N	
23	215	LGWMA looks forward to playing a key role in implementation of this strategy. We believe that close working relationships need to be developed and maintained between the CALPB, its committees and other natural resource managers.	E	
23	216	The feed back on the strategy was covered by other organisations as noted in the REWQC meeting papers for meeting of 13/11/96.	N	
23	217	LGWMA supports the general thrust of the strategy. However there are other important and interrelated issues in the context of river environment and water quality which need to be integrated into an overall catchment based strategy for waterway management.	E	
24	218	Page 13, Column 1 - suggest add "This area includes the Puckapunyal Army Range where remnant live ordinance has impeded reclamation to perennial species.	?	
25	219	I note that the strategy initially focuses on nutrient issues and that other water quality issues will be tackled over time. EPA supports the need to develop more detailed action plans for the range of additional water quality issues identified .	E	
25	220	EPA supports the general thrust of the document. The approach of development and adoption of BMP is consistent with that advocated by EPA. There are a number of matters which should be further developed before the strategy is endorsed: status of SEPP EPA role consistency with Government policy	EC	
25	221	The SEPP (WOV) is referred to as one of a range of policies the WQS has considered. However SEPP (WOV) differs from the other strategies listed on page 13 - SEPP express in law the community's expectations, needs and priorities for using and protecting the environment.	C	Amend to reflect suggested wording in response.
25	222	EPA role - within the detail of the recommendations there are statements that EPA should have a primary responsibility to identify and register point sources discharging to drains and develop action plans (4.6); that institutional arrangements for responsibilities for drain management should be resolved (4.8) and that point source discharges should be reviewed (5.3).	N	EPA is probably the only organisation which can actually carry out these actions, esp 4.6 and 5.3. It is also closely involved with GMW in resolving 4.8

		These recommendations should be reviewed. EPA does not manage natural resources. GMW has responsibility for the management of the irrigation system.		
25	223	Consistency with Government Policy. The Government has accepted the recommendations in the Working Group Report on Effluent Standards and Compliance for Waterways. In the forward to the report the Government advised it would be looking for considerable improvement in water authorities environmental performance over the next 3 to 5 years. ...In addition the report required the development of a position paper on effluent management. EPA Publication 473 Managing Sewage Discharges to Inland Waters proposes that existing plants which plan to continue to discharge to waterways (after having demonstrated that discharge to land is not practical or environmentaly beneficial) should upgrade treatment within 5 years. Minimum standards for effluent quality are proposed. The timescale of twenty years for the upgrade of STP is therefore not acceptable. The premise that investment by the water authorities in the management of their systems is solely related to nutrients is also incorrect. There are a range of other parameters which must be addressed in the upgrade of treatment systems. The argument that STP do not have a significant impact on downstream communities because of the overall impact of other nutrient sources neglects the impact of pollutants from STP on particular sections of receiving waters.	N	see 5/30
25	224	The concentration on reducing the supply of nutrients P and N is a reasonable strategic approach. The focus on P does not preclude the management of all pollutants, including N. This is a matter of continuing discussion and negotiation between EPA and a range of stakeholders.	N	REWQC needs to be included in these discussions.
25	225	EPA agrees with the assessment of a range of other water quality parameters and looks forward to input to the development of strategies to improve water quality.	E	
25	226	EPA supports in general the principles outlined, including the BMP approach. Further work needs to be done to monitor adoption of BMP and implement other recommendations in the Strategy. There is scope to manipulate the levels of cost effectiveness through eh use of incentives and other tools.	E	
25	227	What is meant by a “range of other regulatory measures will be considered”		
25	228	The time frame for strategy implementation is noted. however Govt policy has identified a more rigorous time frame for STP. This should be reflected in the implementation program.	N	See earlier comments 5/30
25	229	The identification of the importance of non structural instruments is strongly	E	

		supported. Significant aspects of review of planning schemes provide opportunities to assist in implementing the strategy.		
25	230	There are many uncertainties associated with eh introduction of a tradeable pollution rights scheme and it is far from clear whether a scheme for nutrients is feasible or desirable. Any such scheme would need to be established under the EP Act.	I	Note - our intention is to thoroughly investigate the idea before moving towards implementation.
25	231	How is the strategy to ensure that all installed farm reuse systems are used optimally. Is there a need for an audit role and who will do it?	I	Audit is an idea worth pursuing
25	232	The reference to point source discharges to drain is unclear (p31). There is a range of issues and organisations associated with management of these different potential pollutants. EPA does not manage drains. This point and the recommendations arising from it need further consultation and clarification.	N	See action 4.6
25	233	Program 6 Timeframe - see previous point		
25	234	Program 7 refers to the use of natural wetlands for stormwater treatment. This needs to be carefully managed and monitored to ensure there is no degradation of existing wetlands.	N	
25	235	The Urban program does not recommend the retrofitting of stormwater treatment options. There are a range of complementary measures which minimise waste and reduce contamination of stormwater in the first place which could be recommended - this includes street sweeping. The high cost of traditional infrastructure improvements may provide the impetus to devise more creative alternatives.	C	Consider adding this point
25	236	The management of sullage and septic tank effluent (p 33/34) is the responsibility of local government. Local government also has responsibilities to ensure that planing amendments and subdivisions create blocks which are able to contain waste on site, if a sewer is not available. The community has to deal with adverse offsite impacts where these responsibilities have not been met in the past.	N	
25	237	p35 suggests that point source dischargers should monitor their contribution and report their results to REWQC. This needs further consideration in terms of identity of those contributors, the level of monitoring required and the cost.	I	implementation/reporting issue
25	238	How are measures of adoption of BMP on private land to be reported? p35 This section needs elaboration.	I	see action 12.4
25	239	The Chapter on cost sharing provides useful models for further discussion. EPA's approach is based on polluter pays	N	
25	240	Action 4.5 primary responsibly should be for the managers: farmers in association with UDV, VFF and dairy companies. Secondary responsibility is with agencies and GMW.	C	

25	241	Action 4.6 see earlier comments on role of EPA.		
25	242	Action 5.3 - licensed point source discharges are reviewed as part of EPA ongoing activities. However not all point sources re licensed as many are not scheduled under the EP Act. Review this section.	N	see 25/232, 25/222
25	243	Action 5.13 - secondary responsibility for ensuring COFP lies with local government for private land and NRE for public land.	C	
25	244	Action 5.14 local councils can have a role in the monitoring and reporting adoption of BMP	I	
25	245	Action 6.1, 6.2 see earlier comments	N	
25	246	Action 6.3 waste minimisation schemes are an important tool used by EPA and are to be encouraged.	E	
25	247	Action 6.4 - the timetable for the establishment of waste management plans has been outlined by Government. The timeframes are tighter than those included in the strategy.	N	
25	248	Action 12.3 Monitoring of licensed point source discharges is required in licences issued by EPA. Data is usually available after discussion with the licensee. However the provision of monitoring undertaken voluntarily by licensees and provided to EPA may not be made available to third parties with the permission of the licensee.	N	see 25/237
26	249	the Department supports the Strategy's objectives the BMP approach the current focus on P management while accepting that opportunities to manage other nutrients are also part of the strategy.	E	
26	250	The Department supports trialing of the methodology to assign economic benefits to nutrient reduction	E	
26	251	Need for discussions to resolve more detailed concerns .	C	
27	252	There are implied nutrient reduction targets ... The desired nutrient reductions recur throughout the draft and give the impression that they are the targets despite Section 4.4 and Ch 7 saying they are not. Whenever desired P reductions are given, it needs to be clearer that they are not targets and worded along the lines that adoption of targets should reduce nutrient loads by...	C	This was certainly the intention. Check wording.
27	253	Care needs to be exercised with regulatory approaches because instream nutrient effects may interfere with the relationships between nutrients leaving farms and nutrients leaving the ends of drains.	N	
27	254	Monitoring needs to take into account management as well as creating the appropriate infrastructure. Dairy effluent systems, drainage reuse, WFP will only be effective if accompanied by appropriate management and operation.	C	Change monitoring section to reflect this.

27	255	There appears to be a problem with 50% reduction in nutrient load on p31 para 3 and p41 para 4.1. The outcome of 32 t P on p41 comes from 64000ML (p31) for 1991-92. The tonnes of P in drainage water for this season is not given but if 32 t leads to a 50% reduction then the drain total flow would need to be 64 t. Since it was 169 t for 1994/95, the 64 t seems too low even though 1994/95 was a much wetter year.	N	64 000 ML derived from IP5 Table 6.5 and 6.6 which show the flow, P and N loads for the irrigation and non irrigation periods in 1991/92 and the number of diverters required to decrease the flow during the 1991/92 irrigation season by 50%. The assumed 0.5 mg/L conc may be a bit on the high side.
27	256	The strategy also states that the 50% reduction desired for irrigation drains is to be made up of a mixture of reuse, drain diversion and other BMP yet on p 41 it is attributed to diversion only.	C	attribute reduction to these other practices as well. Difficulty is deciding how much to attribute to each.
27	257	There is an assumption that reducing inputs into the drains will reduce outputs from the end of the drain p28 4.3. This is a little tenuous because instream processes are a "real thorn in the side". Irrigated agriculture can reduce inputs to drains by BMPs yet instream processes may maintain P concentrations. All that can be achieved by BMPs are reductions in nutrient loads discharged into drains which may not lead to reductions in loads from drains. It may be more appropriate that nutrient reductions from BMPs for irrigated agriculture were expressed as reduction into drains rather than from drains as used in the draft strategy.	C	Agree that this is a concern. We have a similar concern with nutrients already in train in waterways - it may be a long time before we see major improvements. We've assumed that any P that gets into the drain will eventually (perhaps over a very long time frame) come out the end of the drain - P is a conservative element. Agree that we should refer to farm BMPs as achieving reductions in nutrients reaching drains.
27	258	P31 para 2 "we will ensure that all reuse systems are used optimally" is an optimistic statement. Experience would indicate that 100% adoption is unusual and that 80% should replace all.	D	In reality this is correct, but there is nothing wrong in having a 100% target.
27	259	P31 para 7 "reuse systems must be managed to ensure water remains free of BGA." Research is needed to develop these guidelines. There is a real danger that the strategy could result in more BGA blooms in reuse dams which would be very negative.	C/A	See Action 4.16. This must be a high priority.
27	260	Implementation of reuse and drainage diversion components of the strategy need to take into account the need to prevent the spread of water borne pathogens, particularly Johne's Disease.	I	Implementation issue.
27	261	The development of tradeable pollution rights could ultimately lead to a more economically efficient implementation of the strategy. Any such scheme will need to take into account the non conservative nature of nutrients in surface waters.	I	Issue to be addressed in developing a tradeable pollution rights scheme.
27	262	Action 4.5. The 5 year O&M cost really only refers to the O&M cost for dairy farms currently discharging dairy shed effluent for one year. The O&M cost should be multiplied by 5 for the 5 year cost.	E	The 5 year O&M cost shown for action 4.5 should be $316K
27	263	Action 4.5. As the action refers to all dairy effluent systems managed in accord with BMP, allowance needs to made for upgrading existing effluent systems (because of intensification) 40% of dairy farms at a capital cost of $4.8M and annual O&M of $1.2M (say).	N	This will be a cost but should it be included in the strategy?
27	264	Action 4.5. The outcome of 8.4 t of P reduction assumes that all the effluent	C	

		produced in the milking shed on 5% of farms is discharged to the drain. In reality probably only 1/3 of this actually reaches the drain. the potential reduction is more likely around 3 t of P.		
27	265	Action 4.5. The action includes an extension program which is not costed. Estimated cost of $500 000 over three years	E/C	The extension program is shown as the capital cost. We must include the actual capital cost of construction and upgrading systems.
27	266	An issue that requires resolution is who identifies and records direct dischargers and follows up to ensure an effective effluent management systems is installed.	I	Implementation issue.
27	267	Action 4.9 appears to be undercosted. the specified $500 000 would only cover the cost of the Target 10 nutrient management program. In addition there is the current fertiliser project, $240K for the next three years, plus any involvement of the horticulture Program. The figure for the next 5 years is more like $1M. There will also be costs to DNRE associated with Action 2.5 ???	C	
27	268	DNRE will need to have an integral role in any review of the Piggeries Code of Practice, but in any such review DNRE will need to work closely with industry.	I	Agree.

12. Appendix 3 - List of Actions and Priorities

Goulburn Broken Water Quality Strategy

Priority of Actions listed in Strategy.

Priority		Action
VH	1.1	GB Board will assign responsibility for strategy implementation to the REWQC The Board will ensure that all its activities recognise water quality considerations in implementing their programs.
VH	1.11	Ensure provision of information about nutrient management BMP to resource managers.
VH	1.12	Monitor relevant research and disseminate information to stakeholders
VH	1.17	Apply benefit:cost analysis, currently being developed, before implementing major nutrient management works.
VH	1.20	REWQC will establish a process to review and refine nutrient management BMP and ensure that these BMP are compatible with other BMP
VH	1.2	REWQC to oversee and coordinate strategy implementation. Works implementation coordination - responsibility assigned to Irrigation and Dryland Board committees. formal links will be developed between these Committees.
VH	1.21	Make information about best management practices widely available by publishing information recently documented.
VH	1.3	Day to day coordination of strategy implementation will be the responsibility of the Goulburn Broken Water Quality Coordinator, who will be employed by Goulburn Murray Water on behalf of the REWQC. The coordinator will provide executive support to the REWQC.
VH	1.6	Implement cost sharing arrangements with secondary beneficiaries.
VH	2.2	Use the Waterwatch program as the strategy's community education tool. Future source of local funds for Waterwatch needs to be determined.
VH	3.8	Develop local, or sub catchment, plans to address water quality issues in priority areas. These are (not ranked): • catchment to Lake Nillahcootie • catchment to Lake Eildon • mid Broken River (Nillahcootie to Caseys Weir) • Broken Ck • catchment to Lake Mokoan • lower Goulburn River (downstream of Goulburn Weir) • local catchment to Goulburn Weir Pool • lower Broken River (below Caseys Weir) • catchment to Greens Lake/Lake Cooper • other, more local, areas contributing nutrients directly to waterways. • blue green algae hot spots. Provide technical and extension support for implementation of these plans.
VH	4.1	Achieve new drainage diverters to reduce annual drain flows by 64 000 ML, especially in Deakin Drain, Broken Ck and MV Drain 6. Offer an incentive to construct storages for diverted water.
VH	4.14	Finalise methodology for allocating new diversion licences. Implement this over the irrigation region.
VH	4.16	Define requirements for reuse systems to remain blue green alae free.
VH	4.17	Continue development and implementation of the Broken Ck Weir replacement program
VH	4.4	80% (5360) of irrigation farms with functioning reuse systems. Increase rate of adoption by 40 per year.

VH	4.4A	All reuse systems will be used effectively by encouraging installation of electric power
VH	4.5	All dairy effluent systems managed in accord with best management practice. No farm directly discharging dairy effluent to drains. Implement an extension program to achieve this.
VH	4.9	adoption of nutrient management BMPs by all sectors of the farming community
VH	4.19	Drain management plans prepared.
VH	5.1	Install approx 550 km of filter strips along rivers and streams by increasing the rate of implementation of river management works by 25% and the rate of farm works by 25%
VH	5.14	Land managers will report on their adoption and implementation of BMP, including relevant Codes or Guidelines.
VH	5.18	Encourage resolution of the Water Act requirement for diversion licences.
VH	5.2	Develop and implement a program of river management works so that the rate of implementation is increased in priority areas by 25%
VH	5.4	Develop and implement sub catchment nutrient management plans for the high priority catchments listed above in 3.8
VH	6.1	All STPs with the equivalent of zero summer discharge or tertiary treatment to <2mg/L TP for the summer period. Priorities - Shepparton, Mooroopna, Seymour, Benalla.
VH	6.7	Support adoption and implementation of the Northern Victorian Wastewater Management Strategy.
VH	8.3	Fish Farms - research, adopt and implement BMP for improved feed formulations, feed management techniques, pond sediment and waste management. All farms will adopt these BMP.
VH	9.1	Investigate local water quality concerns associated with septic tanks at Kinglake, Toolangi, Flowerdale, Wandong, Merrigum, Tungamah ($30K each), and others as they arise.
VH	9.3	Implement action to overcome local water quality concerns.
VH	12.1	Continue VWQMN, MSOM, EPA salinity and MDBC monitoring. This will be coordinated in the catchment by the REWQC.
H	1.13	Formally develop roles and responsibilities of coordinator and have this confirmed by REWQC and G-MW.
H	1.14	Become involved in state and MDBC nutrient initiatives to ensure best outcome for catchment and enable transfers of experience and knowledge, both into and out of the Goulburn Broken
H	1.15	Overview reporting of blue green algae blooms
H	1.18	REWQC will prepare a Final Strategy document incorporating the changes to the Draft Strategy resulting from the Government response and this addendum.
H	1.4	Establish a Planning Support group
H	1.5	Implement a catchment nutrient management rate as part of a catchment environment rate
H	1.7	The REWQC will report annually to the community, the Catchment Board and Government on the implementation of this strategy, including: • the condition of water quality in the catchment • loads of nutrients exported from the catchment works undertaken to manage nutrients.
H	1.9	Ensure implementation of Goulburn Broken strategy is coordinated with implementation of similar strategies in Victoria and the Murray Darling Basin
H	2.1	Develop a communication strategy as part of the Catchment Board strategy.
H	2.4	Prepare regular newsletters and media releases about strategy implementation for distribution within the catchment. Investigate other methods for distribution of information such as landcare group newsletters, the Internet and G-MWs Waterline system.
H	2.5	Ensure other community education programs include water quality issues in their scope and are coordinated.
H	3.1	Local government to apply the principles set out in this strategy in their planning schemes and municipal strategies.
H	3.3	Provide technical support to decision makers and resource managers.
H	3.4	Development proponents will assess the impact of their proposal on nutrient concentration and loads.
H	3.6	Irrigation whole farm planing to take into account nutrient management issues.

		Government funding to be dependent on preparation of a WFP
H	3.7	Landholders will prepare property management plans that implement this strategy on a local basis.
H	4.11	Ensure current WFP processes recognise nutrient issues.
H	4.12	Use Waterwatch to identify hotspot catchments. Agencies and landholders will develop action plans to address issues in these catchments.
H	4.15	Implement an extension program to encourage adoption of BMP by irrigators.
H	4.2	Investigate practicalities of metering. Then meter all diversion licences.
H	4.7	Investigate opportunities for the use of natural and constructed wetlands to process drain water, especially near drain outfalls.
H	4.8	resolve institutional arrangements about responsibilities for drain management, including both arterial and community surface drains.
H	5.10	Use Waterwatch to identify hotspot catchments. Agencies and landholders will develop action plans to address issues in these catchments.
H	5.11	Investigate catchment condition as a means of prioritising areas
H	5.12	Land managers will adopt principles to minimise sediment production and movement.
H	5.13	Public land managers will continue to apply the Code of Forest Practice to their operations.
H	5.15	Develop and implement Mokoan restoration strategy.
H	5.16	Support the establishment of WMA over the entire catchment
H	5.19	Identify catchments contributing excessive amounts of sediment and P
H	5.20	Identify and target high P generating catchments for investigations and works.
H	5.5	encourage adoption of BMPs by all land managers by the provision of technical and extension services (2 people).
H	5.6	Ensure irrigation BMP are adopted by irrigators
H	5.7	Ensure WFP processes recognise water quality issues.
H	5.9	investigate methods of prioritising areas using turbidity data.
H	6.2	Full wastewater reuse on land or tertiary treatment of discharges to <2mg/L.
H	7.1	Responsibility for urban stormwater assigned to municipalities.
H	7.2	All new subdivisions will incorporate stormwater best management practice. This will be achieved via planning requirements.
H	9.5	Finalise Lake Benalla water quality investigation.
H	9.6	Ensure development of emergency management procedures for critical issues.
H	11.1	Incorporate research results into strategic policy direction and development
H	11.2	Develop and implement a coordinated research and investigation program.
H	11.3	Develop National Eutrophication Management Program research program in conjunction with LWRRDC/MDBC and research organisations.
H	12.2	Monitoring will be supplemented to include measures of algal growth.
H	12.3	Point source monitoring
H	12.5	Publish monitoring results annually
H	12.6	Use Aqualabs to improve knowledge of nutrient fluxes, especially over short timeframes.
H	12.8	Waterwatch monitoring by community.
H	12.9	Develop index of stream condition indicators.
M	1.10	Monitor other water quality issues in the catchment especially biocides and acidity. Obtain technical reports on these two issues. Assess trends of water quality parameters.
M	1.16	Maintain and further develop nutrient models of the catchment.
M	1.19	REWQC to define "Significant impact" in conjunction with relevant authorities.
M	1.22	Review flow issues associated with water quality and blue green algae as part of Strategy implementation.
M	1.8	Review strategy regularly to ensure that progress is being made in the right direction. Targets for nutrient reduction, and the assumptions made in setting these targets will be regularly tested, especially as new information becomes available.
M	2.3	Survey current catchment community perceptions on water quality issues
M	2.6	Implementation of Phoswatch campaign
M	2.7	Develop GIS data storage tools along the lines of the watertable watch program
M	3.10	Develop and, if feasible, pilot a pollution trading scheme to permit cost effective nutrient management

M	3.11	Catchment characteristics mapped and stored in a format readily accessible by all agencies and community groups in the catchment.
M	3.12	Investigate use of rating, or rating concessions, to achieve nutrient management.
M	3.2	REWQC will work with local government to achieve water quality improvements via the planning process. A consistent process for assessment of nutrient impacts of development in the catchment will be developed.
M	3.5	Develop consistent land capability mapping for the entire catchment; provide training to relevant stakeholders in the application of this mapping.
M	3.9	Implement special area plans under C&LP Act as required.
M	4.10	investigate water quality issues associated with drains, especially biocides, heavy metals and pathogens.
M	4.13	Develop BMP for feed pads, calf sheds and other intensive dairy operations.
M	4.18	Investigate opportunities to divert drainage water back into the channel supply system.
M	4.3	All irrigation farms with an approved whole farm plan. Increase rate of WFP adoption and implementation by 25% (40/yr)
M	4.6	Point source discharges to drains identified and registered, especially industrial, urban stormwater and sullage sources and action plans developed to minimise discharges.
M	5.17	Ensure maintenance of existing stable waterways and riparian zones.
M	5.21	Address nutrient issues associated with dryland drainage as part of implementation of the RCS.
M	5.3	Review point source discharges in the catchment and implement management activities.
M	5.8	Investigate use of special area plans
M	6.3	Implementation of waste minimisation schemes by industry
M	6.4	Continue to develop waste management plans in line with Government requirements. Implement these plans to meet SEPP and strategy requirements.
M	6.5	Further develop recommendations of Water for Industry and Wastewater for Industry reports for possible implementation.
M	6.6	Review, as part of the strategy review process indicative targets for STP
M	7.3	Review stormwater treatment practices and prepare stormwater management plans at all towns in the catchment. Seek opportunities to improve current stormwater treatment practices at reasonable cost Put in place appropriate management regimes especially for wetlands.
M	7.4	Assess local impacts of urban stormwater contaminants (eg toxicants, heavy metals) on receiving waters.
M	8.1	Piggeries-review Code of Piggeries Practice to incorporate nutrient balance requirements for long term sustainability. Ensure municipalities are aware of these when assessing development applications
M	8.2	Piggeries - Upgrade existing requirements for effluent treatment as changes are proposed to ensure long term sustainability.
M	9.2	Investigate other local water quality concerns.($30K each * 4)
M	9.4	Investigate impacts of local water quality issues on groundwater.
M	10.1	Encourage coordinated investigation into other water quality issues, especially acidity in dryland area.
M	10.2	Encourage coordinated investigation into other water quality issues, especially biocides in irrigation areas.
M	10.3	Investigate occurrence of pathogens in waterbodies and toxicants and heavy metals from urban stormwater.
M	10.4	Implement actions from these investigations
M	10.5	Assess other water quality parameters on a catchment basis and present results in mapped format,
M	11.4	REWQC to support research to establish nutrient load and concentration targets.
M	12.10	Investigate use of biomonitoring to assess stream health and impacts of nutrient discharges.
M	12.4	Monitor adoption of BMP, especially • WFP implementation • Reuse systems • drain diversion

		• filter strips installed.
M	12.7	Continue to investigate the use of daily turbidity data collected by water treatment plant operators

13. Appendix 4 - 3 Year Works Program.

	Estimated 3 year cost				Timing		
Action	**Fed**	**State**	**Reg**	**Ind**	**Y1**	**Y2**	**Y3**
1.2	73	73	49	0	■	■	■
1.3	84	84	56	0	■	■	■
1.7	5	5	5	0	■	■	■
1.10	10	10	0	0	■	■	■
1.11	15	15	0	0	■	■	
1.16	3	3	0	0	■		
Sub total	191	191	110	0			
2.2	100	100	100	300	■	■	■
2.3	6	6	0	4	■		
2.4	6	6	4	0	■	■	■
2.6	159	159	106	0	■		
sub total	271	271	210	304			
3.2	43	43	43	0	■	■	
3.3	93	93	93	0		■	■
3.5	75	75	50	0		■	■
3.8	38	38	0	25	■	■	■
3.10	70	70	0	0	■	■	
3.11	25	25	0	0			■
3.12	20	20	20	0		■	■
sub total	364	364	207	25			
4.1	653	653	0	3915	■	■	■
4.2	83	83	83	83	■	■	■
4.2a	0	0	20	0	■		
4.3	113	113	0	225	■	■	■
4.4	0	0	0	7344	■	■	■
4.4 mgt par	75	75	0	75	■	■	■
4.4a	2250	2250	0	9000	■	■	■
4.5	25	25	0	450	■	■	
4.6	40	40	40	0	■	■	
4.7	30	30	0	0	■	■	
4.9	150	150	0	0	■	■	■
4.13	30	30	0	0	■	■	
4.14	60	60	120	0	■	■	■
4.16	113	113	0	0	■	■	■
4.17	100	100	100	0		■	■
4.18	33	33	33	0	■	■	
4.19	100	100	100	0	■	■	■
sub total	3853	3853	496	21092			
5.1	1100	1100	1100	0	■	■	■
5.2	510	510	510	0	■	■	■
5.3	55	55	0	0	■	■	
5.5	150	150	0	0	■	■	■
5.9	30	30	0	0	■	■	
5.11	25	25	0	0	■	■	■
5.15	138	138	275	0	■	■	■
sub total	2008	2008	1885	0			
6.1a	500	500	2000	0			■
6.2	567	567	2267	0		■	■
sub total	1067	1067	4267	0			
7.3	130	130	130	0	■	■	■
7.4	75	75	50	0		■	■

sub total	205	205	180	0			
8.1	25	25	0	0			
8.3	38	38	0	75			
sub total	63	63	0	75			
9.1	40	40	40	0			
9.2	30	30	30	0			
9.3	0	0	0	0			
9.4	6	6	6	0			
sub total	76	76	76	0			
10.1	15	15	0	0			
10.2	135	135	0	0			
10.3	150	150	0	0			
sub total	300	300	0	0			
11.1	3212	3212	0	3212			
sub total	3212	3212	0	3212			
12.2	11	11	0	0			
12.4	20	20	20	0			
12.6	23	23	0	0			
12.7	23	23	0	0			
12.10	75	75	0	0			
12.1	152	243	169	0			
sub total	303	393	189	0			
Grand Total	11812	11902	7520	24708			

14. Appendix 5 - Summary of Costs and Cost Sharing

14.1 20 year program

Capital only 8% discount

Action	Fed	State	Reg	Ind	Regional fund source
1.2	244	244	163	0	Reg Rate
1.3	282	282	188	0	Reg Rate
1.7	17	17	17	0	
1.10	32	32	0	0	
1.11	14	14	0	0	
1.16	4	4	0	0	
1.17	8	8	8	0	
Sub total	600	600	375	0	1575
2.2	334	334	334	1002	UWA, RMA
2.3	17	17	0	12	
2.4	19	19	13	0	Reg Rate
2.6	172	172	115	0	UWA
sub total	543	543	461	1013	2560
3.2	39	39	39	0	Municipalities
3.3	173	173	173	0	Municipalities
3.5	62	62	41	0	Municipalities
3.8	62	62	0	42	
3.10	62	62	0	0	
3.11	20	20	0	0	
3.12	17	17	17	0	Municipalities, water authorities
sub total	435	435	269	42	1180
4.1	868	868	0	5210	
4.2	185	185	185	185	GMW
4.2a	0	0	19	0	GMW
4.3	376	376	0	751	
4.4	0	0	0	16426	
4.4 mgt par	64	64	0	64	
4.4a	5033	5033	0	20130	
4.5	22	22	0	401	
4.6	36	36	36	0	GMW
4.7	27	27	0	0	
4.9	501	501	0	0	
4.13	27	27	0	0	
4.14	60	60	121	0	GMW
4.16	97	97	0	0	
4.17	119	119	119	0	GMW
4.18	29	29	29	0	GMW
4.19	133	133	133	0	GMW
sub total	7576	7576	641	43168	58962
5.1	3673	3673	3673	0	RMA
5.2	1703	1703	1703	0	RMA
5.3	49	49	0	0	
5.5	501	501	0	0	
5.9	27	27	0	0	
5.11	55	55	0	0	
5.15	133	133	267	0	GMW
sub total	6140	6140	5642	0	17923
6.1a	1399	1399	5595	0	UWA
6.2	2523	2523	10091	0	UWA
sub total	3922	3922	15686	0	23529
7.3	173	173	173	0	Municipalities

7.4	89	89	60	0	Municipalities
sub total	262	262	233	0	758
8.1	23	23	0	0	
8.3	41	41	0	83	
sub total	65	65	0	83	212
9.1	48	48	48	0	Municipalities
9.2	33	33	33	0	Reg Rate
9.3	0	0	0	0	
9.4	6	6	6	0	Reg Rate
sub total	88	88	88	0	263
10.1	14	14	0	0	
10.2	116	116	0	0	
10.3	110	110	0	0	
sub total	240	240	0	0	481
11.1	4817	4817	0	4817	
sub total	4817	4817	0	4817	14450
12.10	64	64	0	0	
12.1	508	810	565	0	GMW
12.2	35	35	0	0	
12.4	67	67	67	0	Reg Rate
12.6	30	30	0	0	
12.7	20	20	0	0	
sub total	725	1026	632	0	2383
Grand Total	25427	25729	24027	49138	124321

source costin8.xls

14.2 5 year program

Action	Fed	State	Reg	Ind	Regional fund source
1.2	122	122	81	0	Reg Rate
1.3	141	141	94	0	Reg Rate
1.7	8	8	8	0	
1.10	20	20	0	0	
1.11	15	15	0	0	
1.16	5	5	0	0	
Sub total	311	311	183	0	
2.2	167	167	167	500	UWA, RMA
2.3	11	11	0	8	
2.4	9	9	6	0	Reg Rate
2.6	197	197	131	0	UWA
sub total	384	384	304	508	
3.2	43	43	43	0	Municipalities
3.3	187	187	187	0	Municipalities
3.5	75	75	50	0	Municipalities
3.8	68	68	0	45	
3.10	70	70	0	0	
3.11	25	25	0	0	
3.12	20	20	20	0	Municipalities, water authorities
sub total	488	488	300	45	
4.1	1088	1088	0	6525	
4.2	138	138	138	138	GMW
4.2a	0	0	20	0	GMW
4.3	188	188	0	375	
4.4	0	0	0	12240	
4.4 mgt par	75	75	0	75	
4.4a	3750	3750	0	15000	
4.5	25	25	0	450	
4.6	40	40	40	0	GMW
4.7	30	30	0	0	
4.9	250	250	0	0	
4.13	30	30	0	0	
4.14	70	70	140	0	GMW
4.16	113	113	0	0	
4.17	150	150	150	0	GMW
4.18	33	33	33	0	GMW
4.19	167	167	167	0	GMW
sub total	6145	6145	688	34803	
5.1	1833	1833	1833	0	RMA
5.2	850	850	850	0	RMA
5.3	55	55	0	0	
5.5	250	250	0	0	
5.9	30	30	0	0	
5.11	25	25	0	0	
5.15	163	163	325	0	GMW
sub total	3206	3206	3008	0	
6.1a	1500	1500	6000	0	UWA
6.2	928	928	3713	0	UWA
sub total	2428	2428	9713	0	
7.3	217	217	217	0	Municipalities
7.4	113	113	75	0	Municipalities
sub total	329	329	292	0	
8.1	25	25	0	0	
8.3	50	50	0	100	
sub total	75	75	0	100	
9.1	60	60	60	0	Municipalities

9.2	40	40	40	0	Reg Rate
9.3	0	0	0	0	
9.4	6	6	6	0	Reg Rate
sub total	106	106	106	0	
10.1	15	15	0	0	
10.2	135	135	0	0	
10.3	150	150	0	0	
sub total	300	300	0	0	
11.1	2821	2821	0	2821	
sub total	2821	2821	0	2821	
12.10	75	75	0	0	
12.1	254	404	282	0	GMW
12.2	18	18	0	0	
12.4	33	33	33	0	Reg Rate
12.6	38	38	0	0	
12.7	23	23	0	0	
sub total	440	590	315	0	
Grand Total	17050	17200	14910	38293	

source cost5yr.xls