

AUSTRALIAN WATER AND WASTEWATER ASSOCIATION

SUBMISSION TO THE HOUSE OF REPRESENTATIVES STANDING COMMITTEE ON ENVIRONMENT AND HERITAGE INQUIRY INTO CATCHMENT MANAGEMENT

EXECUTIVE SUMMARY

The Australian Water and Wastewater Association (AWWA) welcomes this opportunity to present a submission to the Committee regarding its inquiry into catchment management. The submission contains six sections, each addressing one of the Inquiry's terms of reference. A section providing background on the Association is included as a preface and a summary of our recommendations follows this page. The executive summary below briefly outlines our key messages, rather than providing a review of the information we have presented in each section of the submittal.

1 THE DEVELOPMENT OF CATCHMENT MANAGEMENT

Implementation of catchment management in Australia has benefited from a synergy with the Landcare movement. While this has been good, many stakeholders are still not adequately involved and we need to improve our abilities to comprehensively assess all costs and benefits and understand and integrate the scope of activities within catchments and with regard to catchment management overall within Australia.

2 VALUE OF A CATCHMENT MANAGEMENT APPROACH

Australia's wellbeing depends utterly on management of two of our most precious resources: soil and water. They have been mismanaged in the past; however, good catchment management can retrieve them both. We have made good progress, but we still have a long way to go before we can really say we are doing it.

3 METHODS FOR ACHIEVING SUSTAINABILITY

The main task is to radically change the perception of all catchment stakeholders. They need to clearly understand the importance of stopping the damage. More importantly, they need to start working towards retrieving the situation. We need to complement our relatively sound knowledge of specific on-the-ground mechanisms with systems that allow us to prioritise needs and ensure accountability.

4 STAKEHOLDER ROLES

We need to improve our ability to define roles and to implement mechanisms that permit timely communication amongst relevant stakeholders. In particular we need to improve the coordination of government entities and the focus on drinking water.

5 PLANNING, RESOURCING, IMPLEMENTATION, COORDINATION, COOPERATION

This is the heart of the issue, as the keyword in ICM is *integrated*. Integration is the area that is perhaps least well developed and is the most relevant determinant of success. Models developed by each of the states for implementing catchment management need to be evaluated, lessons learned and improvements made.

6 MECHANISMS FOR MONITORING, EVALUATING AND REPORTING

We lack comprehensive, user-friendly mechanisms for uniformly monitoring and evaluating the relative success of our efforts. There is tremendous potential for utilising electronic information technologies to improve both effectiveness and efficiency in these regards. The Federal Government could make a substantial contribution in this area.

Summary of Recommendations

- Catchment management is a cost-effective approach to realise a number of desirable outcomes. Adequate integration provides the opportunity to ensure that public and private resources are expended so as to realise the greatest overall benefit. We have not yet managed to achieve this level of integration. We should allocate adequate resources to make Australia world-class in the management of its catchments. The benefits are there to justify the costs.
- The most important and most difficult aspect of catchment management is the integration of all activities. Electronic information systems should be developed to enhance our ability to document the scope of activities within a catchment. Economies of scale and the enormous potential complexity of this task make it an appropriate arena for Federal government involvement.

So long as management of land and water remain separated, the risk of inappropriate application of resources remains. An optimal academic solution may be the establishment of catchment-based jurisdictions that apply to all authorities. For a myriad of reasons this is likely to prove unfeasible. Electronic systems may offer the best opportunity to achieve the desired result by creating “pseudo-jurisdictions”. Entities can submit information that is then appropriately segmented on a geographic basis by the electronic systems.

- We need to improve our coordination of funding for both on the ground projects and research activities. This is a precursor to assessing the effectiveness our efforts.

The ANU Centre for Resource and Environmental Studies and the CRCs for Catchment Hydrology and Freshwater Ecology have made important contributions. The CSIRO, the LWRRDC and the CRCs for Water Quality Treatment and Wastewater Management and Pollution control have all contributed work that highlights the benefits of catchment management. Possibilities for developing an integrated research agenda with respect to catchment management should be investigated.

There is currently no single source of information regarding the resources devoted to managing and enhancing individual catchments. At a minimum, all of the collective grant funding provided by various levels of government should be catalogued in a single place, so it is accessible on the basis of individual catchments. Only then can we start to assess whether our funding allocations are appropriately aligned.

- The goal of potable water supply has not necessarily been given the prominence it deserves in catchment management efforts. This may be due in part to a lack of alignment between the boundaries of catchment management bodies, the physical jurisdiction within which water authorities are located and the catchments from which they derive their source waters. This issue needs to be investigated. In particular, there is a need for a system that provides a graphical representation of the different boundaries mentioned above and allows assessment of the extent of any mismatch. This is an appropriate area for Federal involvement.
- AWWA is currently piloting a version of the Partnership for Safe Water in conjunction with the Water Services Association of Australia, the American Water Works

Association and a multi-stakeholder advisory committee. This program has been successful in optimising the operation of water treatment plants in the U.S. Plans are in place to create similar programs to address distribution systems and catchments. The AWWA and its partners would welcome Federal assistance developing the catchment component. The US AWWA has recognised Australia's relatively proactive involvement in catchment management and supports our taking the lead role in developing the catchment component.

- Substantial resources have been expended on increasing the quality of discharges from point source discharges (such as wastewater treatment plants and industrial outfalls), and providing engineered drainage systems to control flooding. We need to understand whether this is the most effective use of resources. In particular, there is a serious need to improve our understanding of the cumulative effects of land use decisions and our options for improving decisions and mitigating development impacts. This research agenda should be given priority and adequately resources.
- AWWA is a unique resource as it offers access to a range of expertise, encompassing different points of view. We have only begun collating the results of our survey of member's interest regarding the seventeen national interest groups that were recently established. However, the results to date place our environment and catchment management group at the top of the list, with more subscribers than either the water systems or wastewater systems group. Our network can offer honest multi-faceted response to issues and proposals and assist in problem solving and strategy development. We are available to assist and would encourage you to make use of the resources we can offer.
- Catchment management in Australia has evolved as a result of Federal Policy, interpreted and implemented in a variety of ways by state government, local government and others. Documentation of the 'experiment', its successes and its failures, is lacking. AWWA has targeted this as a worthwhile project and is hopeful this inquiry will be a good source of material. We would welcome Federal assistance in carrying out this project.
- The newly formed Sydney Catchment Authority and the McClellan Inquiry reports offer insight into where we are and where we could/should be. The issues, problems, opportunities and solutions raised are not unique to the Sydney area. We strongly commend this to the Committee's attention. In particular, the failure of the existing mechanisms to adequately address source water quality issues should be noted.
- Management of water quality and water quantity (both flooding and drought) problems share a common root – land use. Yet the interconnection of these two issues is not adequately integrated in our management systems. We need to improve our understanding of this synergy and adequately attribute benefits and costs in these regards. This should be a research priority.
- We lack objective decision support systems. Responsible bodies, and the communities they are responsible to, need comprehensive information in a concise and understandable format. Techniques such as multi-criteria analysis are useful, but the complexity often makes them inaccessible. The Federal Government could make a significant contribution by developing a system that provides a user-friendly way to assess the costs and benefits of development decisions.

ABOUT THE AUSTRALIAN WATER AND WASTEWATER ASSOCIATION

The Australian Water and Wastewater Association (**AWWA**) is a national multidisciplinary association of individuals, corporations and agencies. The Association was founded in 1962 to promote effective management of water and its related resources.

AWWA represents over 500 corporate members including most water agencies and government departments with an interest in water, consulting practices, laboratories, suppliers and contractors to the water industry, as well as more than 3000 Managers, Engineers, Chemists, Biologists, Health Professionals, Researchers, Students and other individuals.

The Association has branches in all States/Territories; supported by a Federal Office based in Sydney. National Special Interest Groups (NSIGs) within the Association provide a mechanism to provide members with the opportunity to communicate and exchange information and data on specialist topics. The AWWA Environment and Catchment Management NSIG and the Association's Technical Director, Brian McRae, prepared this submission.

1 THE DEVELOPMENT OF CATCHMENT MANAGEMENT

All of the water in our rivers and streams is derived from rain falling on private or state land. Rainfall runoff flowing overland or underground is altered by interaction with the land and the condition of the land influences the pattern of flows. Our land use, or abuse, influences water, and the environment and people are effected by pollutants in the water and by the pattern of flooding or drought that results.

While this synergy may seem obvious, government has traditionally separated the management of land and water with little regard given to the consequences of land use decisions. As with many things, it is more difficult to remedy the effects of poor decisions than it would have been to prevent the situation occurring. One of the most fundamental problems to effective catchment management is the mis-match between government jurisdictions and natural boundaries such as catchments.

The traditional role of water authorities and resource agencies has been the allocation of supply of water for various consumptive uses such as town water supply or irrigation. Land use management has typically been the prerogative of local government, for the primary purpose of providing for orderly development. In some instances these roles have fallen to a single authority, but often multiple authorities are involved, each with different geographical jurisdictions. Responsibility for assessing the impact of land use on water quality has not typically been vested in any particular authority.

The whole question is made more difficult because of the incremental nature of development of land. No single development, unless it is unusually large, is likely to create a measurable impact on water quality. However the cumulative impact of all development within a catchment has a potentially huge impact on the quality and quantity of both surface and subsurface water resources. Furthermore, nature is

ignorant of human jurisdictions. As water flows downhill, so does anything that is discharged into it.

The origins of 'catchment management' can be traced back to biblical times. Numerous systems constructed at that time to maximise the collection of scarce seasonal resources are still functioning today. The modern water tank, which is a prevalent feature in Australian rural locations, is little different from ancient cisterns. In more recent times, water authorities proactively exerted control over their source water catchments. In both of these cases, the primary concern was assuring adequate *quantity* of supplies.

Today, most lay people would see ICM as primarily directed to improving water quality for the primary purpose of protecting the environment. This is a reasonable, albeit general, description of the purpose of ICM in Australia and throughout the rest of the world. However, the need to encompass other issues, such as potable water supply, is evident from the recent Sydney water crisis.

The Landcare movement has made a significant contribution to present-day catchment management activities in Australia by providing a focus for community-based actions and a method of getting Federal support for activities that were traditionally State responsibilities. Landcare can also be attributed as a source of the strong environmental focus of catchment management activities. While all of this has been both good and necessary, we have failed in most cases to gain a comprehensive perspective of the dynamics within catchments or the overall state of our catchments collectively. We have not been able to identify or implement mechanisms to integrate the various government and private entities whose activities influence the health of our catchments. Our research dollars and the efforts of our experts are not necessarily being harnessed for the greatest good.

The Federal Government is responsible for the formal policies that have promoted the growth of catchment management in Australia. State and Territory governments have developed different approaches for implementing these policies. For this reason, a state-by-state assessment is necessary if one wants to understand the development of catchment management within Australia.

It would be beneficial to document these different models and to encourage discussion and debate. AWWA has identified this as a worthy project and we will be pursuing it. We would welcome assistance on this effort and would be happy to collaborate or share information. The Committee's inquiry should be a useful source of information in this regard. A brief overview of activities in various states is provided below. As we are in the process of assembling this information, what is presented below should not be considered either complete or fully accurate.

NSW has perhaps the longest-running set of formal state government programs that fall within the catchment management umbrella. The NSW Department of Land & Water Conservation's Coastal Hazard, Estuary and Flood Plain management programs fall into this arena. They all incorporate community-based approaches to managing aspects of catchment systems. In addition, there are some 50 Catchment Management Committees that include appointed representatives who collectively act in an advisory capacity and have a voice in the allocation of grant funds. There are also several Catchment Management Trusts, a central coordinating committee and a

special organisation of Sydney-region coastal councils. The NSW EPA recently weighed in on the issue by requiring the development of catchment-based stormwater management plans. This proliferation of entities involved in catchment management raises the question of whether integration is being adequately addressed. The newly created Sydney Catchment Authority is a special case, discussed further below.

QLD has approximately 25 Catchment Committees, which collectively encompass some 70% of the state. It is interesting to note that while QLD has roughly twice the land area of NSW, it has about half the number of catchment bodies. These committees are responsible for strategies, some 7 of which have been completed. The QLD Department of Natural Resources is responsible for implementing these strategies. This is in contrast to the situation in NSW where implementation falls often falls to local government or community groups, albeit with some state funding available.

SA and VIC have created catchment bodies that have a regional focus. There are approximately 11 Catchment Management Authorities in Victoria and 10 Catchment Management Boards in South Australia. In both instances these entities have a degree of authority that is higher than that of the bodies in NSW and QLD, which can be characterised as being primarily advisory in nature.

Tasmania has recently reorganised the government agency responsible for catchment management, the Department of Primary Industries Water and Environment, and has announced some major initiatives with respect to catchment management.

In Western Australia a formal state-wide approach is lacking; this can be attributed to the fact that much of Western Australia is still undeveloped. However, a number of initiatives have been taken in specific areas to create bodies that pull together existing Landcare and other community groups into catchment focused management entities. The willingness of the effort to allow customisation of the arrangements to suit specific circumstances is noteworthy. There are six formal catchment management entities in WA. Five of these fall under the oversight of the Waters and Rivers Commission, while the Swan River Trust is unique by virtue of having its own dedicated enabling legislation. Arguably, the Trust is the best example in WA of an integrated approach to catchment management.

We do not have much information at this time on efforts within ACT and NT. However, we are aware that the ACTEW Corporation has been looking at some projects to further understanding of, and improve, the management of their catchments.

The issues of mis-matched government agency boundaries and poorly assigned responsibility for catchment management were discussed above. As AWWA is the most comprehensive representative of the Australian water industry, it seems appropriate to include a brief discussion of the different state/territory arrangements for water management.

Four of the eight states have, in essence, a single water/wastewater authority: ACT, NT, SA and WA. Victoria has over the last 7 years moved from a local government model to a regional model, consolidating 300+ entities into 23 authorities. NSW, QLD and TAS essentially operate local government-based systems, with Sydney Water, Hunter Water and Hobart Water being the exceptions. Stormwater management is

typically the responsibility of local government, although the water authorities do at times take on this activity. An awareness of these arrangements is relevant to understanding the conditions that influence any intention to integrate water management and land-use management activities.

The importance of the separation of land and water management responsibilities is evident from examples of instances where water authorities have opposed individual developments within their catchments. It is not uncommon to find the planning authority dismissing the water authority's objection on the grounds that the impact on water quality of the individual development, considered in isolation, will be insignificant. This type of decision often results in a precedent that permits other development to occur. The net result is a deterioration of water quality for which no one individual development is responsible due to the cumulative impact of small scale decisions.

While state-based authorities have made efforts to manage catchments and integrate consideration of land use decisions with water quality and quantity impacts are admirable, the responsible authorities often have limited powers. Often they are only able to use persuasion to encourage existing agencies, with their conflicting objectives, to have regard to the impact their decisions will have on local water resources. Often, no regulatory or legislative recourse is available.

This is particularly reflected in the division between those that make policy and those that implement it. Land use decisions are the point where there is the greatest opportunity to control sources of impacts in the catchment. This power resides with local government. Even if the local authority is substantially involved in catchment management activities, there is likely to be a separation within the authority – often profound – between development approvals and catchment management efforts.

The newly formed Sydney Catchment Authority is worth mentioning. It is a milestone in the development of catchment management in Australia as it: is a catchment management body that has been given very strong referral powers regarding development; has been resourced by assigning it ownership of water resources; and has been specifically charged with water supply responsibilities – for both consumptive and environmental needs. The McClellan reports are an excellent source of information and analysis of catchment management, particularly with respect to issues related to water supply, and we would commend them to the Committee's attention.

2 VALUE OF A CATCHMENT MANAGEMENT APPROACH

An integrated approach to land and water management should recognise the interrelationship between the two, particularly the impacts to water that occur offsite, or at-a-distance, from land use and development activities. If properly established, this will enable the impact on water quality and quantity to be factored into the decision making process. Such an integrated approach is also essential to ensure that public and private resources are expended where they will have the most benefit.

At present, resources are being expended on increasing the quality of discharges from point source discharges (such as wastewater treatment plants and industrial outfalls), and providing engineered drainage systems to control flooding. While this is important, because they are obvious sources of contamination, in some cases these

resources might yield better results if they were applied to implementing techniques to manage land use decisions and diffuse sources of pollution. However, so long as management of land and water remain separated, the risk of inappropriate application of resources remains.

In a discussion of the value of a catchment management approach, the case of the City of New York in the United States is worth mentioning. New York City is similar to Sydney and Melbourne as they all have source water catchments that have historically enjoyed a degree of recognition and protection. The City was recently confronted with declining water quality. A study of available options indicated that source control efforts were a cost-effective alternative to the substantial expenditures, both capital and subsequent operations and maintenance, associated with augmented treatment.

The need for and value of integrated management of our catchments can be appreciated by looking at various impacts on stream health and their cause. In most cases the cause is due to activities located on land, often remote from the stream.

2.1 Biological Pollutants

Biological pollutants are bacteria, viruses and similar organisms that can produce a health risk to humans or animals who drink or enter the water.

The most likely sources of these are improperly treated sewage from municipal treatment plants, septic tanks or other on site waste disposal systems. Other sources can be town stormwater, animal waste from intensive industries or decaying organic matter.

2.2 Nutrients

Nutrients are chemical materials such as Nitrogen, Phosphorous and Potassium compounds that stimulate unwanted growth of aquatic plants, leading to algal blooms or excessive growth of higher plant forms. Some algae can produce toxins that is a risk to the health of humans or animals that drink the water.

Excessive growth and subsequent decay can reduce the Oxygen levels of the streams resulting in fish kills or a change in the balance between plants and animals reducing the biodiversity of the waterway.

The most common sources of nutrients are improperly treated sewage from municipal plants, septic tanks and on site treatment systems, animal manure from intensive agricultural industries such as feedlots, piggeries and dairies, urban runoff, and runoff from agricultural land containing fertiliser. An important source of nutrients in smaller streams is animal manure where cattle have direct access to the stream.

2.3 Salinity

Excessive salt content of water creates conditions that reduce the biodiversity of instream and river bank animal and plant life as well as reducing the use of the water for irrigation or drinking purposes. In extreme cases the stream can become devoid of all life.

The usual sources of salinity are irrigation practices that raise the water table, resulting in saline water entering the stream, discharge of irrigation drainage water to the stream and dry land salting caused by excessive tree removal.

2.4 Chemical Pollution

While this is not common in Australia, excessive levels of certain chemicals can reduce the biodiversity of the waterway. This is generally caused by discharge of chemical pollutants into the waterway. In some cases the chemicals may constitute a health risk to humans and animals.

The most common sources are storm runoff containing agricultural chemicals, industrial discharges or mine drainage waters and stormwater runoff from urban and industrial areas. Minor cases can also result from overspray of agricultural chemicals by air, ground spraying, and/or improper disposal of containers.

There is also some evidence that reduced biodiversity due to chemical pollution may assist the formation of algal blooms, by reducing natural factors that limit or control algae growth.

2.5 Stream Flow Reduction

Australia's water resources are also affected by activities that impact on the reduction of stream flows both generally and by altering the natural flow regime. This requires a careful balancing of the use of water for economic benefit and the protection of the resource for long-term benefit and environmental uses. Previously water managers only considered the immediate economic advantages of diverting water from streams and the total volume of approved licenses to divert water is now considered excessive for a number of river systems. This has resulted in a significant reduction in river flows causing excessive salinity, restriction of water to users, algal blooms and loss of biodiversity.

Other causes of stream flow reduction include vegetation changes, urbanisation, erosion & sedimentation, storage of winter flows and inappropriate forestry practices.

2.6 Groundwater Management

Stream flow can be derived from both ground water and surface water sources. Increasing use of groundwater is becoming a potential management issue. Groundwater is generally in equilibrium, with inflow and outflow balanced overall. The use of groundwater needs to be conducted in an integrated manner to prevent adverse impacts on stream flow, especially during dry periods. The abstraction of groundwater needs to be carefully controlled to prevent the resource from being exploited. Where possible the abstraction rate should not exceed the average long-term recharge rate. Over exploitation of a groundwater resource can result in reduction of stream flow by loss of base flow, saltwater intrusion as well as potential permanent loss of the resource.

In some arid areas mining of groundwater may be the only economic source of water and stringent measures such as appropriate pricing mechanisms to preserve it for as long as possible may be appropriate.

2.7 Stormwater Management

This concept reflects what is largely, although not exclusively, an urban issue. Historically, this was largely a matter of flood control. It is important to acknowledge the cycle that results when permeable areas are converted to impermeable areas – by paving or building structures – and people are located in areas that may be unsuitable due to a high inherent flood risk. Paving increases the amount of runoff and has an impact on the time of concentration. This means that more water ends up in one place at the same time, causing or exacerbating flooding and flood damages. To remedy this situation, we build stormwater conveyance devices. These in turn can make the situation worse in ‘downstream’ areas. The adoption of on-site detention is an attempt to break this cycle by integrating these concerns into the land use planning cycle.

As the quality of point source discharges has been improved via the enhancement of treatment and source control systems, awareness has increased regarding the contaminant loadings of runoff, particularly from urban areas, but also from intensive agricultural or pastoral areas. The accumulated debris from automobiles, industrial and commercial sites, domestic use of pesticides and fertilisers, companion animals and improperly disposed wastes accumulates in the stormwater system. Many efforts to control this are underway, but the task is enormous. The large volumes and constrained land use make traditional treatment remedies impractical.

A third dimension of stormwater management goes to the issue of the next item, sustainability. A number of pioneering efforts are underway to harvest stormwater resources that would traditionally be ‘wasted’. These include aquifer storage recovery efforts (notably in South Australia) and on-site use. Water tanks are well represented in Australian rural areas, but these traditional methods are being complemented by somewhat innovative approaches such as the Figtree development in NSW where rainwater is harvested and then integrated into the development’s plumbing system.

3 METHODS FOR ACHIEVING SUSTAINABILITY

The management of a catchment is not easy. There are always competing objectives to be considered. The level of management should be dependent on the uses to be protected and the relevant economic and social costs. Incentives or penalties may be required to achieve the desired objectives. Regulatory and enforcement need to be adequate to manage the more entrenched stakeholders.

A logical first step is to prevent the current situation from further deterioration. Even this may not be easy to achieve, as many communities do not believe their water resources are at risk and hence will see controls as being imposed by others for no obvious benefit.

In order to achieve sustainability, we need to have a comprehensive understanding of the dynamics of a system. This is no easy task. Natural ecosystems are complex. The cumulative effect people and their activities is equally complex and perhaps less predictable. We still may not make the right decisions, but if the systems are in place to form the basis of decisions, and evaluate the effect of those decisions, we can at least maximise our chances of success.

There is tremendous potential to utilise electronic information systems such as GIS technology to organise, present and analyse the data that is relevant to understanding the dynamics of catchment systems. This is a potentially complex undertaking, but Australia is world class in its use of such systems and possesses a knowledgeable group of practitioners.

The Australian National University Centre for Resource and Environmental Studies recently completed a GIS model that includes all of the surface water systems in Australia. The system was designed to look at the level of disturbance in Australian catchments but it is probably the only framework that exists providing coverage at the national scale. Various States are gathering useful data but using different methodologies. It may be possible to incorporate state and/or local spatial data into the CRES framework to expand its functionality. What CRES has could be considered a starting point for providing data at a national/regional scale.

Another effort that may contribute in this regard is the National Land and Water Audit. This again raises the issue of integration, which is so vital to catchment management. These two efforts potentially complement each other, but are not necessarily coordinated. A universal base system that is founded on a catchment approach could help promote efficiency and reduce redundant efforts.

The issue of scale is significant and needs to be considered. National coverage is targeting the regional scale, but many land management decisions have to be based on data at a smaller scale. We need a tiered system of good data and good tools to help us to make good management decisions at the different scales. It may be possible to leverage existing work by providing authorities across Australia with a mechanism that allows them to add and update relevant information. The effort would be considerable, but it would put Australia in a position unmatched by any other country. Commencing an investigation into the feasibility of this idea should not be lightly dismissed.

3.1 Point Sources of Discharge

The larger of these are generally already identified, controlled and licensed by State pollution management agencies.

Areas now requiring attention are the smaller sources that have traditionally discharged to the environment such as dairies, stock and loading yards and builders.

A second issue that requires attention is sites that allow polluted stormwater runoff to leave the property. This latter group includes construction sites, cement batching plants, sand and gravel yards and domestic building sites.

The management of these smaller sites varies across Australia. In some areas local government has taken a strong role in controlling these smaller discharges to the environment. In other states the state environmental manager has taken this role. There are a number of impediments to effective control.

One is the sheer volume of sites and dischargers. Another is that the operators and owners of these sites often lack adequate resources or knowledge to manage

site discharges. A third is the lack of resources within enforcement agencies, especially local councils and the difficulty and expense of successfully moving a citation through the legal system. The proceeds of fines do not always flow back to the enforcing authority, or are insufficient to meet expenses, resulting in a diminished incentive to pursue the role.

As most people are usually prepared to do the right thing, an education program coupled with an enforcement regime may address most of the problem. Planning and building permits should place appropriate conditions on new development to collect and treat runoff during the construction period.

An opportunity exists for the Federal and State Governments to include appropriate environment control requirements backed up with "carrots and sticks" in their specifications for major works. Such action should send clear signals to all contractors and providers of services to government that the health of our waterways is a priority. In some cases it may be opportune to provide bonuses for above average environmental performance where this can be clearly measured.

There are a number of existing programs that deserve consideration and evaluation. Where success can be demonstrated, opportunities to resource and perpetuate the systems elsewhere should be considered. One such program that should be evaluated is Queensland's recent high profile campaign to fine waterways polluters.

3.2 Urban Storm Runoff

Urban streets in every town and city in Australia are without exception drained to the nearest watercourse. This results in litter, grass clippings, dog faeces, fertilisers and pesticides, oil, mud and all the waste of an urbanised society entering the river system.

Traditional stormwater systems, which rightly include the street/curb/gutter system, are designed to convey water rapidly away from areas where it is not wanted. This can make the situation downstream worse by concentrating the flows and further development upstream can overwhelm downstream systems if their design capacity is inadequate.

In the case of systems to handle runoff quantity, it is appropriate to question their sustainability and look for alternatives. Stormwater quality issues should be addressed primarily by source control and secondarily by looking for ways to incorporate solutions into drainage systems and on development sites between pollutant sources and the drainage system.

The CSIRO Urban Water Program includes consideration of alternatives to traditional stormwater systems and will lead to identification of research priorities for the future, where viable alternatives are evidently not available or are only just emerging. An example of the application of alternatives can be found in the aquifer storage recovery programs in South Australia. A research priority for the future may be development of more extensive databases and decision support systems to assist management agencies with catchment planning. (Contact information and AWWA publications available regarding the above examples).

Traditional treatment approaches are generally not a viable option due to the intermittent nature and large volumes associated with stormwater flows. A traditional centralised wastewater treatment plant would need to have an enormous capacity to handle the volumes and much of the time this capacity would sit idle. The alternative is a smaller plant with a large holding area. The problem with this solution is that appropriately sited land to store the flows is either generally not available or is prohibitively expensive.

Sustainable solutions are likely to be small-scale in nature, serving either a single site or a small area. Solutions can be broken down into three basic categories: education; engineered solutions; and development controls. The first two are addressed below while the third is taken up in the next section.

Education to influence public behaviour is generally viewed as a cost-effective approach. However, it is difficult to truly measure effectiveness, the investment is really a long-term solution as the most effective programs are probably those that are applied within the school setting and ultimately people are less controllable and predictable than "hard" solutions. None of this should be taken as an argument against this undertaking, it is simply an acknowledgment that a comprehensive solution needs both hard and soft fixes.

The WaterWise in Schools and the NSW Agriculture WaterWise on the Farm programs appear to be successful models that could perhaps be given more support. (WA's WaterWise in Schools program in particular has won mention. Other states also have similar programs. We can supply contacts if desired). AWWA has also recently produced a CD-ROM for use in schools that addresses, in part, stormwater pollution issues.

A number of decentralised hard fixes are available. On the quality side, these include constructed wetlands, litter and/or oil booms and specific litter and/or sediment traps within storm drain systems or on development sites. With respect to quantity issues, on-site detention is gaining increased acceptance. There are opportunities to apply proven technologies such as water tanks in new and innovative ways. There are also great potential benefits available from dual-purpose facilities such as parks that also function as detention systems, potentially providing both quality and quantity management benefits. The CRC for Catchment Hydrology has produced a number of resources that address urban runoff management issues and alternatives.

3.3 Planning Controls

Simple Planning controls under the relevant State planning legislation can be an effective method of control. However, success requires commitment of local planning authorities to the objectives of the legislation.

Victoria has approached this problem by preparing a set of standard ordinances for a range of standard land use zones. Councils are required to adopt only the standard zones and their corresponding ordinances. Each ordinance sets objectives for the corresponding zone and provides requirements at varying levels, including those to protect water quality.

Water management authorities are given special referral powers that require councils to refer development applications in sensitive catchments to them. The referral powers permit a water authority to consent, consent with conditions or refuse consent to a proposed development. The council must comply with the water authority's request. Appeal rights are provided for any applicant who is aggrieved by a water authority's decision to prevent abuse of this power. However in considering an appeal the tribunal must have regard to the objectives of the zone as described in the planning scheme ordinance.

It is appropriate to consider requiring land developers to provide stormwater treatment facilities as part of the infrastructure required for their development. To guide developers and councils there is a need for suitable codes of practice. As this is a fertile area for innovation the codes should be based on achieving a specified reduction in pollution rather than being prescriptive about the type of devices to be provided. It may be beneficial for Councils to offer reduced drainage charges for solutions that offer high performance with low operating costs.

There is room for design standards that promote the incorporation of site-design features that make the site more sustainable. For example, semi-permeable pavement areas (*e.g.* pavers rather than asphalt or concrete) and/or paved areas or rooftops that drain to grassed or vegetated areas rather than directly to the street. Both quantity and quality benefits can accrue from these design alternatives. They do of course need to be incorporated with due respect to site-specific suitability considerations. There are good reasons for building codes that require drainage away from the site. However, we need to have systems that consider the alternatives and implement them where feasible, rather than blindly opting for the most conservative approach. We may need standards so that building authorities are not excessively exposed to the liability that may be associated with requiring an alternative that is potentially more 'risky'.

3.4 On Site Waste Disposal Systems

The standard of approval and control of on site disposal systems such as septic tanks and domestic treatment plants varies across the country. Surveys have indicated that many systems are inappropriate for their location and are not being maintained (AWWA journal, *Water*, references available upon request).

The recent outbreak of contaminated oysters at Lake Wallis in NSW indicated clearly the public health risk that can be created. While there are standards and codes of practice many approvals are still being granted with a minimum of investigation and the ongoing audit of the performance of these systems by the relevant Authorities is virtually non-existent in most states.

The problem of managing on site disposal systems is similar to many other catchment problems. An individual site may have negligible impacts on water resources, but the cumulative effect of multiple systems can be substantial.

It is clear that some administrative program of inspection and audit of these systems is necessary. The aims should be to firstly educate landowners and potential purchasers that it is their responsibility to ensure their systems are operating correctly, for both public health and environmental reasons. The second

aim should be to detect and penalise the landowner that fails to manage his system and reward the owner who does the right thing.

There is a program in the United States that was funded by the federal EPA and is run by an outsource contractor that targets the educational needs. It is a model worth looking at as something that may be of benefit here. It goes by the name of "Small Flows Clearinghouse". They offer a free newsletter and other information. If there is interest in providing a similar service here, AWWA would be happy to discuss how we might assist. We have a national on-site systems interest group that would be a good taking off place. We can provide you with more information on the small flows clearinghouse upon request.

3.5 Management of the Riparian Zone

The riparian zone, which includes vegetation along the stream bank, instream vegetation and the bed and banks of the stream, has a significant impact on almost all aspects of the stream ecology. In summary the most important impacts are

- Contributing nutrients and other inputs to the aquatic food chain.
- Providing habitat for native birds and the larger branches that drop from native trees also provide habitat for fish.
- Trees in this zone provide shade to reduce water temperature and reduce sunlight.
- Tree roots stabilise the banks.
- Ground cover filters sediment from run off and plants abstract nutrients before surface runoff enters the stream.

Native trees are preferred in this zone as exotic vegetation such as Willow and Ash trees pollute the water in autumn with leaf litter and shade the grasses and other vegetation below, which are necessary for filtration of overland flow into the stream.

Without a well-managed riparian zone excessive sediment fenters the stream from overland flow or bank failure occurs from the action of stock. This sediment clogs the stream bed, smothering native flora, and destroying the egg laying sites of native fish.

Good management of the riparian zone is essential. While it may be the single most important determinant of river system health, it can become a "band-aid" solution if good land use management is not practiced upslope. This takes us back to the need to keep an integrated approach in mind. There is some tendency currently to loose sight of the forest, in our quest to focus on the trees. We must continue our productive efforts, but evaluate them and additional needs by monitoring the overall health of both individual systems and our collective ecosystem.

We do not have any evidence, but would suspect that this is the area where the landcare program has made the most substantial contribution to catchment management. This is based on the assumption that the most degraded waterways are probably those where ranching is practiced and that the landcare program has actively reached out to this stakeholder group. It may be appropriate to look to the

landcare program to determine whether there are incentives that could be provided to facilitate the expansion of what they may have accomplished in this area.

4 STAKEHOLDER ROLES

Catchment health is not determined by any single action; but by the cumulative effect of many individual activities. Many of these occur on private property. Because an individual action may be relatively insignificant, or at least impossible to measure, it is extraordinarily difficult to convince individuals and agencies that just removing a few trees or allowing cattle to access a section of a stream will do any harm.

To deal with this perception environmental “champions” are required at the local level. The Landcare movement provides a good model of success in this type of environment. The role of government at all levels is to provide advice, information, appropriate support and resources, and where necessary the threat of penalties. However “throwing money” at the problem will not necessarily solve the problem, or offer the most cost-effective remedy. Ultimately, a change of attitude that results in the assumption of personal responsibility is likely to be the most effective remedy. This will take time and local commitment.

The most successful results have been achieved where individual landowners have become convinced of the need to change and have been able to access sufficient assistance to top up their own resources (generally on a 50/50 basis).

Convincing local landowners to take action is a slow process and can usually only be achieved by working on a one-to-one basis. This requires field officers with adequate time and motivation to meet with individual owners to discuss options provide support and assist in preparing funding applications. Once a number of landowners have developed their own properties to a stage where the benefits begin to become obvious to neighbours then the majority become convinced.

One of the most difficult issues in allocating funding is assigning the appropriate priorities. This goes to the heart of ICM, the integration of activities. To use NSW as an example, activities within catchments to improve their health may be carried out by: local community groups; local government; state agencies; trusts; regional government organisations; local government committees formed under Department of Land and Water Conservation programs; private parties and catchment management committees. Funding for these activities may come from an equally diverse mix of sources. The activities are not necessarily coordinated and there is no easily accessible way to find out everything that is going on.

The situation is the same in terms of activities that have adverse effects. There would be real potential value from a system that provides an easy way for people to catalogue their activities and for others to access the comprehensive list. The ANU CRES GIS system was mentioned above as a potential starting place for developing a system that facilitates integration of stakeholder activities. A fully developed system needs to incorporate the positive management efforts, as well as adequately incorporating potentially adverse activities.

It is suggested that the roles of each tier of Government are:

Federal Government

- Setting National strategy
- Initiating and funding research required at a national level
- Monitoring performance at a National level
- Funding major programs
- Developing codes of practice and guidelines
- Identifying and funding training requirements
- Coordination
- Providing education material
- Promoting the development of universal systems that facilitate communication and coordination

State Government

- Establishing land use planning controls at a State level
- Setting state strategy and through their catchment agencies local strategies
- Identifying priorities
- Providing support through state agencies and reallocating responsibilities between agencies where necessary to facilitate integrated management of catchments
- Monitoring performance of state agencies and local government
- Allocating and accounting for funds
- Providing appropriate structures to develop and implement local plans (eg Catchment Management Authorities)
- Ensuring that all state agencies operating comply with the State strategy
- Providing and education material and field officers
- Monitor and report on the condition of the state's catchments

Local Government

- Identify local priorities
- Amend and administer local planning ordinance to reflect local strategic plan
- Initiate and support local pollution control by-laws
- Support educational activities
- Show leadership in their own works programs and actions

The Community

- Accept the challenge and provide leadership and support for initial projects
- Monitor and report on local issues
- Education
- Initiate local actions by organising action groups (such as Landcare and Streamwatch)
- Accept responsibility and accountability for resources

Private Sector

- Increase awareness of consequences of their actions
- Develop/adopt improved land management practices
- Sponsorship
- Leadership
- Participate in the increased recycling/reuse of wastewater

5 PLANNING, RESOURCING, IMPLEMENTATION, COORDINATION & COOPERATION

Many of the issues and ideas that we would raise with respect to this section have been covered in previous sections and in the last section below. It is difficult to assess the adequacy of resources as we do not have systems that really permit us to know the status quo across the whole playing field. Existing systems, such as the ANU CRES system, may provide us with considerable leverage towards developing a system that will permit that sort of assessment.

If we are indeed that close to an understanding, then we need some reasonably objective way to prioritise needs. Only at that point can we say whether we have sufficient resources to make reasonable progress.

Coordination is a key issue; it is akin to integration. It should be relatively clear from what has been said elsewhere in this submittal that we believe that this aspect of catchment management is the key piece that we need to improve. Furthermore, we believe that electronic data systems that make use of a web-based interface are a feasible option at this time, are the best route to go in terms of taking us where we need to go and would be most effectively developed at a Federal level.

Having said that, there are a lot of systems already in place at the local and state level and every effort should be made to integrate them, rather than re-inventing the wheel. This is a potentially monumental task, but we would argue that it is worth the effort and that we are up to the task in terms of local expertise and ingenuity. In looking at the costs, it should be realised that a system of this sort has many potential benefits that extend beyond the realm of catchment management. There are also potential cost savings and revenue streams that could accrue from a sophisticated spatial based information system.

6 MECHANISMS FOR MONITORING, EVALUATING AND REPORTING

This is critical in order to realise integration and improvement in the effectiveness of efforts. These need to occur at the scale of the catchment and incorporate all of the activities of diverse parties into one place, insofar as practical. The development of systems should be centralised to realise the benefits of economy of scale. However, the systems should make it easy for many people to enter information and view the information. A number of ideas and suggestions in this regard have been mentioned above.

The management of catchments appears to fall into a number of categories

- Management of existing diffuse sources of pollution and activities on private land or crown land occupied by private persons.
- Management of point sources of pollution (including construction activities)
- Management of Crown land
- Management of new development

6.1 Management of Existing Diffuse Sources

This is probably the most difficult aspect of the catchment management problem. It will require a complete change of attitude for a large number of landowners and will take a long time. It is likely that this can only be achieved by local groups working

with local communities, groups and individual landowners. Local leaders need to be involved to demonstrate to communities the benefits to be gained. Funding for on ground extension staff and contributions toward works such as tree planting, fencing of streams and off stream watering points will be required.

To ensure ownership of projects and ongoing maintenance, equal funding or in kind contributions such as labour by the landowner are essential.

Such projects are best managed at a local level by local catchment boards or councils. Paperwork and reporting should be kept to a minimum commensurate with reasonable financial accountability.

Strategic direction should be set at state and federal level to ensure acceptance criteria for applications provides maximum community benefit.

6.2 Management of Existing Point Sources of Pollution

Major point sources are currently managed adequately by the State Environment Protection Authorities. Smaller local sources such as small building sites and septic tanks are probably best managed by local Councils, who in most states have statutory powers that could be applied.

Some support in the form of national codes of practice, training and resources to set up monitoring systems may be required. On going finance to maintain an acceptable level of monitoring is probable best funded from a user pays system using annual licences and/or permit fees.

State government should have the responsibility of monitoring the performance of these systems through appropriate legislation, such as the relevant Environment Protection Acts.

6.3 Management of Crown Land

To ensure the right signals are sent to landowners government has a responsibility to apply the same performance it seeks from private landowner to its own land. To not do so will undermine the whole strategy.

It is essential that government insist that its leaseholders, contractors and agencies operate and be seen to operate in an environmentally responsible manner. To achieve this, all leases, licences, contracts and similar documents should specifically require appropriate management techniques. The ability to meet these requirements should be part of any selection criteria.

6.4 Management of New Developments

State and local planning legislation probably provide the most appropriate method of managing new developments. In all states there exist land use planning controls with enforcement provisions and appeal mechanisms. By setting state-wide and local planning objectives it should be possible to ensure environmental impacts are taken into account in considering individual applications. Where possible, planning ordinances could call up codes of practice so that permitted development is conditional on the relevant code of practice being complied with.

6.5 Incentives

The opportunity exists to explore alternative options such as Transferable Pollution Rights. This technique involves an industry reducing its level of pollution below its required licensed level and selling that capacity to another licensee. Such a system offers the opportunity to reduce levels of specific pollutants at minimum cost, but obviously requires careful monitoring and control.

Taxation incentives may also be an opportunity to encourage landowners and industry to provide the financial resources required improving their environmental management.

Over the past 10 years most urban sewerage authorities have altered their trade waste charging structure to move away from volume charging to a system based on the strength of the waste and cost of treatment. In NSW, the EPA is moving towards a load based licensing system that has a similar intent. Such systems need to be investigated for possible wider implementation.