



# THE HYDROLOGICAL SOCIETY OF S.A. INC.

c/o Water Resources Branch  
Box 1751, Adelaide, S.A. 5001

NEWSLETTER NO. 56

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## GUEST EDITORIAL

### HYDROLOGY AND DEVELOPMENT

There has been considerable recent debate on the stalled state of development in South Australia.

My proposition is that the mutual suspicion which separates the pro- and anti-development lobbies could be usefully reduced, to the benefit of all, if we hydrologists expanded our activities into what I will call engineering environmental hydrology.

By examining the way in which development controls are applied in catchment management, I hope to prove the general case by inference from a particular situation with which I am familiar.

As hydrologists we are concerned with many of the interactions of water, land and vegetation. As 'engineering hydrologists' most of us have specialised in their quantity aspects. More recently however we have been persuaded that the priority areas of concern have shifted to the water quality aspects of the interactions. As engineering hydrologists we were largely left out of the problem recognition stage and, here in South Australia, we have not been greatly involved in the investigation or rectification stages either.

In a recent address in Adelaide, Professor Imberger argued that the detailed understanding of the physical processes of a reservoir was the only possible starting point in the interpretation, and ultimate management, of the chemical and biological processes taking place within it.

The analogous extension of this to the chemical and biological processes taking place on the surface of a catchment is obvious and similarly valid, but, up to now, has been largely overlooked by both hydrologists and water quality managers.

The consequence of imposing management in catchments without a clear understanding of the many hydrologically controlled water quality processes taking place has lead to:

- an inability to develop indicators of the average status or water quality determinants in which the effects of high temporal hydrological variability are removed. Consequently management objectives cannot be quantified and management performance assessed.

- an understandable desire to 'play it safe' by the banning of certain developments, rather than the seeking of a reduction in impacts by the 'engineering' of the processes involved in producing the deleterious effects.
- certain judgements, which should have been recognised as only involving aesthetics, being muddled by psueo-scientific arguments, to the detriment of both science and the badly needed development of an aesthetic ethos.

This kind of situation can, I believe, only continue to result in mutual distrust between those saddled with the responsibility for management and development controls, but having inadequate tools for the task, and those suffering from the necessarily arbitrary decisions made. I believe this kind of situation is also repeated similarly in many areas of environmental management. The solution is not to hand over more power to one or the other sides of the conflict, but to ensure that the lack of knowledge and communication which characterise the conflicts are reduced by appropriate scientific investigation and the adoption of improved methods, including those associated with this area of hydrology.

So rests my case - except for a rider.

I am concerned that a belief has sprung up that problems such as this can be handled by setting up a multi-disciplinary management team. Such a team, set up to manage a truly inter-disciplinary problem (as distinct from a multi-disciplinary problem) will only end up by talking endlessly and knowledgeably around its edge. What are needed are individuals, in full recognition of their ignorance, exploring the core area in a series of systematic investigations and expanding their own areas of knowledge into the 'new' area - something which cannot be done in a hurry.

I am even more concerned when the multi-disciplinary team is also a multi- (government) departmental one. Where an ongoing job has to be done, the creation of permanent multi-disciplinary teams, involving multi-departments, may result in impressive initial success in problem recognition, but can only be a recipe for long-term disaster in problem solving.

RICHARD CLARK

## ARTICLES OF INTEREST....

WHERE TO FROM HERE?

## Competitive Markets and Conservation

John A. Hayward, Director of the Centre for Resource Management, Christchurch, N.Z., looks at the managing of public resources in a market economy.

In the history of modern economic thought there has been much debate about the role a government should play in its country's economy.

Two hundred years ago, Adam Smith published his path-breaking study "An Enquiry into the Nature and Causes of the Wealth of Nations". In it, he developed the proposition that private markets should be liberated from "the tyranny of government control". Private markets, Smith argued, frequently promote the interest of society more effectively than can governments, whose interventions usually only serve to make things worse. Although much of his work has been refined and modified, many of his "leave it to the market" conclusions have survived.

As the New Zealand government promotes economic policies that are more strongly market-oriented on the one hand, and proceeds with reforms for the administration and management of environmental resources on the other, it is perhaps appropriate to consider the relations which might, or should, exist between the market and environmental management.

In the 19th century, Ricardo, Malthus and others made clear the dependence of a country's economy on its resources. However, for the first half of this century few economists paid attention to that connection. Most believed that the industrial countries either possessed adequate stocks of natural resources or that these could be acquired by importing - usually from their colonies.

However, since the 1950's many authors have dealt with the questions of economics, resources and environment. For some, the prime concern has been the failure of the market to deal adequately with problems of pollution. Others have been more concerned with the effects of economic activity on resource scarcity. For example, in 1952 the United States Presidential Commission on materials Policy reported that the problems of resource exploitation and future scarcity made the welfare of future generations increasingly dependent on prudent resource management. More recently, reports from the Club of Rome and the work of Forrester, the Meadow's and others, have drawn attention to the problems of resource consumption, population growth and impending resource scarcity.

For many, the predictions of doom are unconvincing. Their response has been that as resources become scarce, the market will ensure that their price rises, thereby leading entrepreneurs to search for cheap substitutes. While all would acknowledge that there will be uncertainty about the success of that search, the point to be made is that the market will identify impending scarcity and generate signals that will lead to innovation, substitution or change.

The important question to be asked is, are today's prices high enough to ensure that resources will be used efficiently and the search for new substitutes encouraged? It is in the sphere of price and value that we encounter problems in dealing with environmental resources.

In a perfectly competitive market, value and price would be synonymous. If markets are less than perfect there will be a divergence between price and value. However, for a perfect market to exist, a number of conditions must be met. In the context of our natural resources, private ownership is perhaps the most important condition. Ownership is an essential precondition to trade in a market and a clearly defined system of property rights is necessary for an efficient market. However, most environmental resources are held in public ownership and, because they are seldom bought or sold, there are few price signals from which we might begin to deduce their value.

In the past, public resources have been undervalued and too often excluded from economic consideration. They have been treated as a common property to be used by anyone. Garret Hardin in his essay "The Tragedy of the Commons" has eloquently pointed out that public resources are exploited when the costs incurred by an individual or firm in their use are less than the costs incurred by society.

Another important feature of a market is the assumption that owners capture all the benefits. But the problems with public resources are that, firstly, they are not "owned", and secondly, those who benefit from using them are frequently widely dispersed and difficult to identify.

These and other shortcomings mean that despite the many benefits our society might derive from a market economy, we cannot rely on the market to be an efficient or appropriate mechanism for the allocation of environmental or publicly-owned resources. It is in the inability of the market to deal appropriately with these resources that we find the rational argument for government intervention.

However, if such intervention is to be more effective and efficient than the market it seeks to replace, then the government and its agencies must address at least two questions:

1. What value do we assign to publicly-owned resources and what methods do we use to assess this value?
2. What are the appropriate institutional arrangements for managing resources owned both by present and future generations?

These two problems are fundamental to our attempts to identify the When, Where and How a government should intervene in a market economy for the purpose of managing the resource endowment we call our environment.

For some years now, we in New Zealand have dealt separately with the issues of environment and economics. Other OECD member states have recognised that their economies and environments, if properly managed, are compatible, mutually reinforcing, and essential issues for government concern. As we, in New Zealand, set out to achieve this closer integration, we will find ourselves in something of a dilemma. On the other hand, we will find that government intervention becomes more necessary to retain those environmental features which contribute much to both our economic activity and our quality of life.

For example, we know that in the next decade there will be increased competition for water in several New Zealand regions. We know that our planned expansion of coal mining faces many problems. We know that both surface and groundwater will be increasingly polluted by run-off from high yielding farmland.

We also know that in these and other issues the market will not, of itself, safeguard the interests of the public - owners of these resources. We must therefore decide on an appropriate level of government involvement.

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## FROM THE HYDROLOGICAL TRAPS.....

No contributions received for this issue!  
How about writing something NOW for next Newsletter.

## FLOOD-PLAIN MANAGEMENT (Contributed by Chris. Wright)

The news coverage in recent weeks of the flood damage to homes in Bolivar should be no cause for surprise to flood hydrologists in South Australia. The problem of development of flood-prone land for permanent and semi-permanent housing is rapidly becoming more acute around Adelaide, since suitable building land is rapidly becoming scarce and expensive and the temptation to develop marginal land is increasing.

Several instances of this problem come to mind:

- the turmoil over development in the Mallala area within the floodplain of the Gawler River;
- the housing development at Mount Barker which has already been flooded;
- proposals to build a caravan park at McLaren Vale in the floodplain of Pedlar Creek.

Unfortunately decisions to construct housing within flood-prone areas are commonly made on economic grounds (i.e. cheap land), and without reference to the hydrology of the area. Once the decision to develop has been made, the hydrologist is called in, either because flooding is perceived to be a potential problem, which must be solved (rather than a reason for not developing the area), or because of statutory regulations which must be satisfied. Developers commonly assume that flood protection can be provided to order (simply a matter of building a large enough flood bank!) without reference to the general flood processes in the creek, or to the fact that levees for flood protection are "Designed for Failure", i.e. designed for a particular return period flood.

The common consequence is a legal battle, in which the final decisions are generally made by adjudicators who have no background or understanding of flooding issues.

In South Australia we have considerable advantages over the eastern states in that most of the floodplains for the major creeks in the vicinity of Adelaide have already been defined and the information made public. The next step, that of Gazetting the information and issuing of Supplementary Development plans, has begun. After completion of these procedures it will be very much more difficult for developers to ignore the real dangers of flooding. Hopefully these steps will protect members of the public, who at the time of purchase of a flood-prone property, may have no understanding of the risk to which they are exposing themselves.

THE CHOWILLA SALINITY MITIGATION SCHEME  
Contributed by Claus Schonfeldt

An important component of the Murray Darling Basin Ministerial Council's strategy to manage salinity and drainage problems within the Basin is interception of salt inflows at favourable locations and its judicious disposal.

Proposed schemes at Woolpunda (S.A.) and Mallee Cliffs (N.S.W.) will intercept groundwater inflows. The proposed scheme at Chowilla will manage surface flows in the anabranch system to reduce the largest point source input within South Australia.

The Chowilla region is however far more than a large contributor of salt to the river. It has important environmental significance for flora, fauna, and its general amenity. The region is within the Riverland Wetland listed as an important international wetland area under the Ramsar Convention.

The impact of the proposed scheme on these environmental aspects is therefore of great interest.

A particular interest is the impact of the proposed scheme on the health of the vegetation. It seems that opinions are divided, which is perhaps not really surprising.

A draft EIS is currently on public exhibition (until 10 June) and a high degree of interest and response is anticipated.

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A.W.R.C. INTEGRATED CATCHMENT MANAGEMENT  
WORKSHOP

Contributed by Claus Schonfeldt

On 17 - 19 May, the AWRC Planning and Surface Water Committees held a workshop focussing on integrated catchment management (ICM).

The workshop brought together a cross-section of people (300+ to the seminar and 150 to the workshop sessions) throughout Australia involved in a whole range of activities related to catchment management. There were also invited guests from N.Z. and Canada to introduce some overseas experience.

The diversity of interests covered various government agencies, academic and research organisations and national interest groups, including participants from the farming community.

The purpose of the workshop was to identify major issues and opportunities for implementing integrated catchment management throughout Australia.

Prior to the workshop, State participants had worked together to produce a draft strategy for implementing ICM in their State. These strategies identified the major impediments and opportunities in each State. The strategies were refined in the light of ideas and experience exchanged at the workshop.

A workshop report is being prepared in time for the next AWRC meeting in July.

The report will outline recommended strategies.

An interesting aspect of the workshop was the discussion about the title, namely integrated catchment management.

It is universally agreed that integrated catchment management is a community-based concept in which grass-roots caring for our environment and reservable resources is the key. Governments and bureaucracies foster the proper approach, but it is the community at large which must feel and do the responsible thing. In particular it is important that groups of landholders within a catchment identify management problems (e.g. salinisation) themselves, and work together on their solution.

Yet the name is not one which is readily marketable. Professionals may identify with the terms (although even this is questionable), but what does the word catchment mean to the man on the land?

Something catchy is sought. For example, Victoria has two interesting community-based activities called 'SALT WATCH' and 'LAND CARE'. An extension for integrated catchment management might be TLC, for 'TOTAL LAND CARE', rather than Tender Loving Care. However, this doesn't properly bring water management into play.

So for those who love a challenge, here it is. Your opportunity to be an advertising executive for a day.

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### WATER DIVINING

Contributed by John Waterhouse

Water divining is a subject best avoided. However it seems to be irretrievably lodged in our society's folklore, and is clearly believed by a large number of people, if not by a majority. In 1988, large proportions of water wells drilled in the wet areas of South Australia, notably the Adelaide Hills, were probably sited by diviners. Drillers report that some clients measure the exact site of their drillhole and are reluctant to pay for unsuccessful holes unless they are precisely where the diviner found the "stream".

So what can be done to inject a note of rationality into the situation, given that hydrogeologists have been bemoaning the situation for several generations? Is there any point in trying given the current upsurge in fringe medicine, astrology and sundry subjects?

For those interested in following the whole dismal business further, I can recommend some light reading:

- 1) "Divining" by Cristopher Bird.
- 2) "Water Divining and other Dowsing - a practical guide" by Ralph Whitlock.

Both of these gems were found in book sales. This may say something for the popularity of the subject among the literate, and was fortunate because the former was reduced from \$39.95 to \$3.95!

Christopher Bird also wrote a brief well-known book called "Secret life of plants". His book is subtitled "The art of searching for water, oil, minerals, and other natural resources or anything lost, missing or badly needed", which leaves few aspects of divining unmentioned. Whilst the reader with practical knowledge of underground water would find many points with which to disagree, there is no doubt that Mr. Bird has written an exhaustive and surprisingly interesting book, particularly because it discusses the historical background of divining. It is also well illustrated, with drawings and even a medallion demonstrating that the forked stick has been used for a long time in human history. How lucky that in Australia the hazel twig could be successfully replaced by that most indigenous of materials, fencing wire!

Ralph Whitlock's book is much smaller, and written by a devout adherent to the faith. He also writes a most readable column in "New Scientist" magazine. Without descending to ridicule, this book tests one's most open-minded and best intentions, but is nonetheless worth reading if a couple of hours can be found. Without any claim that the following is representative of the book, consider it:

"Finding a glass of table wine taken with a meal helps my digestion, I am mindful of St. Paul's advice - take a little wine for your stomach's sake. I pour out a glass of wine and test my reactions to it by moving the oscillating pendulum from a position over my left hand towards the wine. All is well. But when I replace the glass of wine by a full bottle, the pendulum falters and switches to gyrations. If someone pours wine into a large jug while I continue with dowsing with the pendulum, I can gradually increase the strength of the gyrations. The quality of the wine may be excellent and beneficial, but the quantity is wrong. To drink a whole bottlefull would do me no good."

This is but a small sample of the subject matter that will be included in any serious discussion by a devoted diviner (or dowser, as the British would call the person).

As one who has accepted an invitation to address the S.A. Dowsers Association, I can attest to the absolute faith of the diviner in the method. My talk was preceded by a woman who sexed her seedling paw-paw plants with a pendulum consisting of a nail on a length of cotton. There have been conventional attempts to debunk divining, ranging from field demonstrations of its remarkable inconsistency to papers like Bill Williamson's "Water Divining - Fact or Fiction" which Bill wrote when working for the N.S.W. Water Resources Commission. There have been reports to the South Australian Parliament in the past on subjects such as patent water finding machines, and no doubt there will be more. However these seem to have had little or no effect on the general public perception.

A telling statistic was provided by a pre-war survey in N.S.W. which found that bores drilled at divined sites had the same success rate as those drilled where convenient, for example at the corner of paddocks or behind the shed.

There is little doubt that this belief in the ability to "find" underground water (let alone gold, oil, water pipes, inflamed liver etc.) is deeply entrenched, and also difficult to substantiate. It can also be expensive to its adherents when they persist in drilling for water in geologically hopeless situations or at totally impracticable sites considering access for drilling and pump rigs.

Most groundwater specialists avoid arguing the subject, since logical arguments are not appropriate in most cases, and we have our health to consider! Comments would of course be welcome, but this is not intended to be the start of a prolonged debate on the subject of divining for water or anything else. If anyone has any practical suggestions about what the Hydrological Society could, or should do to elevate discussion about divining in our 20th century society, the next issue of the Newsletter awaits your initiative....

## FROM THE SECRETARY....

Membership of the Society currently stands at approximately 170. Suggestions have been made that efforts should be made to attract membership from a wider spectrum of the profession, such as E.T.S.A. staff, and the Department of Environment and Planning. We need volunteers to approach potential members within these and other organisations.

There has been some action recently with regard to a proposed Discussion Paper on Water Quality Standards. Dennis Mulcahy of the Centre for Water Treatment and Water Quality Research, has been approached and is willing to become involved in finalising the discussion paper. Graeme Dandy will be the co-ordinator.

A meeting in April on the Hydrology of the Northern Flinders Ranges was attended by a hard-core of specialist hydrologists. The address was given by David Kemp of the Highways Department, who has been analysing two major storms which were recorded in the Emu and Windy Creek catchments at Leigh Creek South. Pluviometers and streamgauges were installed by E.T.S.A. in 1985, and the storms in late 1986 and early 1987, were major runoff events and caused Aroona Dam to overflow for the first time in 10 years. The storms were analysed using RORB. David found that the RORB parameters were very different from commonly adopted values for the Mount Lofty Ranges, but were comparable with values derived in studies in the Alice Springs area, and by Cordery for Broken Hill catchments. His

main reason for undertaking the analysis was to examine the design standards for culverts on the main Leigh Creek road, where considerable damage had occurred since the road was completed. He found that in many cases the culverts were under-designed, and has proposed a revised standard for flood estimation for similar areas. It is hoped that the data obtained from these two storms, and the work done by David will be used to re-examine the adequacy of the Aroona Dam spillway. It is understood that Kinhill Engineers are in the process of carrying out an analysis for E.T.S.A., which will indicate the recurrence interval of the flood which can be safely handled by the spillway.

The A.G.M. will be held on 18th August, and following the elections, an address will be given by Vince Kotwicki on the "Hydrology of the Solar System". The Ian Laing Prize, awarded for academic performance, particularly in subjects related to the aquatic environment, for final year honours or postgraduate degrees, will be awarded/presented during the A.G.M. There will also be an award for Honorary Life Membership.

Members of the Society who may be thinking of serving on the executive committee should consult the notice accompanying this Newsletter calling for nominations. The positions of Chairman, Vice-Chairman, Treasurer and Secretary are elected annually. Non-office holders on the Committee are elected for two years at a time.

HYDSOC Committee for 1988

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