The NSW State Groundwater Policy Framework Document

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To manage the State's groundwater resources so that they can sustain environmental, social and economic uses for the people of NSW.

Prepared by:

Department of Land & Water Conservation

NSW Government

Hand digging a well at the turn of the century.

ISBN 0 7313 0333 4

HO/64/97

First printed August 1997

5000 printed on recycled paper

Cover Plates

Above: An artesian bore near Moree

Middle: Groundwater-fed wetland in the Gibraltar Range National Park

Below: Dethridge Wheel irrigating fruit trees in the Murrumbidgee Irrigation Area

FOREWORD

Groundwater is often referred to as the forgotten resource - “out of sight, out of mind”. It is a resource that is poorly understood by most people, although many have heard of the Great Artesian Basin, and most of us consume some of the many spring and bottled waters available.

Groundwater is an important resource in NSW. It makes a substantial contribution as a source of water for the maintenance of aquatic environments, and is an integral component in the long-term management of water resources on both regional and State levels. Groundwater is an important commodity, and a vital component of both urban and rural industries, and our economic and social framework.

The need to properly manage groundwater is, therefore, directly related to the value of this resource and the risk of devaluation or destruction of the resource or related environments through over-exploitation or contamination. The risks of groundwater resource degradation are real and significant, and in some areas of the State the effects of degradation are beginning to translate into economic and environmental losses.

Groundwater occurs everywhere below the ground surface. It varies greatly however in quality, quantity and depth depending on host rock type, the nature of the overlying soils and the rainfall of the region.

By its nature, groundwater is often less susceptible than surface water to short term depletion and contamination. However, if excessively depleted or polluted, there is often little that can be done to restore a groundwater system to its natural state.

In recent years, concern has increased about the declining condition of the State’s water resources. Increasing pressures on groundwater use have already resulted in the over-exploitation of some aquifers, and this may affect long-term supplies. Contaminated groundwaters have been identified in both rural and urban areas, and in a number of cases have posed serious threat to human and animal health. In addition, rising water tables and salinity problems have decreased the utility of other land and water resources, and important wetlands have been degraded or lost altogether.

The NSW Government and the community recognise the need for a coordinated approach to the improved management of groundwater. This is best achieved through implementation of the State Groundwater Policy Framework Document and its Component Policies. Together these documents make up the NSW State Groundwater Policy. The policy is consistent with NSW Government directions for natural resource management.

To achieve its goal, a partnership approach between the community, industry and government has been adopted for the management of groundwater resources. The community will continue to participate in the decision-making process.

Kim Yeadon MP
Minister for Land and Water Conservation

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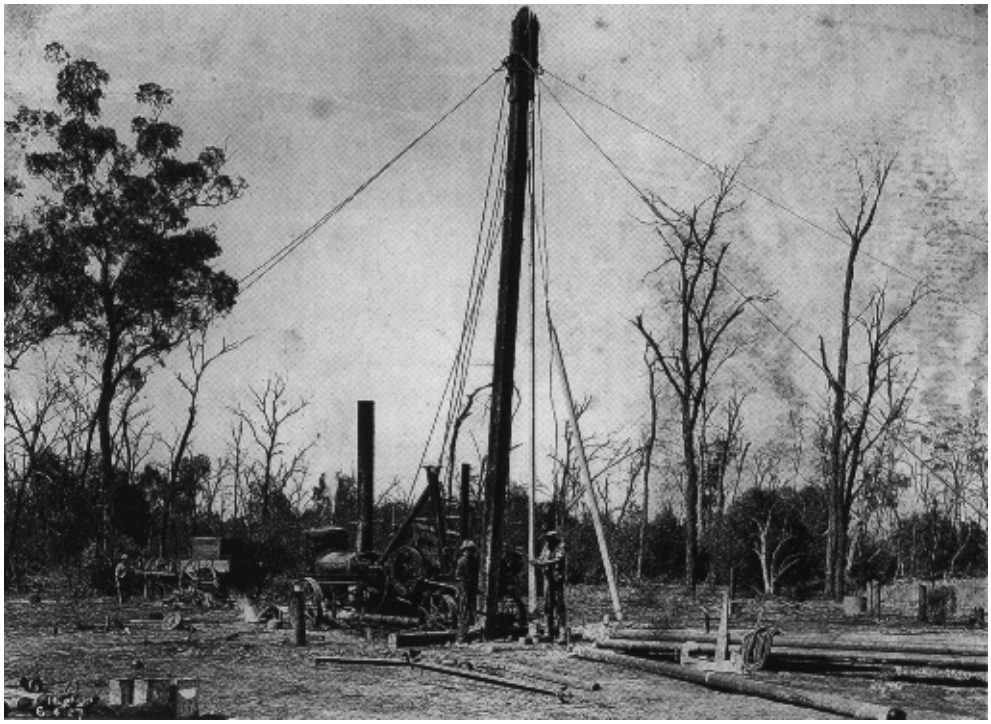
Steampowered rig shallow boring for water in the north west country



1. POLICY SUMMARY

The Goal for the management of groundwater in New South Wales is:

To manage the State's groundwater resources so that they can sustain environmental, social and economic uses for the people of NSW.

It is the policy of the NSW Government to encourage the ecologically sustainable management of the State's groundwater resources, so as to:

- slow and halt, or reverse any degradation of groundwater resources;
- ensure long term sustainability of the systems ecological support characteristics;
- maintain the full range of beneficial uses of these resources;
- maximise economic benefit to the Region, State and Nation.

Adoption of the State Groundwater Policy means that the sustainability of groundwater resources and their ecosystem support function will be given explicit consideration in resource management decision making.

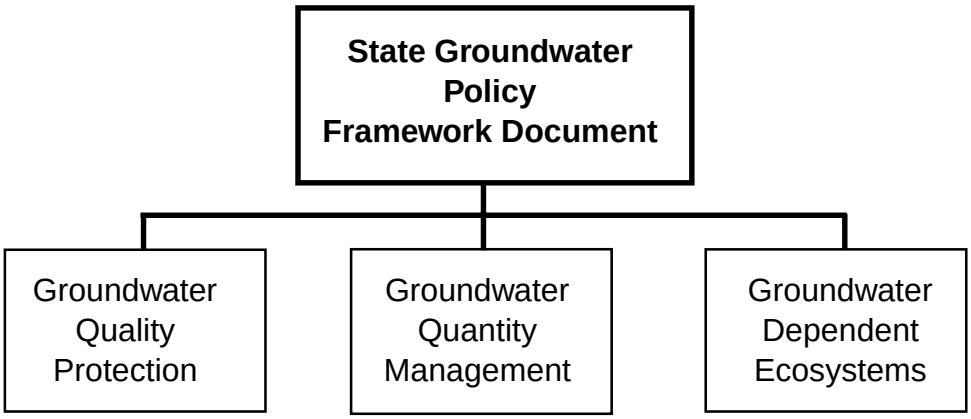
NSW groundwater management policies and practices will be consistent with the aims of the National Strategy for Ecologically Sustainable Development (ESD), the Inter-Governmental Agreement on the Environment (IGAE), the National Water Quality Management Strategy (NWQMS) and the Council of Australian Governments (COAG) water reform agenda. The policies and practices will be in line with NSW government directions for natural resource management.

The State Groundwater Policy objectives will be achieved through application of the resource management principles listed below. These are discussed in detail in section 5.

- An ethos for the ecologically sustainable management of groundwater resources should be encouraged in all agencies, communities and individuals who own, manage or use these resources, and its practical application facilitated.
- Non-sustainable resource uses should be phased out.
- Significant environmental and/or social values dependent on groundwater should be accorded special protection.
- Environmentally degrading processes and practices should be replaced with more efficient and ecologically sustainable alternatives.
- Where possible, environmentally degraded areas should be rehabilitated and their ecosystem support functions restored.
- Where appropriate, the management of surface and groundwater resources should be integrated.
- Groundwater management should be adaptive, to account for both increasing understanding of resource dynamics and changing community attitudes and needs.
- Groundwater management should be integrated with the wider environmental and resource management framework, and also with other policies dealing with human activities and land use, such as urban development, agriculture, industry, mining, energy, transport and tourism.

1.1 Component Policies

A set of three component policies will be developed in association with stakeholder based working groups, identifying management needs and opportunities and providing clear management principles and guidelines. They will commit agencies to the review and modification of related regulatory and operational activities, and to the support of cooperative management programs. The Policy relationships are shown below.



1.2 Implementation

A risk assessment approach will be used to prioritise implementation of the policy. This means that the level of management applied to each of the State's varied groundwater systems will be commensurate with the degree of stress or potential threat a particular system is under. The range of management tools will include:

- Groundwater Management Plans where necessary;
- supporting guidelines for Local Government and industry;
- aquifer availability and vulnerability maps for NSW;
- an education strategy;
- legislative mechanisms for groundwater management;
- licensing tools and conditions for groundwater users which better reflect resource protection objectives, and
- economic instruments applicable to groundwater management.

Formulation of Groundwater Management Plans will require the cooperation and coordination of a number of government agencies and key stakeholder groups. The Government will establish clear environmental objectives for groundwater resources on

Spray irrigation in citrus orchard near Narromine

a system by system basis, as appropriate. This will be dependent on the groundwater risk assessment process which will prioritise management planning across NSW and trigger action in response to specific changes in aquifer health. Performance against these environmental objectives will be assessed on the review of Groundwater Management Plans.

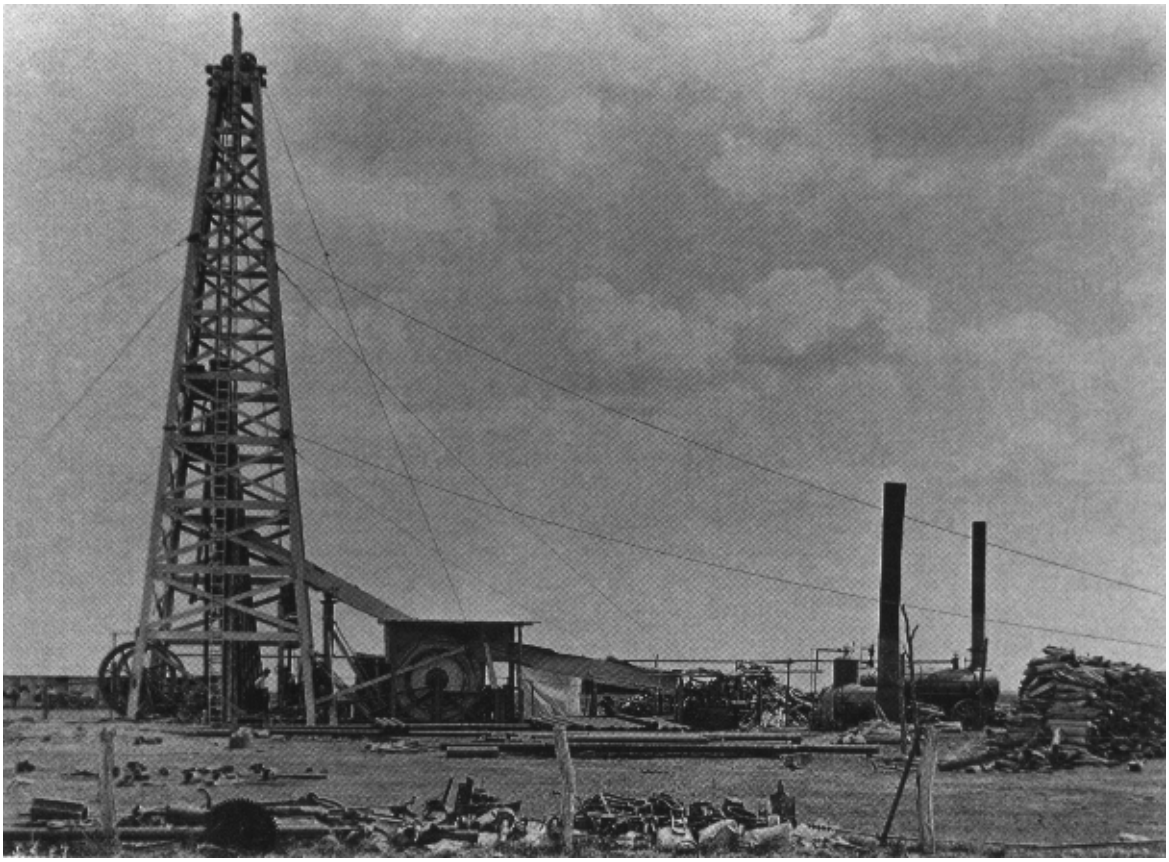
The broader community will have significant input into the management planning process, particularly advising on appropriate uses and values of the local groundwater systems. Where Land and Water Management Plans or Catchment Strategies exist or are being developed, Groundwater Management Plans will form a vital input into these.

1.3 Reporting and Review

Component policy development and review will be coordinated through a stakeholder working group comprised of relevant agency and community representatives. The policies will require Cabinet endorsement and the working group will meet periodically to review performance and ensure implementation is progressing. The policies will be formally reviewed on a five yearly basis.

Where Groundwater Management Plans already exist, review and reporting will be through local Groundwater Management Committees. New Plan development, review and reporting will be through local Groundwater Management Working Committees and are to be 'signed off' by Government to ensure the commitment of necessary resources. Plans will be reviewed on a five yearly basis.

Artesian boring plant, 1927



2. PURPOSE AND SCOPE OF THE POLICY

The purpose of this Groundwater Framework Policy document is to provide a clear NSW government policy direction on the ecologically sustainable management of the State's groundwater resources for the people of NSW.

The focus of the Policy is on water below the ground surface in a geological structure or formation, and on the ecosystems from which these waters are recharged or into which they discharge.

It provides for the better consideration of all issues which affect, or are likely to affect the condition and functioning of the resources of these areas including water chemistry, geology, aquifer recharge and discharge, and dependent ecosystems such as wetlands, lakes and streams, springs and seeps. It requires that careful consideration be given to all factors affecting the stability, vulnerability, and productivity of these systems.

The State Groundwater Policy is a framework policy designed to establish:

- objectives and principles for groundwater management;
- a coordinated program for policy development, reporting and review;
- tools for policy implementation; and
- opportunities for information sharing.

It will guide the decision-making of State and local government, as well as landholders in their management and use of groundwater. It will influence the type and selection of management activities and resource development opportunities supported by the State's resource managers. Some actions required to prevent groundwater resource degradation may conflict with existing or potential economic development. In such cases the full costs and benefits of the social, economic and the environmental implications will need to be considered when making a decision on what can be fundamentally divergent uses for the resource.

Left: Stock tank fed from artesian bore
Right: Stock bore and holding dam

3. GROUNDWATER: THE NATURAL RESOURCE

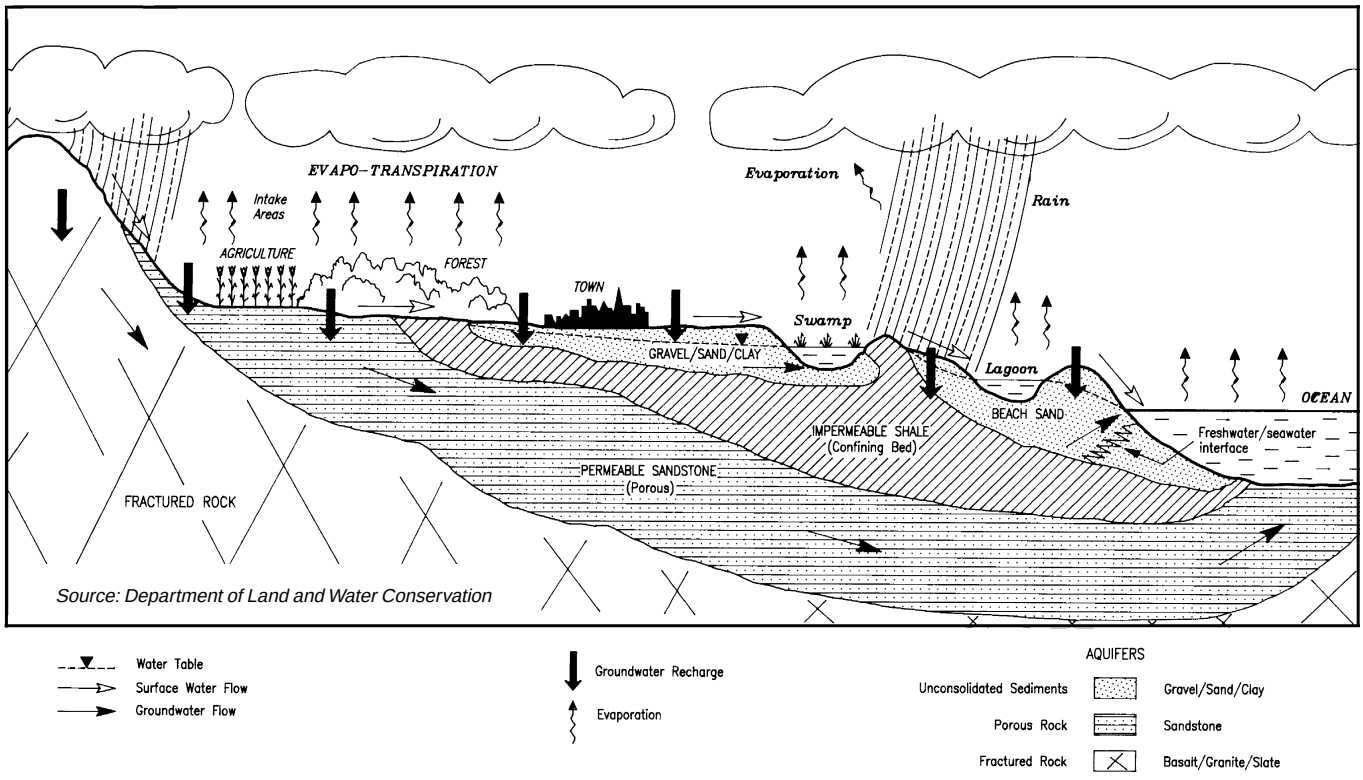
3.1 The Water Cycle

Groundwater, in a broad sense, is all water which occurs below the land surface. Water bearing zones are called aquifers. Aquifers occur in geological formations which are sufficiently permeable to allow water to move within them, and allow it to discharge or be extracted. Groundwater is usually categorised as occurring in:

- **Unconsolidated sediments** - unconsolidated sands and gravels commonly found in alluvial valleys, coastal plains and sand dune systems. Groundwater is contained within the pore space in these sediments.
- **Sedimentary rocks** - consolidated or semi-consolidated formations such as sandstone, limestone, shales, etc. Groundwater occurs both within the pore space in the rock matrix and also within fractures and joints.
- **Fractured rocks** - igneous and deformed consolidated formations such as granite, gneiss, basalt, etc. Groundwater in these rocks occurs mainly within fractures and joints.

It has been found that natural groundwater quality generally reflects the type of rock that hosts the groundwater resource. The rate at which water travels through a groundwater system may vary from tens of metres a day, to as little as a metre a year.

Figure 1 - The Water Cycle



Because groundwater is out of sight, its occurrence and movement is generally poorly understood. Groundwater constitutes part of a dynamic water cycle, and is interrelated with surface water. Surface water infiltrates into geologic formations to become groundwater, and groundwater reappears at the surface through springs and seeps, and emerges at oceans, rivers, lakes and wetlands (Figure 1).

3.2 Groundwater Occurrence

The volume of all groundwater in NSW is estimated to be about 5,110 million megalitres (ML), enough to cover the State to a depth of four metres. This is about 200 times the storage capacity of all the water supply dams in the State. Unfortunately the groundwater is not all of good quality nor uniformly distributed, with less than 5 million ML suitable or obtainable for use. Records reveal extreme variations - at depths from a few metres to some 1,400 metres, yields from nil to 400 litres per second, and salinity from about that of rainwater to about ten times that of seawater.

Unlike surface water, groundwater can be found in most areas of NSW. However, it varies considerably in terms of its recharge potential, vulnerability to pollution, and its connection to surface waters and other ecosystems. It is, however, a vital town water supply source, drought reserve, or alternative to fully committed or contaminated surface supplies. It is:

- widely distributed and accessible;
- reasonably constant in quality within an aquifer;
- a mappable, predictable resource; and
- often large in volume and an effective buffer to drought.

3.3 Groundwater Use

Groundwater can be obtained from a wide variety of aquifer systems and its uses are extremely diverse. It is a vital resource that has led, and now supports, agricultural and grazing development over much of inland NSW. Total consumption in NSW is about one million megalitres a year, with more than 530,000ML used each year for agriculture and stock purposes, as well as 15,000ML for industry, commerce, mining and recreation. An additional 60,000ML is taken for urban use by over 130 communities, as well as an unknown amount for private, domestic purposes, especially in arid areas of the state where surface supplies are unreliable or absent. There are more than 70,000 licensed bores in NSW.

A variety of natural systems are also sustained by groundwater, including the base flow of rivers, swamps, wetlands, springs, and some lakes.

4. POLICY FRAMEWORK

4.1 Context

4.1.1 Ecologically Sustainable Development

Ecologically Sustainable Development has been adopted by this policy to provide a basis for the protection of the groundwater resources of New South Wales.

In Australia, the Federal and State Governments have endorsed the National Strategy for Ecologically Sustainable Development (Commonwealth of Australia, 1992) to pursue this goal. The ESD strategy has three core objectives:

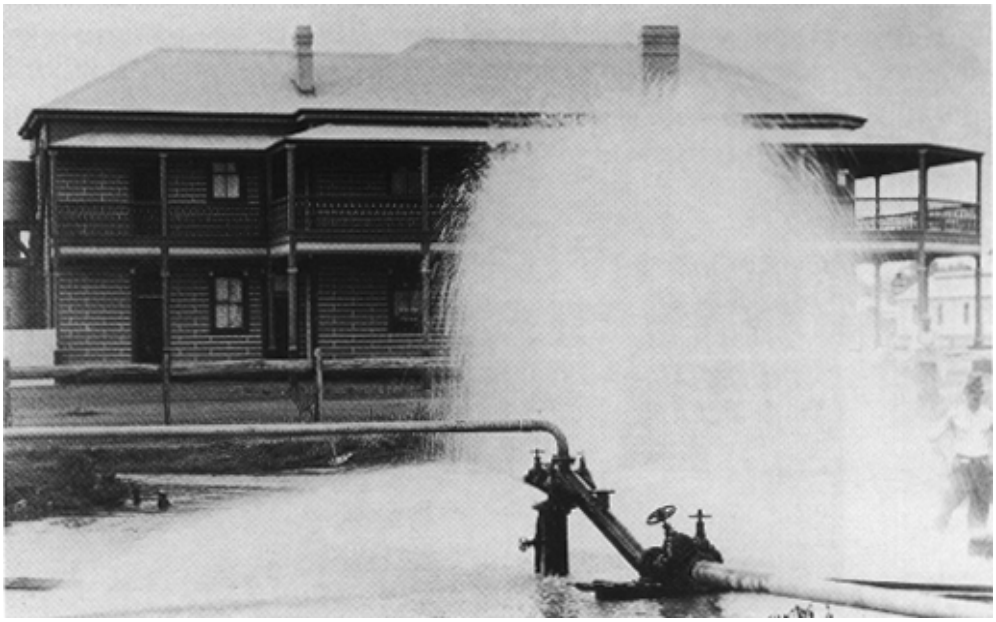
- to enhance individual and community wellbeing by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life-support systems.

Both the national ESD strategy and the IGAE have adopted the 'precautionary principle' as one which should provide a basis for policy making and program implementation at all levels of Government. The precautionary principle states that:

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

This precautionary principle is particularly applicable to groundwater management in NSW. There are often long time scales associated with shifts in the condition of many groundwater systems and our knowledge of groundwater is often poor.

Due to pressure decline in the Great Artesian Basin, the Moree bore is now pumped to maintain flows.



4.1.2 An Integrated Approach

This policy adopts an integrated approach to groundwater management. The health and use of groundwater is affected by activities occurring in other parts of the catchment. A catchment wide focus is, therefore, needed to effectively manage groundwater. It should be recognised, however, that aquifer boundaries don't always match surface water catchment boundaries, and management of groundwater systems may, therefore, involve more than one surface water catchment. The best resource management solution will require a range of people bringing their skills and resources together to resolve the problem. Integrated management means that groundwater issues must be considered in relation to surface water management and land use planning decisions.

4.1.3 Community Involvement

This policy has been developed and endorsed by a group comprised of Government and community members. The community will be involved during the Component Policy development and Policy implementation processes. Of particular importance will be stakeholder involvement in the development of local Groundwater Management Plans, the major vehicle for policy implementation in the State's most vulnerable or contentious aquifers. A partnership approach between the community, catchment managers and Government will be sought to identify issues and options for groundwater management, and to resolve the trade-offs between economic, social and environmental objectives at a local level, within the constraints of the State-wide policies. Community representation will reflect a wide spectrum of stakeholders, including State-wide stakeholders if appropriate.

4.2 Legislation and Responsibilities

The right to the control, management and use of groundwater in NSW is vested in the Minister responsible for water resources, under the Water Administration Act 1986. The Minister's functions are largely exercised by the NSW Department of Land and Water Conservation (DLWC). The Department, in turn, manages a process to allow private individuals and government agencies access to the resource by way of a license.

Development and use of land is the one consistent element in the list of potential threats to groundwater. Land use planning legislation and instruments, therefore, provide some control over the uses to which land is put. Land use planning in NSW is administered by the Department of Urban Affairs and Planning (DUAP), in cooperation with local government authorities under the Environmental Planning and Assessment Act 1979 (EP&A Act).

Potential effects of proposed developments on sub-surface water are matters which are required to be taken into account under the EP&A Act when undertaking environmental assessment. The provisions of the Act apply to both local Councils approving developments or carrying out their own works, and to other authorities carrying out their own works or issuing approvals, including licences for groundwater extractions.

The protection of groundwater from contamination is primarily governed by the Clean Waters Act 1970, and the Environmental Offences and Penalties Act 1989, which make it an offence to pollute waters, including groundwater. The Environment Protection Authority (EPA) administers these two Acts. However, individuals, local and state government agencies can bring legal action under this legislation.

5. OBJECTIVES AND PRINCIPLES

5.1 Policy Objectives

It is the policy of the NSW Government to encourage the ecologically sustainable management of the State's groundwater resources so as to:

- slow and halt, or reverse any degradation in groundwater resources;
- ensure long term sustainability of the systems biophysical characteristics;
- maintain the full range of beneficial uses of these resources; and
- maximise economic benefit to the Region, State and Nation.

Throughout the world, governments and communities are trying to come to grips with the concept of sustainability, and what it means, in a practical sense, for management of specific resources.

Ecological Sustainable Development (ESD), in groundwater terms can be difficult to define, even in the best characterised groundwater systems. Sustainable management of a groundwater system involves management for the maintenance of a number of different aspects of the system, and includes consideration of:

- beneficial use of the aquifer both now and in the future,
- average recharge over a specified time;
- long term and short term seasonal climatic variation;
- variation and change in quality;
- impact on the environment;
- the capacity of the aquifer storage to buffer seasonal variations;
- induced recharge;
- economic impacts of management options;
- social and cultural impacts; and
- access to the resource.

Policy and practice for groundwater management must, therefore, be adaptive enough to accommodate both changes in community values and a better technical understanding of the resource.

A sub-artesian irrigation bore in the east of the Great Artesian Basin

5.2 Policy Principles

Principle One

An ethos for the sustainable management of groundwater resources should be encouraged in all agencies, communities and individuals who own, manage or use these resources, and its practical application facilitated.

Ecologically sustainable resource management and control of resource degradation requires concerted action throughout the community and Government. Such action will occur and be effective only if there is widespread acceptance by all sections of the community of their resource management responsibilities. This acceptance will depend on greater community understanding of the impacts of misuse of groundwater or inappropriate land management practices, and on a growing perception that real opportunities exist for better groundwater management.

There is an urgent need to foster this stewardship ethic in relation to groundwater management. As a first step towards development of this ethic, the NSW Government is committed, through this policy, to raising the awareness of groundwater and groundwater management issues in the general community, as well as of groundwater users and local and state government agencies. A groundwater education campaign will be accompanied by the development of practical tools to enable all parties to recognise and assess groundwater management issues relating to their activities and spheres of influence. In addition, the broader community will be included in the development of local Groundwater Management Plans. This recognises the fact that local communities have a sound knowledge of their resource.

Principle Two

Non-sustainable resource uses should be phased out.

Depending on the location, some activities are essentially incompatible with groundwater resource and dependent ecosystem conditions, and will inevitably result in resource depletion or a decline in ecosystem support functions. Strategies are needed to actively discourage these activities and, over time, phase them out. This principle recognises the practical dimensions of sustainable resource management when dealing with existing developments. Any proposed non-sustainable uses however, will not be permitted.

The disposal of insufficiently treated sewage into permeable coastal sand aquifers is one example of inappropriate use that will be phased out or modified to make the practice ecologically sustainable. Contamination of a good quality groundwater resource is incompatible with the intergenerational equity aspects of ESD. The Component Policies will identify many of those current uses that are non-sustainable and will detail how they could be phased out.

Principle Three

Significant environmental and/or social values dependent on groundwater should be accorded special protection.

This principle recognises that specific protective strategies may be warranted for areas of significant environmental value. Environmental protection may be sought for a number of reasons, including:

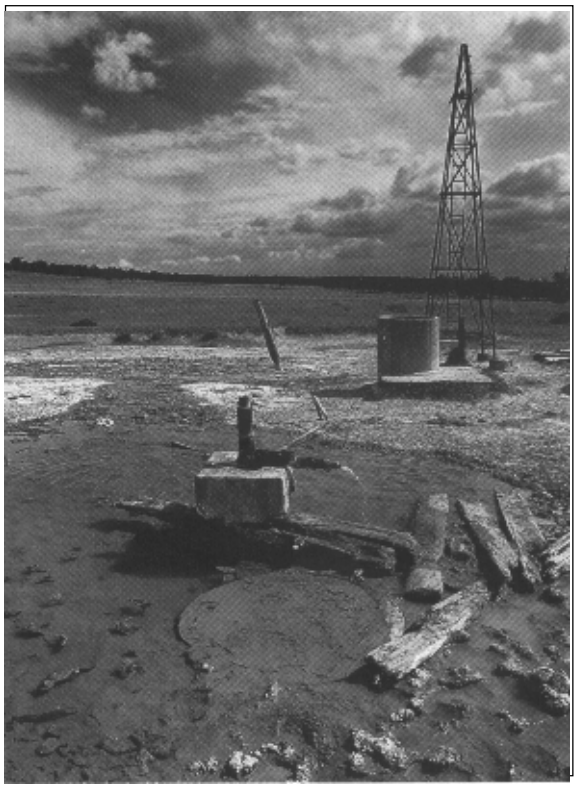
- maintenance of intrinsic environmental value, particularly where groundwater dependent ecosystems support threatened species, populations and communities, or critical habitat as defined in the Threatened Species Conservation Act 1995;
- conservation of special or representative areas. The State's wetlands may, in particular, require special protection against excessive groundwater pumping, particularly where these are afforded protection under other policies, planning instruments, or international agreements. Likewise they need to be protected against inappropriate land use in the immediate catchment; and
- maintenance of unique social or recreational amenity. Where town water supplies are wholly or partially derived from groundwater, strategies may be required to ensure other land use activities don't adversely affect the quality of the groundwater.

Other social values, including Aboriginal values, will form an important component for recognition and protection. Strategies could range from reservation and exclusion of non-compatible uses, to special management provisions.

Groundwater-fed wetland in the Gibraltar Range National Park

Principle Four

Environmentally degrading processes and practices should be replaced with more efficient and ecologically sustainable alternatives.



This principle applies both to the use of groundwater resources, and to other activities and practices which impact on groundwater. Strategies for achieving this objective will encourage and facilitate the adoption of best available management practices. Working with industry and local government will be the key. Economic instruments may also be used to enlist the innovative capacity of industry and commerce in pursuit of this environmental goal. These concepts will be further developed in the Component policies.

An example of an area where this principle may apply is the Great Artesian Basin. Currently, less than 10% of artesian water flowing from uncontrolled bores is being used, with the rest flowing to waste. As a consequence, pressures in the Basin are dropping, forcing many to pump the resource, and resulting in the drying of unique mound spring ecosystems. The introduction of efficient practices to significantly reduce wastage will mean artesian groundwater resources will be able to maintain their beneficial uses in the long term, while conserving groundwater dependent mound springs.

Best practice for industry is also necessary, so that activities occurring above an aquifer will not diminish the beneficial use of the groundwater resource. Examples of such activities are numerous, and include the management of urban waste, stormwater management, underground storage of harmful chemicals, and pesticide and herbicide use.

Principle Five

Where possible, environmentally degraded areas should be rehabilitated and their ecosystem support functions restored.

There are many contaminated sites, particularly in urban centres, that are currently impacting on water quality in the underlying aquifers. Where the natural groundwater quality is suitable for drinking water or other beneficial uses, these contaminated sites should be rehabilitated, so the resource can maintain these beneficial uses. At many locations, the groundwater system may support sensitive wetlands, springs, lakes or

hanging valleys. In such situations steps should be taken to clean up the source of pollution and restore the degraded wetland areas so that the ecosystem support function is returned. In addition, over-extraction of groundwater resources poses significant threats to dependent ecosystems and regional economies in some areas.

This principle recognises that rehabilitation of degraded areas can generate economic and social, as well as environmental benefits including:

- increases in biodiversity with subsequent improvements in long-term genetic and economic opportunities;
- increases in local productivity with consequent social and economic benefits;
- a reduction in the need for other resource development to compensate for the loss of the groundwater and dependent ecosystem amenity;
- greater rates of return on existing development investments; and
- conservation of groundwater reserves for future generations.

Principle Six

Where appropriate, the management of surface and groundwater resources should be integrated.

This principle recognises the interconnectedness of surface and groundwater ecosystems, as depicted in Figure 1. Benefits of linking the management of surface and groundwater systems include:

- greater scope for water users to manage business risk in regards to water management; and
- greater scope to manage environmental risk associated with water use.

In the southern part of the State, for example, where there are large areas of shallow water tables resulting from inappropriate irrigation practices, a more integrated approach of substituting groundwater pumping for surface water pumping may be an effective management tool.

This principle commits the government to increasing the understanding of surface and groundwater interactions, and linking the relevant management regimes. It should be noted that the connections between surface and groundwater systems vary dramatically from system to system across the State. In the coastal dunal systems, for example, surface water recharging an aquifer may emerge again at a discharge area within hours. Water recharging the Great Artesian Basin, however, may not discharge for some tens of thousands of years. Linking the management of surface water flows and groundwater extractions in the Great Artesian Basin may be inappropriate in most areas. In addition, it is envisaged that considerable work will need to be done at a local level to characterise the interactions between surface and groundwater systems. Links between management regimes, including the setting of environmental objectives for surface and groundwaters, will need to reflect the outcomes of this work.

Principle Seven

Groundwater management should be adaptive, to account for both increasing understanding of resource dynamics and changing community attitudes and needs.

Our knowledge of aquifer characteristics and behaviour, and groundwater quality continues to grow as more bores are constructed, and investigations undertaken. One feature of groundwater that is generally poorly defined is the amount of recharge that occurs both seasonally, and in the long term. Groundwater allocations are based on estimates of long term recharge. Unlike surface water, this feature cannot be explicitly measured, so any groundwater management regime, including any system of water access and use rights, needs to be adaptive to allow some change through time, as estimates are refined.

The community's attitudes and needs also change over time with respect to the mix of social, economic and environmental benefits it wishes to see derived from natural resources. A groundwater management framework which adapts to changing attitudes and better knowledge is, therefore, essential.

Principle Eight

Groundwater management should be integrated with the wider environmental and resource management framework, and also with other policies dealing with human activities and land use, such as urban development, agriculture, industry, mining, energy, transport and tourism.

Groundwater, by its very nature and position in the water cycle, is a natural receptor for pollutants. To date, little attention has been paid to the impacts of land use activities on groundwater. This policy places explicit emphasis on preventing groundwater pollution through integrating groundwater protection with land management policies and practices.

A good example of the need for integrated management can be found in the current move away from ocean and river disposal of sewage effluent, towards land disposal by irrigation. While this is a positive step in total water and nutrient management activities, care must be taken with respect to groundwater resources. If inefficient effluent irrigation occurs in areas which are vulnerable to groundwater contamination, the problem is simply shifted, not solved.

As groundwater is ubiquitous, there are many such activities which have the potential to contaminate it. Strategies for integrating groundwater management with other resource management and land use activities include: education and awareness; groundwater vulnerability mapping, and; the inclusion of groundwater management and contamination issues in local government planning.

6. COMPONENT POLICIES

The State Groundwater Policy encompasses three component policies, outlined below. Clearly, and necessarily, the policies will overlap and interrelate in many regards. These relationships will be made explicit within each of the policies, so that the best possible management of the State's groundwater resources will be achieved.

6.1 Quality Protection Policy

Groundwater varies dramatically in quality from aquifer to aquifer. This depends on many factors, including the chemical composition of the geological formations through which it moves, the nature of the overlying soils and the climate of the region. The salinity of groundwater, for example, can vary from very low, making it suitable for drinking, to ten times that of seawater. Such variation makes setting overall water quality objectives a much more difficult task.

Nonetheless, many human activities have, either individually or cumulatively, a significant impact on groundwater quality. These activities are many and varied, and may contaminate the resource from either a point source or a diffuse source. Potential point source contaminants emanate from such activities as land filling, mining, wastewater or sludge disposal, manufacturing, underground storages or accidental spills. Diffuse sources of contamination can be either urban or rural, such as from fertiliser or pesticide application.

Clearly the community needs to be aware of the impacts these activities may have on groundwater quality. In some instances, depending on the type of aquifer, many activities would have a negligible impact. In others, where the geology of the aquifer makes it more vulnerable, and the quality of the groundwater is high, the impact may be significant.

The Quality Protection Policy will provide a framework for the sustainable management of groundwater by:

- providing a beneficial use classification system applicable to all aquifer systems in NSW;
- establishing water quality objectives for the State's priority aquifer systems;
- providing a comprehensive set of policy principles for groundwater quality protection;
- establishing a mechanism for coordinating the activities of agencies and the community in relation to groundwater quality;
- clarifying and, where appropriate, considering mechanisms for strengthening the regulatory tools for groundwater quality protection;
- establishing reporting and review requirements for groundwater quality protection measures;
- establishing an education program and action plan to promote awareness and best practice in relation to the protection and enhancement of the quality of the State's groundwater; and
- establishing research goals for groundwater quality protection.

6.2 Quantity Management Policy

The State's aquifers vary dramatically in their ability to yield groundwater. In some areas, groundwater extraction has already begun to put the resource under stress. This has resulted in unacceptable drawing down of some aquifers, jeopardising the long term sustainability of supply, and increasing pumping costs.

It is now understood that groundwater and surface water systems are closely integrated in the water cycle. Surface waters can flow naturally to groundwater, and conversely, groundwater can be critical in providing base flows to surface water systems. The same relationships can hold for other aquatic ecosystems such as wetlands, springs, lakes and hanging valleys. The need to manage these systems as 'one resource' is becoming increasingly more apparent.

Pumping test on high yielding bore

The Quantity Management Policy will provide a framework for the sustainable management of groundwater by :

- providing a set of policy principles which will guide future decision making, planning and operational practice in relation to groundwater quantity protection;
- providing a set of objectives relating to the sustainable management of groundwater extractions and their impact on dependent ecosystems;
- establishing the basis for sharing the State's groundwater resources;
- establishing a mechanism for coordinating the activities of agencies and the community in relation to groundwater quantity;
- clarifying and, where appropriate, consider mechanisms for strengthening the regulatory tools for groundwater quantity protection;
- further developing the range of economic instruments available for achieving more efficient and equitable use of the State's groundwater resources;

- establishing monitoring, reporting and review requirements in relation to groundwater quantity management;
- establishing an education program and action plan to promote awareness and best practice in relation to the protection and enhancement of the quantity of the State's groundwater; and
- establishing research goals for groundwater quantity protection.

The Quantity Management Policy will explain the various mechanisms available for making sharing and management decisions within a sustainable resource management framework. It will recognise the variety of aquifer types and behaviour and provide options for flexible management, while safeguarding important dependent ecosystems, and managing interference effects between users.

6.3 Dependent Ecosystems Policy

There is only a recent awareness of the significant role played by groundwater as a component of the physical environment. This awareness has resulted from the observation of the impacts of rising and falling water levels. A consequence of rising water levels is the emergence of poor quality water into streams, wetlands and soils, while falling water levels have resulted in the drying of some wetlands and many of the mound springs of the Great Artesian Basin, as well as a reduction in base flows to many streams. Many surface water ecosystems are largely dependent on groundwater, and their protection is directly related to its protection.

In many situations, the naturally poor quality of groundwater may diminish the perceived need for protection, unless the significance of groundwater as a support to more sensitive water environments is taken into account. Contamination of brackish aquifers, particularly where they are highly permeable, can lead to serious degradation of surface water environments receiving such groundwater discharges. Consequently, the environmental value of groundwater can in some cases, be the critical factor which determines protection measures.

The Groundwater Dependent Ecosystems Policy will provide a framework for the sustainable management of groundwater by:

- providing a description of the interactions of groundwater with other ecosystems;
- providing a set of principles and objectives to guide future decision-making, planning and operational practices where groundwater management affects dependent ecosystems, and vice versa;
- providing a set of practical options for management of groundwater and dependent ecosystems;
- establishing a groundwater dependent ecosystem management framework for local groundwater management plans;
- establishing an education program and action plan to promote awareness and best practice in relation to the protection and enhancement of the State's groundwater dependent ecosystems, and
- establishing research goals for groundwater dependent ecosystem protection and management.

7 IMPLEMENTATION

Clear strategies for implementing the State Groundwater Policy and component policies are necessary for both the long and short-term goals of policies to be realised.

This policy adopts a risk assessment approach to groundwater management. This means the level of management applied to each of the State's varied groundwater systems will be commensurate with the degree of stress or potential threat a particular system is under. Stresses or threats may be related to groundwater use, affecting the sustainability of the aquifer system itself or dependent ecosystems, or to land use activities which have the potential to impact on groundwater quality.

Central to the success of this approach will be a rapid assessment of the State's groundwater systems to identify actual stresses and potential threats. Based on this assessment, management responses will be put in place for each aquifer system. Triggers will also be in place which signal a groundwater system has moved to a higher risk category, therefore requiring more intensive management. The suite of management responses is outlined below.

7.1 Licensing and Regulatory Tools

Government decisions allowing access to, or affecting groundwater, will be made in accordance with the principles in this policy. For example, in issuing groundwater licences, the DLWC must take into account the broader environmental effects of both the extraction and the development for which the groundwater will be used. Likewise, local government or any other authority, in determining development consent or granting licences or permits, must consider the impacts of those developments on the associated groundwater resource. Consideration of groundwater issues should occur, where relevant, in Environmental Planning Instruments, such as Local Environmental Plans.

7.2 Monitoring, Modelling and Investigation

Adequate and reliable monitoring data, as well as targeted research and modelling of stressed or ‘at risk’ groundwater systems are essential to the implementation of the Policy. This policy commits the Government and community to providing that essential baseline information.

7.3 Vulnerability Assessment

All decisions are only as good as the information on which they are based. A critical aspect of the State Groundwater Policy implementation is the development of State-wide groundwater characterisations, and assessments of vulnerability, quality and beneficial use. This policy commits the government to the progressive development of these management tools. Without these, assessment of the impacts of activities on groundwater resources will be inadequate, and successful integration of groundwater management objectives into the broader resource management and land use planning environments will be piecemeal.

7.4 Groundwater Management Plans

Groundwater Management Plans will apply the goals and principles of the State Groundwater Policy at a local level. This policy framework allows managers and the community to integrate many issues and provide an effective plan for use and protection of local groundwater resources. The term ‘Groundwater Management Plan’ is used here synonymously with ‘Aquifer Management Plan’. This latter term is often preferred when dealing with a single aquifer. Groundwater Management Plans will be progressively developed across the State, with priority given to those aquifers most at risk or stressed. Plans may not need to be developed for those aquifers not at risk or likely to be greatly impacted.

While urgent action may be necessary in some highly stressed or at risk systems, plan formulation will normally require undertaking a number of initial studies, including:

- an assessment of the resource base including storage, recharge and discharge, quality and variations thereof, movement and boundaries;
- identification of dependent ecosystems and the relationship between groundwater and these ecosystems;
- identification of places of cultural importance and the relationship between groundwater and these places;
- water demands and their location;
- more detailed local classification in terms of vulnerability and existing and potential beneficial uses;
- development of a contaminant source inventory;
- methods of measuring water usage; and
- reporting of aquifer status and trends.

Plans will integrate the management of groundwater by:

- setting objectives, including environmental objectives, for groundwater use and protection within the State Groundwater Policy framework;
- establishing management and allocation criteria in line with ecologically sustainable use principles;
- determining appropriate uses and values for the resource;
- determining levels of protection for the resource;
- developing transfer strategies, where appropriate;
- devising protection priorities and mechanisms for dependent ecosystems;
- providing protection strategies for places of cultural significance related to groundwater;
- devising wellhead protection strategies;
- where appropriate, devising remediation strategies;
- providing recommendations to local government regarding inclusion of specific groundwater protection measures in planning instruments; and
- devising a local monitoring and reporting strategy.

Formulation of Groundwater Management Plans will require the cooperation and coordination of a number of government agencies and key stakeholder groups. The Government will establish clear environmental objectives for groundwater resources on a system by system basis, as appropriate. This will be dependent on the groundwater risk assessment process. This will prioritise management planning actions across NSW and trigger action in response to specific changes in aquifer health. Performance against these environmental objectives will be audited on the review of Groundwater Management Plans.

The broader community will have significant input into the management planning process, particularly advising on appropriate uses and values of the local groundwater systems. Plan development, review and reporting will be through local Groundwater Management Working Committees, and plans are to be 'signed off' by Government to ensure the commitment of necessary resources. Plans will be reviewed on a five yearly basis.

Where Land and Water Management Plans or Catchment Strategies exist or are being developed, Groundwater Management Plans will form a vital input into these. Likewise, Land and Water Management Plans or Catchment Strategies will provide input into Groundwater Management Plans.

TABLE 1 - Groundwater Management Plans in NSW

Existing	In Preparation
Lower Namoi Valley Alluvium Upper Namoi Valley Alluvium Gwydir Valley Alluvium Border Rivers Alluvium Lower Macquarie Valley Alluvium Bell River Alluvium Cudgegong Valley Alluvium Belubula Valley Alluvium Murray Basin Alluvium - Lower Lachlan - Lower Murrumbidgee - Murray Valley Kulnura Mangrove Mountain Upper Lachlan Valley Alluvium	Botany sands aquifer Blue Mountains Maroota Tomago Tomaree Stockton Alstonville Plateau basalt

7.5 Supporting Guidelines

The development of supporting operational guidelines for industry and local government will be the key to the successful implementation of the State Groundwater Policy. Guidelines on groundwater issues and management options relevant to the particular industry or agency, developed through consultation, will ensure that policy objectives are integrated into the day-to-day management activities and decision-making of the relevant parties.

7.6 Market Strategies

Consistent with water reforms for surface water, options for the introduction of market mechanisms for groundwater management and protection will be considered as one component of the suite of NSW Groundwater Policy implementation strategies. Market strategies, which will be discussed in more detail in the Quality Protection and Quantity Management Policies, may include establishment of tradable groundwater entitlements, where appropriate, or groundwater pricing to better reflect resource management objectives. Any pricing measures will be regulated by the NSW Independent Pricing and Regulatory Tribunal, who will guide Government to deliver arrangements for full recovery of direct costs of groundwater management.

7.7 Groundwater Education

Groundwater education is an important part of the Policy implementation strategy. A groundwater education campaign will be developed which targets a variety of audiences, ranging from school children to catchment planners, water users and environmentalists. A variety of educative tools will need to be available to reflect the level of understanding of groundwater issues required by different sectors of the community. Educators, local government and industry will play a key role in development and implementation of the education strategy.

8 REPORTING

Reporting on groundwater occurs at several different levels, and at a variety of times. There is currently an attempt to dramatically improve coordination of the various environmental reporting and auditing processes.

Where Groundwater Management Plans already exist, there is a process in place whereby the status of the aquifer, and the performance of the Plan against its objectives, is reported on every two years. Plans are updated every five years, if necessary. In practice only the most highly developed and stressed aquifers have had this level of review.

Groundwater reporting also occurs in the biannual NSW State of the Environment Report. This document takes an overview on the health of groundwater across the State. Groundwater reporting is currently included in the State of the Rivers and Estuaries reporting, and is proposed for the State of the Catchments reporting process currently under development. This will allow information from one reporting process to be incorporated and presented as an overview in another forum without duplication.

It is necessary that appropriate resource and environmental indicators are developed and monitored by Government to reflect the state of groundwater in NSW. This work is continuing, and these indicators will then become the basis by which the success of the Groundwater Policy will be judged. This will indicate where adjustments to the Policy can be made if the desired outcomes are not being met.

APPENDIX A - GROUNDWATER CONTACTS

9 COORDINATION AND REVIEW

Policy development, coordination and review will be implemented through a stakeholder working group comprising relevant agency and community representatives. It is proposed that this working group will report to Government and that the Component Policies will require Cabinet endorsement. Once the policies are launched, the group will meet periodically to review policy performance and ensure implementation is progressing. The policies will be formally reviewed on a five yearly basis.

Where Groundwater Management Plans exist, review and reporting will be through local Groundwater Management Working Committees. Plans will be reviewed on a five yearly basis and signed off by Government. Groundwater Management Plans will be consistent with the broader catchment planning objectives and process.

Department of Land and Water Conservation

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Murray:	(02) 6041 1650
Murrumbidgee:	(02) 6953 0745
North Coast:	(02) 6642 7799
Sydney-South Coast:	(02) 9895 7875

NSW Environment Protection Authority (EPA)

Chatswood: (02) 9795 5000

Australian Geological Survey Organisation (AGSO)

Canberra: (02) 6249 9738

APPENDIX B - SUGGESTED FURTHER READING

A National Framework for Improved Groundwater Management in Australia, ARMCANZ & NLP, 1997

Inter-Governmental Agreement on the Environment, February 1992

National Ecologically Sustainable Development Strategy, Commonwealth of Australia, 1992

National Water Quality Management Strategy - 1995 Guidelines for Groundwater Protection in Australia, ARMCANZ 1995

National Principles for the Provision of Water for Ecosystems - prepared for ARMCANZ and ANZECC, 1996

NSW State of the Environment 1995, Chapter 7, NSW Environment Protection Authority, 1995

Towards a National Groundwater Management Policy and Practice, ARMCANZ & NLP, October 1995

Water Resources Policy. Council of Australian Governments Communique. Report of the Working Group on Water Resources Policy. Council of Australian Governments (COAG), 1994