

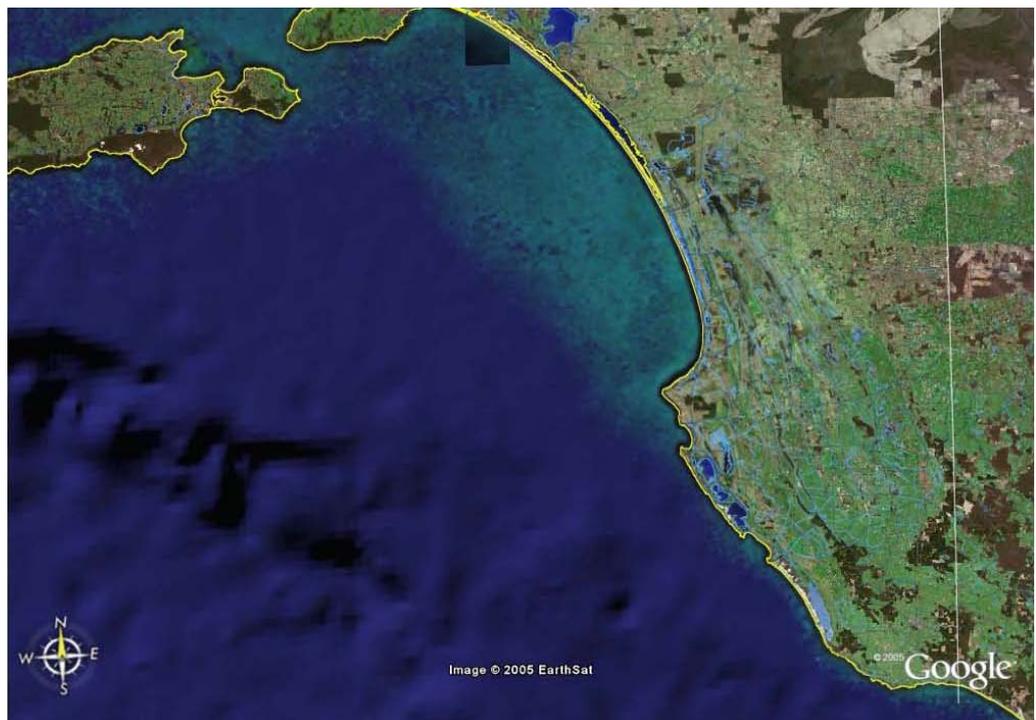


Sharing Water:

Options for the use of shares as a means to define groundwater entitlements in the South East of South Australia

M.D. Young

November 2005



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ISBN 0 643 09270 6

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Cover photo description: Google map image of the South East,2005,

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Policy and Economic Research Unit

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Acknowledgements

This report has benefited from the opportunity to meet with officers of the SA Department of Water, Land and Biodiversity Conservation, the South East Catchment Water Management Board and the South East Natural Resources Management Board. While all judgements made are mine, I would like to thank Jenny Peterson from the South East Catchment Water Management Board for steering me through many of the complex issues associated with this project and organising all the meetings.

I would also like to thank and acknowledge contributions made by members of the South East Catchment Water Management Board following a presentation of a draft of this report to them and also

- Stevie Austin, Darryl Harvey, Julie Cann, Bob McClennan, Claus Schonfeldt, Lud Schmidt and Mike Smith, from the SA Department of Water, Land and Biodiversity Conservation;
- Jodie Berkefeld, Daniela Conesa and David Pasztaleniec from the South East Catchment Water Management Board; and
- Hugo Hopton from the South East Natural Resources Management Board.

Finally, I would like to thank Jim McColl for his ever willing capacity to help me think through challenging issues.

Mike Young
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Terms of Reference

As given by the South East Catchment Water Management Board, the specific objectives of this project are:

1. To describe and compare existing models, relevant to the South East groundwater setting, of allocating water and reissuing allocations as shares of the available resource, and outline the advantages and disadvantages of each model. The proposed component based allocations following volumetric conversion need to be considered, including which components should be expressed as shares.
2. To recommend, for the South East, a preferred model of allocating water and reissuing allocations as shares of the available resource. In determining a recommendation for the preferred model, the following perspectives are to be considered: resource management, licensees, administrative efficiency, compliance and cost to all involved.
3. To assess the capability of the current SA Water Licensing System to implement and administer allocations expressed as shares, and to recommend changes to enable it to serve the preferred model, and the steps involved.
4. To identify the resourcing implications of the preferred model (cost savings or extra effort/expense) on the organisations involved.
5. To identify a process or basis for the periodic assessment of the annual allocations available to each share holder or licensee, taking into account that it is a groundwater resource.
6. To identify any changes to legislation, regulation or policy to enable the preferred model to be implemented.
7. To identify and describe the steps involved in moving the South East of South Australia to allocations expressed as shares (sequence, timing, resourcing).

Executive Summary

The prime purpose of this report is to recommend to the South East Catchment Water Management Board a preferred model for defining licensed water allocations as shares of the available groundwater resource. It is anticipated that the report will be referred to the South East Natural Resource Management Board.

NWI consistency

Among other things, the National Water Initiative recommends that water access entitlements be defined as shares and that licences be unbundled or separated so that water supply and the impacts of use can be managed independently.

The preferred model

A fuller description of the preferred model is presented at the end of this executive summary. Given the nature of objectives stated in legislation, plans and policy commitments by governments, the main finding of this report is that the interests of the South East would be best served by defining water access entitlements using unit shares to defining the proportion of each interest in the amount of water available for use in each management area.

Given policy developments in other parts of Australia and the requirements of the National Water Initiative it is suggested that the South East could become the first region in South Australia where unit shares are issued and licenses are unbundled into

- a water access entitlement;
- accounts that record the amount of water held by a person and available for use at any point in time; and
- a use licence (approval).

Unit shares

Following completion of the Volumetric Conversion Project, all water taking and all water holding licences should be converted into unit shares. These unit shares should be issued in a manner that consistently defines the proportion of each licence holder's interest in the annual amount of water available for metered use within an aquifer.

Water allocation plans will need to be amended to enable the Minister to issue shares. It is recommended that each licensee be issued with 1,000 units per megalitre of volumetric access entitlement they either

- Hold; or
- As a result of the Volumetric Conversion Project are deemed to be eligible to hold.

This will mean that upon the introduction of shares each licensee will hold one unit share per kilolitre of access entitlement. This relationship between the number of shares held and initial volume could be recorded on the share register.

Nett access entitlements

The Volumetric Conversion Project should be modified and extended to enable specification of an assumed aquifer return when ever water is extracted from an aquifer. This will require re-specification of the so-called “delivery component.”

All water access entitlements should be defined as “nett” water access entitlements in a manner that is consistent with the current area-based irrigation equivalent system. In particular, this means that no access entitlement would be required to extract water that can be reasonably be assumed to return to the aquifer.

At present, the approach being used to interpret the nature of volumetric holding allocation and an area based taking allocation is inconsistent. During the process of conversion, all existing water entitlements should be interpreted as nett water access entitlements.

One, not several, shared water pools

To keep administrative costs low and prevent attempts by stakeholders to the use of management review processes as a means to redistribute wealth, it is recommended that there be only one shared water pool per aquifer per management area.

All water access entitlements within that pool should be treated in an identical manner – irrespective of the purpose for which the water is likely to be used. Among other things, this requires that there be no difference between an allocation to a rural and an urban water user.

Seasonal allocations and use approvals should be managed independently from water access entitlements.

Water allocation management

Under the current allocation systems, irrigators are free to vary the amount of water they apply in response to season conditions. In many areas, more water is applied in dry times than in wet times. In order to facilitate efficient allocation of water among seasons, water allocation plans will need to be amended to include carry forward and borrowing rules. Water borrowing and carry-forward rules will enable individual water users to manage seasonal risk with recourse to the Board.

Given the need for water users to manage inter-seasonal risk and, in particular, in order to signal the fact that a prolonged dry spell may in fact be the first sign of adverse climate change, it is recommended that the Board make annual announcements. The amount announced should be the Board’s estimate of that part of aquifer recharge in the last year that could be extracted without adversely affecting aquifer health.

Each share holder’s water account should then be credited with a moving average of the last five year’s announcements.

If this moving average approach coupled with the introduction of carry forward and borrowing arrangements (and trading) is allowed, then individual irrigators will be responsible for and have the capacity to manage for climatic variability. The Board's prime responsibility would maintain aquifer health.

Every five years, and as part of the water allocation plan review, the procedures used by the Board to make an annual announcement should be reviewed. The annual announcement and the five year review processes used should be low cost and not require the development of excessively complex models. Rigorous announcement procedures need to be followed but they can be conservative.

Significant water-affecting activities

Significant water interception, significant non-metered water extraction and any other significant water-affecting activities should not be required to account for their effects on an annual basis. Instead, applications for permission to commence a new significant water-affecting activity should be accompanied by an offer to surrender sufficient shares to ensure that the proposed activity does not have an adverse effect on the interests of others that hold shares in the shared water pool.

When a significant water-affecting activity ceases, it is reasonable to expect that the amount of water in the consumptive pool will increase. To encourage efficient management of significant water-affecting activities, permits authorising a significant water use should contain a guarantee that upon surrender, shares equivalent to the expected increase in water in the consumptive pool will be issued to the entity that surrenders the permit.

To encourage the efficient relocation of significant water-affecting activities, it should be possible to transfer this guarantee that shares will be re-issued from one permit to another without having to incur the administrative and transaction costs associated with re-issuing shares and then re-surrendering them.

In recognition of the fact that this surrender/re-issue guarantee would insure such permit holders from adverse climate change, the surrender rate could include a small premium in recognition of the increased risk that this mechanism imposes on metered water users.

Under and over-allocation

Following completion of volumetric conversion it is likely that several management areas will be either under or over-allocated. In the cases where there is over-allocation shares should be issued in a manner that progressively forces realignment.

The decision about whether or not to distribute any un-allocated water to share holders or to the Minister is a political one. If the amount is small then from a pragmatic perspective it may be cheaper to distribute among existing water users. Where the amount involved is significant, however, it may be wiser to place it in a Ministerial Reserve.

Legislative changes

Implementation of the preferred model arrangements and consistency with the National Water Initiative requires significant redirection of a number of policy directions for South Australia. Arguably, consistency with the National Water Initiative could be achieved by using powers such as the Minister's power under s. 150 of the Natural Resource Management Act to define a water (taking) allocation 'in any other manner.' There are, however, significant legal risks associated with this approach. Rather than taking the risk that some-one may take action in a court seeking to prevent the conversion of existing access entitlements into shares, it is recommended that through the appropriate channels the Minister be approached with a view to amending the Natural Resource Management Act to

- make it clear that water access entitlements may be defined using unit shares to define proportional interests in a defined pool of water available for consumptive use; and
- unbundle or partition existing water taking approvals into a water access entitlement and a separate approval to apply water to a specific area of land; and
- set up a water accounting system.

Administrative costs

Given the nature of reforms and projects that are already under-way and the fact that water allocation plans are about to be reviewed, it is not expected that these recommendations will result in significant increases in costs for the Board.

The State Government will however incur costs associated with the modification of its water access entitlement register and its accounting software. It will also incur costs associated with the amendment of the Natural Resource Management Act.

As these modifications are required as part of the National Water Initiative, however, it would be wrong to argue that the full cost of implementing these changes should be attributed to the South East.

The preferred model

The preferred way to convert all water access entitlements in each management area into shares is judged to be a system that

1. Uses unit shares to define the proportion of the metered pool held by each licensee. Following completion of the Volumetric Conversion Project units should be issued at the rate of 1,000 units per megalitre or 1 unit per kilolitre of water access entitlement allocated as part of this project.
2. Defines each share or water access entitlement in “nett” terms.
3. Uses a surrender approach with a re-issue guarantee to off-set the effects of any significant non-metered water-affecting activities, like forestry, on metered water users. Any permit for a non-metered water-affecting activity should contain a guarantee that if the significant affect ceases and the permit for it surrendered, shares equivalent to the expected increase in the volume of water in the consumptive pool would be issued to the legal entity surrendering the permit. Consideration should be given to the merits of using an exchange rate premium to off-set the nature of the climate change insurance implied by this approach.
4. Allows the transfer of a re-issue guarantee from one permit to another permit without having to incur the administrative and transaction costs associated with re-issuing and then re-surrendering shares when the intent is simply to transfer this guarantee from one permit to another.
5. Defines each share holding on a separate share register.
6. Uses an independent use licence or similar use approval mechanism to manage salinity, aquifer draw down and other local effects on the environment, the aquifer and the interests of nearby land holders.
7. Establishes a separate set of water accounts for each water access entitlement holder. Whenever an allocation per share is announced, this amount should be recorded on the account and made available for use or transfer to another account holder from the day the allocation is credited to the account.
8. Establishes a single shared water pool for all metered water uses and makes no distinction between, for example, a water access entitlement held by rural and urban water users. Among other things, this will require holding and taking allocations to be dealt with in a consistent manner.
9. Allows individual water users to manage seasonal fluctuations in demand and climatic risk efficiently by introducing carry-forward and borrowing provisions to the accounting system.
10. Announces an estimate of sustainable yield annually and uses a 5-year rolling average of these announcements to signal trends in water availability coupled with a major 5 year review of the methods used to make annual estimates.

11. Following completion of the volumetric allocation project,

- a. Allocates any unallocated water as shares to the Minister¹; and
- b. Uses carry-forward and borrowing arrangement to assist rapid alignment with the sustainable yield of a management area.

¹ The Board may, however, hold the view that a pure market model should be used. If this is the case, then any unused water should be distributed amongst all shareholders – including the Minister – on a pro-rata basis.

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Abbreviations

DWLBC	Department of Water, Land and Biodiversity Conservation
HaIE	Hectare Irrigation Equivalent
NIRo	Nett Irrigation requirement for a reference crop growing at its optimal level
NRM	Natural Resource Management
NWI	National Water Initiative
PAV	Permissible Annual Volume
PWA	Prescribed Water Area
SA	South Australia
SE	South East
SEWCMB	South East Water Catchment Management Board
WAPs	Water Allocation Plans

1. Introduction

In South Australia and in the South East, the word allocation is used interchangeably to mean both a water access entitlement and a water allocation. In this report, terminology consistent with the National Water Initiative is used. In particular,

- **water access entitlement** – is used to define “any perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan”; and
- **water allocation** – is used to define “the specific volume of water allocated to water access entitlements in a given season, defined according to rules established in the relevant water plan.”

The SE Catchment Water Management Board has prepared and is now implementing Water Allocation Plans (WAPs) for most of the groundwater in the South East of South Australia, including the Lower Limestone Coast, Padthway, Tatiara and Tintinara Coonalpyn Prescribed Wells Areas. At present, water access entitlements² are defined using

- Area-based water (taking) allocations to define the area of land that may be irrigated using a Hectare irrigation equivalent (haIE) system;
- Volumetric water (taking) allocations to define the maximum amount of water that may be pumped from an aquifer within a year and used for an approved purpose at a specified location;
- Volumetric water (holding) allocations to define the total volume which the licensee can apply to have converted to a water (taking) allocation.

The majority of allocations in the Lower Limestone Coast, Padthway and Tatiara Prescribed Water Areas (PWAs) are area-based allocations. The Government of South Australia committed the South East to a program of metering of water extracted and volumetric conversion by 30 June 2006. The installation of water meters is well advanced across the region.

1.1. Volumetric Conversion Project

The South East is mid-way through a process of converting its area-based allocations to volumetric allocations. Initiated in 2002, a Volumetric Conversion Project is being used to develop rules for the conversion of 2,500 area based water licences into volumetric licences that will limit the volume of water that may be extracted from an aquifer in any year. With funding support from the South East Catchment Water Management Board, the project is being undertaken by the

² In this report and consistent with the terms used in the National Water Initiative a clear distinction is made between entitlements and water allocations. An entitlement defines the nature of a licensee’s long term interest while an allocation is a seasonal volume that a person has been authorised to extract. The NRM Act 2004 uses the term allocation to mean both an entitlement and an seasonal allocation.

Department of Water, Land and Biodiversity Conservation (DWLBC). Once conversion rules have been finalised, it is intended that volumetric conversion will be enabled through the review and amendment of Water Allocation Plans.

Once all water access entitlements have been defined in volumetric terms, it is possible to define them as shares. Among other things, definition of water access entitlements as shares makes it clear that the amount of water available for extraction may have to be changed. Factors that could necessitate a change in the quantity of water made available to a water user include a decline in water availability as a result of climate or land-use change and the emergence of new knowledge about the health of an aquifer.

1.2. Arguments for defining groundwater access entitlements as shares

Extracts from the National Water Initiative are included in Appendix One to this report. Among other things, the National Water Initiative suggests that water access entitlements should be defined as shares of the volume of water available for consumptive use. Arguably, as a signatory to this National initiative the South Australian Government and entities like the SEWCMB, are now obliged to define water access entitlements as shares.

In particular, the National Water Initiative states that

“37. Broadly, water planning by States and Territories will provide for:

- i) secure ecological outcomes by describing the *environmental and other public benefit outcomes* for water systems and defining the appropriate water management arrangements to achieve those outcomes; and
- ii) resource security outcomes by determining the **shares** in the *consumptive pool* and the rules to allocate water during the life of the plan.”

....

“28. The consumptive use of water will require a water access entitlement, separate from land, to be described as a perpetual or open-ended share of the consumptive pool of a specified water resource, as determined by the relevant water plan.”

In addition, and in the brief for this project, the SEWCMB draws attention to “the difficulty of keeping allocations within the Permissible Annual Volume (PAV), as the PAV changes over time with climate and land use changes, was identified as a key issue for the South East in the development of the 2001 WAPs.

As the PAV is reduced in a particular management area, the *Natural Resources Management Act 2004* requires that allocations must also be reduced. Reducing allocations is an administratively complex and time-consuming process, particularly the determination of the method for reducing allocations and can produce great community consternation.”

In an earlier report to the South East Catchment Water Management Board Young and Hatton MacDonald (2000: 36) advise

“As global best practice is showing over and over again, the solution to this problem is to allocate shares [of the PAV] to each irrigator, and then put in

process an arrangement that forces the periodic assessment of the annual allocations available to each share holder. No other system is dependable.”

The main advantages of defining allocations as a proportional share of the PAV, as stated by Young and Hatton MacDonald (2000:37), are that this approach

- forces regular³ estimation and announcement of PAV in a transparent manner;
- makes it clear how the risk of any variations in the PAV as a result of changes in climate or knowledge about aquifer potential is allocated; and
- removes the need to recall and re-issue all licences every time the PAV is changed.

Arguments against defining water access entitlements as shares include

- The fact that this has not been done in the past and that previous allocation systems have worked reasonably well as Ministers have always been able to reduce allocations on a pro-rata basis;
- When defined in volumetric terms the opportunity to claim compensation for the impacts of climate change and any other change in the allocation system are greater;
- The administrative costs of conversion from one system to another;
- The costs of developing the tools and knowledge necessary to define water access entitlements as shares.

Under most share systems, any increase in a PAV or its equivalent that is due to increased rainfall or the re-estimation of stocks is distributed amongst all shareholders in proportion to their “share” of the system.

The remainder of this report focuses on options for the introduction of a share-based water access entitlement system so that a final decision as to whether or not to introduce shares can be made in an informed manner.

The Australian State with the most experience with the use of shares to define water access entitlements is NSW. In particular, s.56 of the NSW Water Management Act 2000 states

“56 Access licences

(1) An access licence entitles its holder:

- (a) to specified shares in the available water within a specified water management area or from a specified water source (the "**share component**"), and

³ Young and McDonald (2000) loosely recommended annual estimation but review at other periods is possible. As set out later in this report and for some types of aquifer, less frequent may be optimal.

(b) to take water:

- (i) at specified times, at specified rates or in specified circumstances, or in any combination of these, and
- (ii) in specified areas or from specified locations, (the "**extraction component**").

(2) Without limiting subsection (1) (a), the share component of an access licence may be expressed:

- (a) as a specified maximum volume over a specified period, or
- (b) as a specified proportion of the available water, or
- (c) as a specified proportion of the storage capacity of a specified dam or other storage work and a specified proportion of the inflow to that dam or work, or
- (d) as a specified number of units.

(3) ..."

An extract from the NSW Ministerial Statement explaining the reasons for defining access entitlements as shares is included in Box 1.

Box 1

Extract from NSW Ministerial Statement on NSW Water Reforms

“Clearly defined access share entitlements issued in perpetuity

From 1 July 2004, most entitlement holders in systems covered by operating Water Sharing Plans (WSPs) will receive an access share entitlement. The access share entitlement provides each entitlement holder a share of a pool of water that is made available for extraction according to the rules of a WSP. The access share entitlement will be legally separate from land, and may be traded subject to the rules of the relevant WSP.

Anyone will be able to buy, own or sell an access share entitlement. Entitlement holders will commonly use their entitlement as collateral when seeking finance from lending institutions for investments. The access share entitlement is thus a vitally important asset to the holder, but its importance extends further. Because its value will have an influence on the entitlement holder’s capacity to raise finance and underpins long term expectations in relation to water supply, it has the potential to enhance the overall economic performance of the irrigated agricultural sector.

A share of a pool of water available for extraction

Underpinning NSW’s new water management framework and the NWI is the principle that the environment and entitlement holders “share” the resource.

The rules of WSPs provide and protect water for the environment. They also govern the sharing of the water available for extraction among entitlement holders, according to the reliability of different categories of access share entitlements (eg high security and general security entitlements).

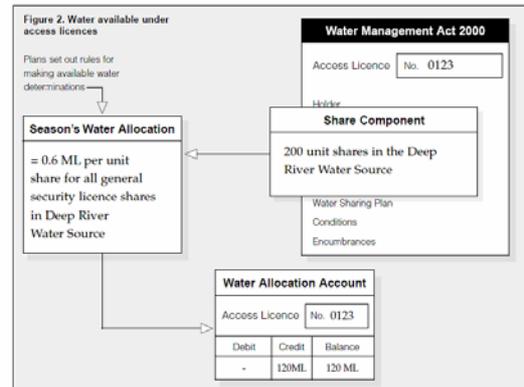
This approach explicitly recognises that water can be a highly variable resource, and neither the environment nor entitlement holders can be guaranteed a particular volume of water on a year by year basis.

Under NSW’s new water management framework, the amount of water available in any allocation period that a entitlement holder receives will vary depending on:

- the amount of water in the water source, as affected by climate, the amount of water intercepted as a result of land use change and increases in water use efficiency, and the nature of water use in interconnected bodies of water;
- the individual pools of water available to each category of entitlement, as determined by the Minister for Natural Resources, according to the rules of the WSP; and
- the entitlement holder’s share of a pool of available water, as specified by the holder’s access share entitlements.

An access share entitlement will specify a number of “unit shares” in a pool of water. The number of unit shares issued will correspond with the volumetric entitlement on existing licences. For example, a person currently holding a general security licence for 500 megalitres could expect to receive an entitlement of 500 unit shares of the general security pool.

The Department of Infrastructure, Planning and Natural Resources will publish data indicating the total long term average volume of water that is likely to be available for extraction in the water source as well as the average volume of water obtained for each unit share. In this way, individual entitlement holders will be able to estimate the volumes of water that they are likely to obtain under different seasonal conditions. The process for converting unit shares into actual volumes of water to be allocated to individual water accounts is illustrated in Figure 2.



The specification of entitlements as shares rather than a volume of water in megalitres neither diminishes nor increases the entitlement holder’s rights. Rather, the intention is to communicate the nature of each holder’s entitlement with clarity. This is not only important for future investment but also for the environment. Entitlement holders will have a clear signal about what their entitlement gives them, thus avoiding any misunderstandings about the true availability of the resource.”

Source:

<http://www.naturalresources.nsw.gov.au/water/pdf/wms02.pdf>

In NSW, water sharing plans for groundwater systems are now in place in a number of catchments.⁴

The Eyre Peninsula Catchment Water allocation plan defines access entitlements as shares but does this via that plan rather than through words on a water licence. Water licences are issued annually and, hence, offer less investment security than is possible if the nature of the long term interest is defined on the water access entitlement

2. Methodology

The methodology adopted in the preparation of this report and in consultation with staff was

- 1) Development of a set of criteria to allow objective assessment of the merits of design options;
- 2) Identification of issues that need to be considered in the course of designing a share system;
- 3) Organisation of these issues in a manner that enables progressive consideration and evaluation of them;
- 4) Evaluation of the design options that could be used to resolve each issue.
- 5) Specification of a preferred option before consideration of its affect on other design options;
- 6) Consideration of design option interactions; and
- 7) Development of a final set of recommendations and alternatives if legislative and administrative changes cannot be made.

⁴ These are listed at <http://www.dipnr.nsw.gov.au/water/sharing/index.shtml>

3. Evaluation Criteria

The first step in the methodology summarised above is the development of a set of evaluation criteria. Essentially this requires consideration and consolidation of the various statements of goals, objectives, principles and other statements in a considerable number of policy documents. These include the Natural Resource Management Act 2004, the National Water Initiative, the State Water Plan for South Australia, the South East Catchment Water Management Plan and in the Water Allocation Plans that have been prepared for each of the six Prescribed Wells Area in the South East.

- Box 2 summarises the goals set out in the South East Catchment Water Management Plan; and
- Box 3 summarises the objects of the Natural Resource Management Act 2004.
- Annex One contains relevant extracts from the National Water Initiative.

Box 2

SE Catchment Water Management Goals for 2003-2008

Consistent with the Natural Resource Management Act 2004, the agreed goals for water allocation and management in the South East Catchment are

- **Goal 1** To protect or improve water quality so that water remains suitable for domestic, environmental, agricultural, recreational and industrial uses.
- **Goal 2** To protect and maintain water quantity within climatic constraints and continually evaluate and refine the quantity and interdependencies of the Catchment's water resources.
- **Goal 3** To identify, protect and enhance ecosystems and their associated biodiversity that depend on water.
- **Goal 4** To introduce policies and incentives to monitor and improve water use efficiency.
- **Goal 5** To introduce systems and incentives to assist in optimising the benefits of using and reusing water while meeting social, environmental and economic objectives.
- **Goal 6** To increase community awareness and participation in catchment management.
- **Goal 7** To develop partnerships with groups and organisations to pursue, and share the costs and benefits of integrated catchment management.

Source: SE Catchment Water allocation plan 2003-2008, p66.

Box 3

7—Extract from Natural Resource Management Act 2004

Objects

- (1) The objects of this Act include to assist in the achievement of ecologically sustainable development in the State by establishing an integrated scheme to promote the use and management of natural resources in a manner that—
 - (a) recognises and **protects the intrinsic values of natural resources**; and
 - (b) seeks to protect biological diversity and, insofar as is reasonably practicable, to support and encourage the restoration or rehabilitation of ecological systems and processes that have been lost or degraded; and
 - (c) provides for the protection and management of catchments and the **Sustainable Yield** of land and water resources and, insofar as is reasonably practicable, seeks to enhance and restore or rehabilitate land and water resources that have been degraded; and
 - (d) seeks to **support sustainable primary and other economic production systems** with particular reference to the value of agriculture and mining activities to the economy of the State; and
 - (e) provides for the prevention or control of impacts caused by pest species of animals and plants that may have an adverse effect on the environment, primary production or the community; and
 - (f) promotes educational initiatives and provides support mechanisms to increase the capacity of licensees to be involved in the management of natural resources.
- (2) For the purposes of subsection (1), ecologically sustainable development comprises the use, conservation, development and enhancement of natural resources in a way, and at a rate, that will enable licensees and communities to provide for their economic, social and physical well-being while—
 - (a) sustaining the potential of natural resources to meet the reasonably foreseeable needs of future generations; and
 - (b) safeguarding the life-supporting capacities of natural resources; and
 - (c) avoiding, remedying or mitigating any adverse effects of activities on natural resources.
- (3) The following principles should be taken into account in connection with achieving ecologically sustainable development for the purposes of this Act:
 - (a) decision-making processes should effectively integrate both long term and short term economic, environmental, social and equity considerations;
 - (b) if there are threats of serious or irreversible damage to natural resources, **lack of full scientific certainty should not be used as a reason for postponing measures** to prevent environmental degradation;
 - (c) decision-making processes should be guided by the need to evaluate carefully the risks of any situation or proposal that may adversely affect the environment and to avoid, wherever practicable, causing any serious or irreversible damage to the environment;
 - (d) the present generation should ensure that the health, diversity and productivity of the natural environment is maintained or enhanced for the benefit of future generations;
 - (e) a consideration should be the conservation of biological diversity and ecological integrity;
 - (f) environmental factors should be taken into account when valuing or assessing assets or services, **costs associated with protecting or restoring the natural environment should be allocated or shared equitably and in a manner that encourages the responsible use of natural resources, and licensees who obtain benefits from the natural environment, or who adversely affect or consume natural resources, should bear an appropriate share of the costs that flow from their activities**;
 - (g) if the management of natural resources requires the taking of remedial action, the first step should, insofar as is reasonably practicable and appropriate, be to encourage those responsible to take such action before resorting to more formal processes and procedures;
 - (h) consideration should be given to Aboriginal heritage, and to the interests of the traditional owners of any land or other natural resources;
 - (i) consideration should be given to other heritage issues, and to the interests of the community in relation to conserving heritage items and places;
 - (j) the involvement of the public in providing information and contributing to processes that improve decision-making should be encouraged;
 - (k) the responsibility to achieve ecologically sustainable development should be seen as a shared responsibility between the public sector, the private sector, and the community more generally;
 - (l) the local government sector is to be recognised as a key participant in natural resource management, especially on account of its close connections to the community and its role in regional and local planning.

The vision of the 2003-2008 South East Catchment Water Management Plan for the South East is

“A healthy and productive Catchment for the benefit of current and future generations.”

After careful consideration of the statements made in the above documents and of the need for a concise way to provide advice on the consequences of selecting different share-system design options, seven evaluation criteria are identified. For ease of presentation each criterion is given a one or two word name.

1. **Sustainable Yield** – Maximise the likelihood of keeping groundwater levels within sustainable limits.
2. **Salinity** – Maximise the likelihood of preventing salinity from reducing productivity and ecosystem health.
3. **Efficient Investment** – Encourage continuing economic development through preference for arrangements that will encourage the economically efficient allocation of resources through time.
4. **Transaction Costs** – Minimise the costs of adjusting allocations and responding to changing environmental, economic and social conditions.
5. **Administrative Costs** – Minimise administrative costs for government and the Board particularly those associated with
 - Negotiating changes to the system
 - Monitoring compliance
 - Maintaining records.
6. **Distributive Equity** – Avoid arrangements that make it possible for one group of water users to act in ways that are against the interests of another group of water users.
7. **Policy Consistency** – Retain consistency with the provisions of the NWI, the NRM Act 2004, the State Water Plan, the South East Catchment Water Management Plan and Water Allocation Plans in the South East.

4. Consideration of issues

There are many different ways that a share allocation system could be implemented in the South East. Importantly, choices made in the resolution of one issue can foreclose options associated with another issue. In this report, eight issues are identified.

4.1. Issue One – Should water access entitlements be defined in “Gross” or “Nett” terms?

When water access entitlements are defined as “gross” access entitlements investments and changes in irrigation practice that reduce the volume of water that returns to an aquifer are retained by the water access entitlement holder and can be used to increase the area irrigated or sold to another person.

When water access entitlements are defined as “nett” water access entitlements, any reduction in the volume of water returned to an aquifer can not be used to expand irrigation and is not considered to be part of the water access entitlements. The often incorrectly termed “saving” can not be sold to someone else.

Figure 1 provides an example of the difference between these two systems. In the example given, the “gross” allocation is 100 ML and the “nett” allocation is 50 ML. In both cases, the same amount is pumped.⁵ In a “net” system, rules in water allocation plans are used to “deem” the proportion of extracted water that is assumed to return to the aquifer and no access entitlement is required to extract this water. These rules vary by crop type and irrigation system.

Under a gross system increases in application efficiency can be used to expand irrigation. Under a nett system only that part of increases in application efficiency that reduces evaporation or transpiration can be used to expand irrigation.

⁵ The numbers used here are hypothetical and are for illustrative purposes only. They are not drawn from data being assembled by the volumetric conversion project.

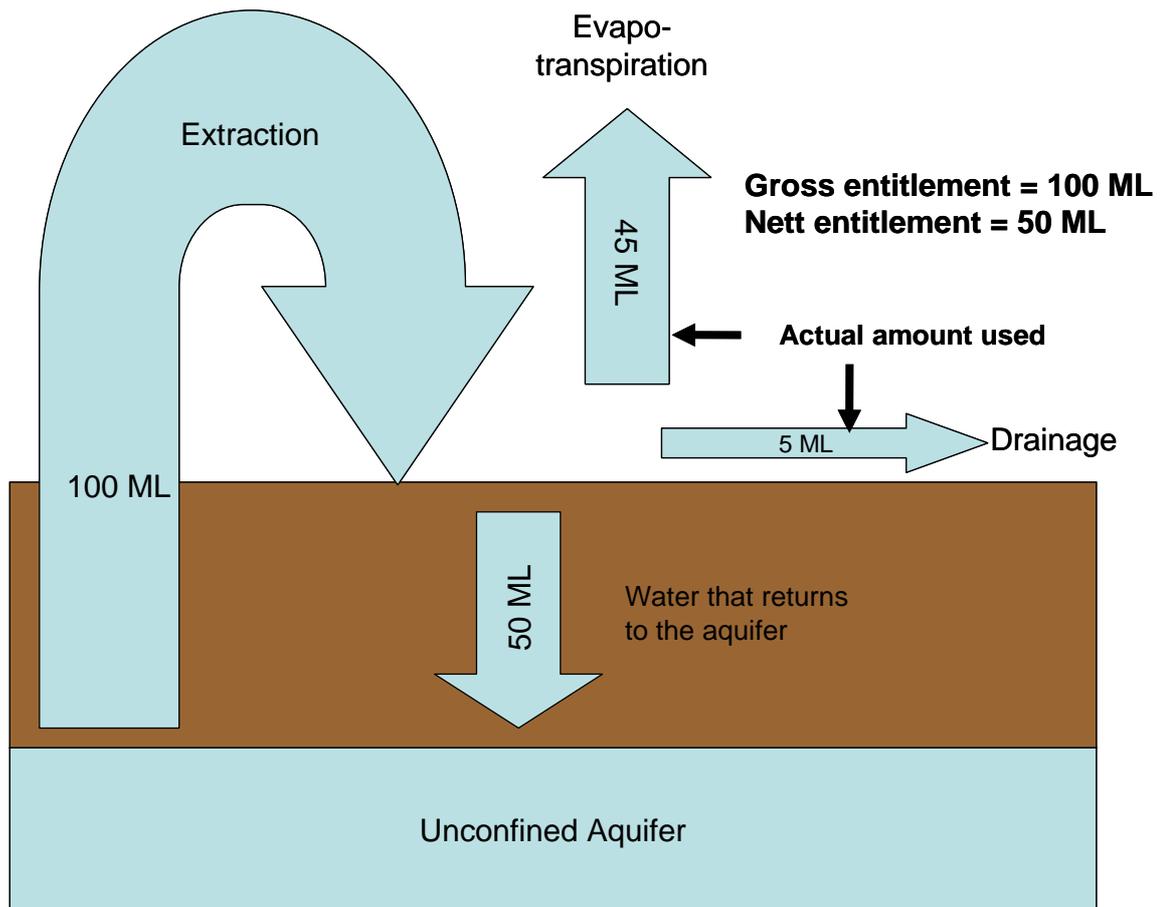


Figure 1 Difference between “gross” and “nett” allocation systems assuming

In a fully allocated “gross” system, allocations per share must be reduced as delivery efficiencies increase. If this is not done then the aquifer becomes over-allocated. In particular, whenever a flood irrigation system is converted to a drip irrigation system allocations per share must be reduced. In implementation many irrigators object to this approach. Those who have already installed drip irrigation systems have to secure more water as others copy them.

As summarised in Figure 2, when a “gross” water access entitlement system is used, the Board must develop and communicate to water users the nature of the Sustainable Extraction Frontier and reduce allocations per share as application efficiency increases.

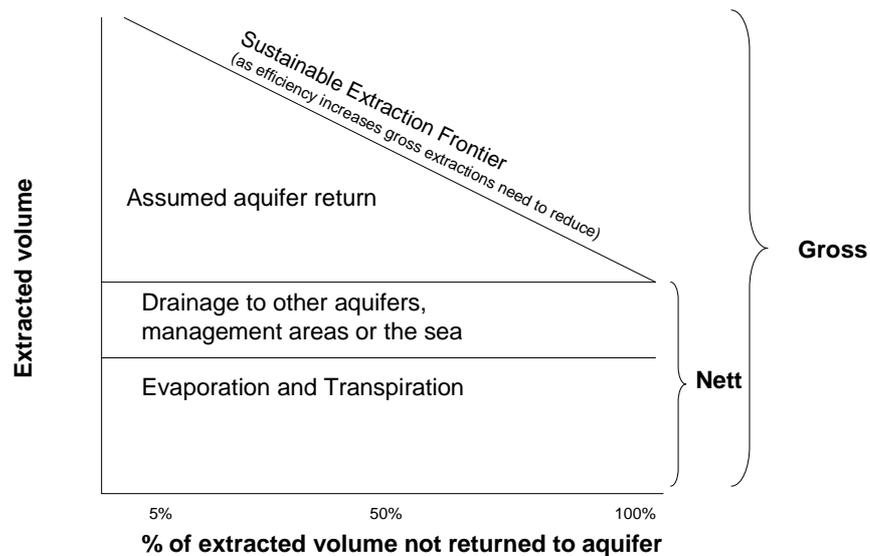


Figure 2 An overview of the difference between a “gross” and a “nett” water access entitlement system

The alternative, used in some parts of the world and other States, is to allocate water on the assumption that 100% of any water is extracted and no water returns to the aquifer. This extremely conservative approach means that any aquifer returns can not be used. As a result, economic activity is less than it could be.

While this conservative approach is preferred by some water administrators, this conservative allocation approach is not a viable option for the South East as too much water has already been allocated to make it possible to do this without reducing existing water access entitlements. This situation has come about primarily because all area-based water licences are “nett” water access entitlements and the holding allocations were issued on the assumption that this approach would continue to be the dominant approach used in the South East.

As summarised in Box 4, both the Volumetric Conversion Project and more recent WAPs – such as Tintinara-Coonalpyn WAP – use a “nett” allocation system and define water access entitlements in “nett” terms. There is, however, a subtle difference between the practice currently being used and a strict interpretation of the meaning of a “nett” water access entitlement. At present, the Volumetric Conversion Project defines the delivery component to include

1. water returns to the aquifer (including transmission and application losses);
2. evaporative losses other than those attributed to evapo-transpiration eg. spray drift (evaporation), evaporation from free standing water during flood irrigation etc.

As illustrated in Figure 1, the delivery component mixes two separate processes. The first process involves the return of water to the aquifer in a manner that makes it possible for this water to be used again. The second process involves final use of the water. It can not be used again. In the long run, administrative costs would be

lower if the second part of the delivery components are assigned to and become part of what is presently defined as the base allocation. *It is recommended that the Board modify the Volumetric Conversion Project so as to make it possible to use the results of this project in the conversion of access entitlements into shares.*

In the absence of detailed information, an estimate of the delivery component should be made at the management area level by irrigation practice and used to develop an estimate for each licence.

In a nett allocation system, it is important to differentiate between water that is used in the sense that, following extraction, it is not available for subsequent use and that which returns to the system. This may mean that initial allocations are higher and in the initial stages more management areas are over-allocated but in the longer run it will also mean that water users will have an incentive to reduce transmission, evaporation and other losses associated with water use. It will also ensure that the allocation process will remain aligned with the capacity of aquifers to supply water. It is recommended, in the strongest terms possible, that the processes used to convert to volumetric allocations are consistent with the framework set out in Figure 1. The present structure and the way the delivery component is defined is characterised by incentive incompatibility. To overcome this, a clear distinction must be made between that part of the delivery component that returns to the aquifer and, hence, is available for use by others and that which in all sense of the meaning is “used” and thus not available for use by others.

Another key consideration is the extra administrative cost associated with the need to track irrigation practice and record water use and then deduct an assumed aquifer return from meter readings. If the Board is committed to allocating all the available water, however, these costs cannot be avoided under either a “nett” or a “gross” allocation system. If, however, it chooses to run a very conservative allocation and assumes that all water is “used,” there is no need to monitor changes in irrigation practice. The benefit is a small saving in administrative cost. The cost is loss of a significant amount of economic activity.

If the Board decides to implement a share system it will also need to consider how to set aside water for the proposed “auxiliary component”. While it is possible to use a Ministerial Reserve and or other mechanisms to hold an auxiliary component outside a share system, the costs of doing this are considerable. As for a bridging component, in the long run it will be simpler if these allocations are either phased out or incorporated into the allocation system and made fully tradeable. The pragmatic solution is either to phase any auxiliary component out after five years or incorporate it into the existing volumetric conversion process.

Box 4

Definitions and concepts being used in the volumetric conversion process

Base Allocation

The Base Allocation is the crop water requirement component of the licence and equates to the annual average irrigation requirement for the reference crop growing at its optimum level from the existing Irrigation Equivalent (IE) water allocation system. The Base Allocation will be calculated as follows -

$$\text{Base Allocation (ML)} = \text{haIE} \times \text{NIRo}$$

where haIE is the current area based allocation on the water licence and NIRo is the “nett” irrigation requirement for reference crop for the new climatic band associated with that licence.

Delivery Component

The Delivery Component is the licence component that describes the volume of water that a reasonably efficient irrigator needs to extract from the resource for irrigation in excess of NIRc (nett irrigation requirement – crop) for their irrigation system/s. The Delivery Component is determined for each irrigation system type within volumetric conversion management zones by analysing data obtained from field data collection programs and other information sources (soils, hydrogeology etc).

It is proposed that there be a minimum delivery component based on irrigation system efficiencies of 65% for flood systems, 85% for pressurized spray systems and 90% for drip systems.

The delivery component is being calculated using data sets of metered water extraction. It is largely calculated by subtracting the “nett” irrigation requirement for the crop from the total volume of water extracted. Therefore the delivery component not only consists of water returns to the aquifer, but also evaporation or losses other than those attributed to the “nett” irrigation requirement eg. spray drift (evaporation), evaporation from free standing water during flood irrigation etc.

Bridging and auxiliary component

It is proposed that the conversion will result in each licensee being issued a base allocation + delivery component, with eligible applicants able to apply for an allocation for auxiliary requirements, crop adjustment factor (CAF), and a bridging volume.

On application, auxiliary components are available to provide for activities like the use of water to reduce frost risk that were accounted for when the irrigation equivalent approach was developed. Bridging components can be obtained in situations where irrigators have been using substantially more than the amount they have been assumed to be using.

Only the base allocation would be tradable. The delivery component would be surrendered and re-issued on transfer. While the issue has yet to be resolved, presumably, any changes in irrigation systems used would need to be notified to DWLBC and the delivery component adjusted in an appropriate manner. Under current policy, the bridging component will be phased out. Only existing licensees with an auxiliary system or practice in place at the time of volumetric conversion will be eligible for an auxiliary component (on application). This component will be issued temporarily, be reviewed every 5 years and won't be tradeable, unless you buy a property with the associated licence and continue with the same use.

As the Board is no longer in a position to introduce a conservative “gross” allocation system and, as summarised in Table 1, essentially the choice is between defining water access entitlements in terms of

- a. The quantity of water that is extracted – a “gross” allocation system;
- b. The quantity that is used after allowing for returns to the aquifer and transfers to other systems – a “nett” allocation system; and
- c. A combination of “nett” and “gross” systems.

Under current policy, a mixture of “gross” and “nett” allocation systems are being used. Some allocations are defined in “nett” terms and some in “gross” terms. This has come about because water holding licences are being interpreted as a “gross” water access entitlement while all area-based taking allocations are being interpreted as “nett” water access entitlements. Thus, when a water holding licensee applies to convert a water (holding) allocation into a water (taking) allocation, they are required to accept a conversion that keeps the total amount of water used (crop water requirement, plus delivery component, plus any other water needs) within the total allocation on their licence. In contrast, holders of a water taking licence do not have to supply the delivery component.

A related issue, arguably of greater concern to the DWLBC and the State is the fact that most water licences in the rest of South Australia are defined in “gross” terms.

In a more formal manner, Table 1 evaluates the options and concludes that a “nett” water access entitlement system is preferable. It is also recommended that the direction of the volumetric conversion project be amended to allow estimation of an “Assumed Aquifer Return.”

Table 1 Evaluation of choices between a gross, a “nett” or mixed allocation system

Issue One - A “gross”, a “nett” or a “mixed” water access entitlement system?			
	Gross	Nett	Mixed
Implications for irrigation industry	Irrigators have to plan and expect their allocations to be cut as others improve technology	Incentive for more efficient use limited to pumping and other costs	
Implications for community			Arguments about inequity may emerge
Implications for Board and DWLBC	Need to cut allocations periodically Less need to monitor irrigation practice on an annual basis to determine where improvements in irrigation efficiency have occurred	No need to cut allocations as automatic adjustments occur as irrigators change practice Need to track use and define “assumed aquifer return”	Need to manage the politics of justifying and defending an inconsistent system
Criteria that most support the option	Policy Consistency (with the rest of the State) Administrative Costs	Efficient Investment Sustainable Yield Distributive Equity Transaction costs	
Criteria that do not assist in choosing among options	Salinity Control – Salinity can be controlled under either system		
Preferred option before consideration of consequential effects	A “nett” allocation system coupled with a modification to the volumetric conversion process so that evaporation is included in the base allocation and the remainder is called an “Assumed Aquifer Return”		

Note: The option of a “gross” system that always assumes zero return to the aquifer is not considered as decisions have already been made to preclude this option.

4.2. Issue Two – How should significant non-metered water-affecting activities be integrated into a “share” system?

At present, significant water-affecting activities are accounted for by setting aside a volume of water to allow for effects of these activities and then requiring arrangements to be put in place to ensure that any increase above the threshold of effects within the set aside are off-set. This is consistent with the NWI which states that

25. “The Parties agree that, once initiated, their *water access entitlements* and planning frameworks will:

... xi) protect the integrity of water access entitlements from unregulated growth in interception through land-use change.”

As well as the interception of water that otherwise would flow through to an aquifer it is also possible for plant roots to tap into an aquifer and “extract” water without pumping it. In the South East the amount of water intercepted by forest plantations is significant. In some locations, it is suspected commercial plantation forests are extracting water directly from an aquifer.

These effects of interception and non-metered extraction need to be managed using separate policies. There are, at least, four ways that un-meterable water-affecting activities can be managed. Options include

- **Prior right** - Users responsible for the water-affecting activity are given a prior right and are not required to off-set the effect of any water-affecting activity that changes in land-use practice have on an aquifer. If the system is fully allocated then others are required to reduce the volume of water they use;
- **Surrender** (with guaranteed restitution if effect ceases) – Any increase in a non-metered affect, possibly above a threshold, is required to be offset by buying and surrendering an access entitlement whose expected annual allocation would be equivalent to the assumed effect on the aquifer that the water affecting activity has;
- **Set-aside accounts above a threshold** – above a threshold, all users responsible for the effect are required to set aside sufficient allocations to offset the effect they are assumed to be having on other water users and water access entitlement holders; and
- **Set aside accounts for all** – all users responsible for the effect are required to set aside sufficient allocations to offset the effect they are assumed to be having. Existing water-affecting activities are given sufficient shares to enable them to do this.

As the Government has already decided against the prior right option, this option is not included in Table 2 below. Under current policy, above a threshold amount of plantation forestry, a permit must be obtained to establish a commercial plantation and water allocation plans require that once a threshold area in any management area has been passed, the estimated effect of a commercial plantation must be offset by “setting aside” a water (taking) or water (holding) licence. In an un-metered allocation system this approach is likely to be the most cost-effective as water is not

managed on an annual basis. With the introduction of metering, however, careful consideration needs to be given to the question of which parts of the system should be managed in a manner that keeps consistency with water accounts.

If the surrender option was adopted, shares would be surrendered when ever a permit for a significant water using activity is issued. To encourage efficiency, these permits would contain a clause requiring the Minister to re-issue shares whenever a non-metered use or water-affecting activity is discontinued. In effect, the government would guarantee that any licence surrendered would be issued at an appropriate re-inclusion rate when the significant water-affecting activity is stopped. Arguably, in a metered allocation system, this is probably the arrangement that most closely approximates the existing system as under a surrender system there is no need to continuously adjust the size of the water access entitlement held if the PAV changes.

Under a surrender and reissue system, water allocation plans would also need to specify the rules for surrender, permit and re-issue. Water allocation plans could also be amended to allow foresters to trade the water-affecting effect from one location to another without having to go through the torturous administrative path of surrendering a permit, issuing a water access entitlement, then surrendering the water access entitlement just issued and receiving a new permit.

The surrender option works as a once-off decision – all subsequent upside and downside risks are borne by others in the system. If it gets drier others have to reduce the water they use. If it gets wetter access entitlement, but not, permit holders receive an increased allocation. Given this, water allocation plans could require the surrender formula to include a surrender premium to compensate others for the insurance against negative climate change and system revisions granted by this system.

Under the risk premium approach, a company wanting to establish 1 hectare of forest, for example, may have to surrender shares that have an expected annual allocation of 1.1 ML of water per annum on the understanding that when the forest is cleared and a permit surrendered they would only be re-issued with shares with an expected annual allocation of 1 ML.

The main advantage of the surrender option is that the effects of non-metered uses do not have to be monitored continuously, water accounts do not have to be kept for them and decisions about discrepancies between forest accounts and actual use do not need to be managed.

There are two downsides to the two set-aside accounting options. First, there is an added cost associated with the maintenance of an accounting system that tracks all non-metered water-affecting activities at each location where it is occurring. Second, it can be politically difficult to force non-metered users to buy more shares or allocations as water supplies fall. In metered systems, arguments about the need for annual estimates can also start to emerge. Moreover, if some, but not all non-metered water-affecting activities are included then equity arguments between old and new foresters must be anticipated. The intensity of these arguments and ongoing scientific challenges will increase as the number of non-metered uses included in the system increases.

In a more formal manner, Table 2 evaluates the options and concludes that a “surrender approach with a re-issue guarantee is preferable. It is also recommended

that consideration be given to the inclusion of a risk premium in water allocation plans to account for the re-allocation of risk implied by adoption of this system.

Table 2 Evaluation of choices for accounting for the effects on non-metered use

Issue Two – Sharing significant non-metered water-affecting activities			
	Surrender with re-issue guarantee	Set-aside accounts above a threshold	Set-aside accounts for all forestry
Implications for industry	Simplicity		All receive an undertaking that they will be issued shares if they stop the non-metered water-affecting activity
Implications for community		Inconsistent approach between new and old non-metered uses	
Implications for Board and DWLBC	Only ever have to deal with a small number of non-metered users. Minimal engagement with established users		Need to maintain records and manage a growing register of non-metered users
Criteria that most support the option	Transaction Costs Administrative Costs Distributive Equity	Policy Consistency	Distributive Equity
Criteria that do not assist in choosing among options	Efficient Investment, Sustainable Yield, Salinity Control		
Preferred option before consideration of consequential effects	<p>Surrender coupled with a re-issue guarantee possibly with a small risk premium that recognises the nature of the climate change insurance given through this mechanism.</p> <p>The surrender requirement would apply to all new significant non-metered water-affecting activities and be implemented by requiring surrender of water access entitlements equivalent to the annual estimated mean impact of that effect. Permits authorising the significant effect would contain a clause guaranteeing that upon surrender of the permit, an access entitlement equivalent to that estimated increase in water availability would be issued to the permit holder or their nominee.</p>		

Note: In some management areas, the Minister has decided that part of the Ministerial Reserve should be used to allow an increase in the area under commercial forestry without requiring others to reduce their water use or holding.

4.3. Issue Three – How many access entitlement pools should be created?

Shares have to be defined as a share of something and, if one wishes to encourage efficient investment, that something has to be defined with precision.

Having indicated the nature of options to account for the effects of significant non-metered uses, the next question to resolve is the question of what to exclude totally from the share system, what to include partially using a surrender option and what to include totally within the system.

Recognising the importance of carefully defining what is to be shared, the National Water Initiative states that

“The *consumptive use* of water will require a water access entitlement, separate from land, to be described as a perpetual or open-ended share of the *consumptive pool* of a specified water resource, as determined by the relevant *water plan* ...

And provides the following definitions

consumptive pool – the amount of water resource that can be made available for *consumptive use* in a given water system under the rules of the relevant water plan.

consumptive use – use of water for private benefit consumptive purposes including irrigation, industry, urban and, also, stock and domestic use.

Table 3 provides an overview of the nature of the existing system and water budgets being prepared for water allocation plans. Table 4 contains speculative observations about the nature of arrangements that might be put in place following completion of the volumetric conversion project.

Table 3 Overview of existing system in terms of what is included in water budgets and what is included in the licence system and, hence, in what is implicitly included in the consumptive pool.

	Included in water budget of current water allocation plans	Licensed under current system
Unlicensed users eg. stock & domestic and other users with a prior right	Yes - estimates used	No
Existing Volumetric water taking allocations	Yes	Yes
haIE allocations - crop water requirement	Yes	Yes
Volume pumped in excess of crop water requirements for haIE allocations	No	No (allowed, but licence is area based, volume extracted is not monitored)
Volumetric water holding allocations	Yes	Yes
Ministers Reserve	Yes (in budget but not in WAPs – was created after WAPs finalized)	Yes (although no licences issued)
Environment - 10% of PAV set aside in some PWAs	Yes	No
Plantation groundwater interception - Existing up to threshold	Yes	No
Plantation groundwater interception - Beyond threshold	Yes	Yes
Plantation groundwater extraction – existing	No	No
Plantation groundwater extraction - future	No	No
Plantations that are removed		
Above threshold	Yes	Yes
Below threshold	No	No

Table 4 Overview of anticipated system following volumetric conversion in terms of what is included in water budgets and what is included in the licence system and, hence, in what is implicitly included in the consumptive pool.

	To be included in water budget of reviewed water allocation plans	Anticipated* to be in water access entitlements following completion of the Volumetric Conversion Project
Unlicensed users eg. stock & domestic and other users with a prior right	Yes - estimates used	No
Existing Volumetric water taking allocations	Yes	Yes
Volumetric water holding allocations	Yes	Yes with allocations defined in "gross" terms
Converted haE allocations:		
• Base allocation	Yes	Yes
• Delivery component (aquifer return plus other evaporative losses)	Yes	Yes = evaporation No = aquifer return
• Bridging component	Yes	Temporarily
• Auxiliary component	Yes	Yes?
Ministers Reserve	Yes	Yes
Environment - 10% of total vertical recharge set aside prior to calculating sustainable yield in all PWAs	Yes	No
Plantation groundwater interception - Existing up to threshold	Yes	No
Plantation groundwater interception - Beyond threshold	Yes	Yes
Plantation groundwater extraction – existing	Yes	No
Plantation groundwater extraction - future	No, but possible	Not resolved yet but possible
Plantations that are removed		
Above threshold	Yes	Yes
Below threshold	No	No but possible (Would promote economic efficiency)

** “Anticipated” as the volumetric conversion project has not been completed and some arrangements are subject to variation. Elsewhere in this report, it is recommended that some of the arrangements set out in this table be varied. Advice should be obtained from the Board before making any decisions based upon the content of this table.*

The question that this section seeks to address is that of how many sub-pools should be defined. In the simplest of systems there is a metered pool and an un-metered pool and shares are used to define interests in the metered pool. The system then needs to be modified if the Board is interested in giving priority to different groups of access entitlement holders. Consideration also needs to be given to the question of whether or not water access entitlements are defined in “gross” or net terms.

The list of water access entitlements and allocations that could – but not necessarily should – be included in a one or more shared water pools and collectively define the consumptive pool include

- All water (taking) allocations
- All water (holding) allocations
- All significant water-affecting activities
- Any Ministerial Reserve
- Any environmental allocation
- All prior rights (eg Stock and Domestic etc)

For completeness one also needs to consider the nature of transfers to other aquifers, drains that supply wetlands, etc.

Given all the above, the next issue that needs to be resolved is the question of how many types of shares should be created?" While there are many permutations of the options, the main options are

- A single shared water pool with surrendering used to manage significant water-affecting activities;
- Two shared water pools – one for all metered uses and one for all significant water-affecting activities; and
- Three or more shared water pools.

Under the single pool option, all forms of water access entitlement are equally secure. Resolution of all between industry issues is left to the market place. If, for example, a town wishes access to more water it must buy that water or buy a water access entitlement from another entity. Significant water-affecting activities are managed using a surrender mechanism.

With the second option, off-set accounts are used to manage water-affecting activities but the rules for off-set accounts do not have to be kept consistent with those for other water access entitlements. The main advantage of this approach is that permits do not have to contain a re-issue guarantee.

With the third option, as is currently the case, different rules operate for each category of water user. In particular, rules and procedures are different for commercial, industrial and urban water users, for holding allocations, for taking allocations and for new commercial plantations and for the Ministerial Reserve. The main dis-advantage of this approach is that water allocation plan reviews tend to focus more on the effects of rule changes on the interests of those in other pools and less on the health of the aquifer.

Of all the options, the cheapest system to administer is one that treats all holdings and water access entitlements in the same manner. The next simplest is one involving two pools in a manner that allows the rules and protocols for commercial forestry and any other water-affecting activities to differ from other water access entitlements. The most expensive option is one that allows the rules for each category of water holding to differ. Generally, as more pools are created, the incentive for one group of share holders to lobby for trade-offs that favour them over other pools increase. Where such structures exist, water allocation plan reviews then

tend to spend a considerable amount of time focusing on distributional issues rather than the questions of sustainable yield, salinity and aquifer health.

More formally, Table 5 assesses the question of how many shared water pools should be established and identifies a single shared water pool as the preferred option with the use of a surrender mechanism to manage significant water-affecting activities.

Table 5 Evaluation of choices associated with the management of non-metered water use

	A single shared water pool with surrendering used to manage significant water-affecting activities	Two shared water pools – one for all significant water-affecting activities and one for all other licences in the consumptive pool	Three or more shared water pools
Implications for irrigation industry	Simple system Water allocation plan reviews focus on sustainability issues.		Opportunities to change plans in a way that favours one group of water users over another
Implications for community	There is only one type of water access entitlement. Changes to the allocation rules etc. can not favour one type of water access entitlement holder over another.	Arguments about what is fair for each group can be expected to emerge.	Even more arguments as there are more groups
Implications for Board and DWLBC	Focus on sustainability. Need to manage non-metered offsets		Difficulty in maintaining a consistent approach Increased costs of preparing more complicated WMPs
Criteria that most support the option	Sustainable Yield Transaction Costs Administrative Costs Distributive Equity Efficient Investment		Policy Consistency
Criteria that do not assist in choosing among options	Salinity Control		
Preferred option before consideration of consequential effects	A single pool for all metered use coupled with the use of surrender arrangements to account for the estimated affect of significant un-metered water-affecting activities on the quantity of water in the consumptive pool.		

Note: In preparing this analysis it has been assumed that there is no advantage in creating pools of differing security. Some licensees, however, may be of the view that urban and industrial users should be given a more reliable or more secure water access entitlement than irrigators and/or plantation owners.

4.4. Issue Four – Should shares be unbundled from use approvals?

In the last few years, Queensland and New South Wales have amended policy to enable them to unbundle or separate definition of water access entitlements from land and water use approvals.⁶ More recently, the Victorian and Western Australian governments have announced that they intend to do the same.⁷

If the government decided to facilitate separation of water access entitlements from water and land use approvals, one way of doing this would be to use

- Water (holding) licences to define the nature of each water access entitlement; and
- Water (taking) licences to regulate water use and irrigation practice.

In effect, one licence is replaced with two. In a separated system one licence is used to specify the nature of the water access entitlement to receive periodic allocations and the other the conditions under which any issued allocation can be used. Under such a regime, a water (taking) licence authorising extraction and use of 500 ML for flood irrigation, would be replaced with

- a water (holding) licence for 500 ML that would define the nature of the holder's share in the consumptive pool; and
- a water (taking) licence authorising flood irrigation of up to 500 ML per annum provided that they held enough water in their water allocation account.

Separation or unbundling of water (taking) licences is a concept that has not been discussed widely in South Australia. Amongst other things, separation increases investment and development options. Irrigators, for example, can place their water access entitlement in a self-managed superannuation trust. The approach also means that trading can occur without the need to obtain an environmental approval. Separation also enables the development of separate markets to assist with the management of salinity.

The NWI, while it is not clear on the issue, can be interpreted as recommending that State separate water access entitlements from use approvals. In particular, in Schedule F it says that

“The Parties agree that water registers will be established in each State and Territory and will:

...

6. Enable resource managers to monitor and accumulate trade and water use volumes accrued under water access entitlements in a separate water accounting system.”

⁶ A typical use approval indicates either the maximum area or maximum volume of water that may be applied to an area of land in year.

⁷ For a detailed discussion of the advantages of separation or unbundling see Young and McColl (2002, 2004).

Under a separated or unbundled system it is usual to set up water accounts to allow people to identify how much water they have and have not used at any point in time. Temporary trades are carried out by debiting one water account and crediting another.

In a more formal manner, Table 6 considers the question of whether or not shares should be recorded on a register that does not record use and other associated conditions, recorded on unbundled licences or defined as shares in a manner similar to that used on the Eyre Peninsula.

Table 6 Evaluation of choices associated with share definition

Issue Four – How should shares be recorded?			
	A statement in each Water allocation plan defining the nature of each water access entitlement as a share (As in the Eyre Peninsula)	Amend existing holding and taking licences to express the nature of each water access entitlement as a share of a defined pool of water	Unbundle and create a separate share register coupled with the introduction of use approvals
Implications for irrigation industry	Registration of mortgages difficult Less investment security	Environmental issues still managed with allocation issues	Lower trading costs Increased investment options
Implications for community			Alignment with policy changes in adjoining Victorian aquifers and other parts of Australia
Implications for Board and DWLBC		Significant change to current policy	Significant change to current policy
Criteria that most support the option	Policy Consistency		Efficient Investment Transaction Costs Administrative Costs Salinity Control,
Criteria that do not assist in choosing among options	Sustainable Yield Distributive Equity		
Preferred option before consideration of consequential effects	Unbundle and establish a separate share register coupled with the introduction of a water accounting system to allow people to identify how much water they have and have not used		

4.5. Issue Five – What type of shares should be issued?

It is assumed from the Terms of Reference for this report that the Board wishes to make it clear to water users that the nature of a water access entitlement is a share. There are two views on the need for defining water access entitlements as shares. The first view is that it is not necessary as legislation always allows the Minister to reduce allocations on a pro-rata basis. The alternative view is that there are considerable advantages in defining the nature of an water access entitlement in a manner that makes the nature of that water access entitlement as clear as possible. When the former approach is taken and the Ministers powers are relied upon, the experience is that irrigators come to expect their full allocation and are surprised when it is not given to them. Moreover in other parts of the world, some Ministers are reluctant to take action to stop aquifer depletion in a timely manner.

If it is decided to define each licensee's water access entitlement on their licence rather than in water allocation plans, then it is possible to do this in one of two ways

- Proportional shares – Define the proportion that each licensee holds on the licence
- Unit shares – Indicate the number of shares that each licensee holds.

If proportional shares are issued then when ever one wants to

- convert a commercial forest into a dryland pasture and issue shares equivalent to the increase in recharge; or
- changing a management area boundary

then each and every licence has to be amended. If, however, a unit share structure is used to define the proportion of each licensee's share in a pool then only those shares affected by the transaction need to be amended. For example, if it was decided to shift the boundary of the hundred of Grey then only those shares that are moved to a new management area would need to be amended. No amendment of any shares that remain in the same area would be needed.

Similarly, if a forest was cleared and shares for the estimated size of the increased recharge issued, under a unit share system, additional shares are easily issued. Under a proportional share system, however, each and every licence needs to be amended. As a result, the costs of running a proportional share system are much higher than running a unit share system and this is why companies throughout the world define the size of each person's shareholding by issuing units rather defining the proportional share that they hold.

If a decision is made to define shares as proportional shares and include a statement to this effect on each licence, then at reasonable cost, it is not possible to use the surrender option recommended above.

Table 7 Evaluation of associated with defining mechanism to be used in defining the proportion of a pool that each licensee holds

Issue Five – What type of shares should be issued?		
	Unit shares	Proportional shares
Implications for irrigation industry		Less opportunity to change boundaries and land use when all agree that the change should be made
Implications for community		
Implications for Board and DWLBC		Very difficult and expensive to make minor modifications to boundaries and to manage changes in non-metered use
Criteria that most support the option	Transaction Costs Administrative Costs	Policy Consistency
Criteria that do not assist in choosing between options	Sustainable Yield Efficient Investment Distributive Equity Salinity Control	
Preferred option before consideration of consequential effects	Issue unit shares	

A related issue is the question of what the value of each share should be. Policy consistency considerations suggest that allocation procedures should closely track those used to define an interest in a company. If this approach is taken then the smallest number of shares that should ever be issued is “one.” It should not be possible to own, say, half a share.

Stock exchange experience also suggests a preference for shares that are valued at less than \$50 per share. Given this observation, then one pragmatic approach would be to issue 100 shares per megalitre or 1000 shares per megalitre.

A 1000 shares per megalitre is recommended simply because this is equivalent to 1 share per kilolitre and, hence, is a relatively easy concept to explain to water users.

4.6. Issue Six – What should happen to any under-allocation?

By convention, a share is a share of a defined pool of water and through this mechanism assigns to the upside and downside risk of changes in the size of the pool to each shareholder. If the pool gets larger, all shareholders receive a larger allocation. If the pool gets smaller, each shareholder receives a smaller allocation. This means that during the process of allocating shares a decision on any under or over allocation must be made.

Several years ago it was decided to distribute most of the unallocated water in each management area among landholders in proportion to the area of land they held. Moreover, in some areas a Ministerial Reserve was established.

During the roll-out process, however, some landholders decided not to take up the water (holding) licence offered to them. Reasons for not taking up these licences were many but included the fact that those that took them up would be required to pay a catchment levy. As a result of this process, some management areas contain water that has not been formally allocated either to the Minister or to a licence holder.

It is also possible that when all the volumetric allocation process is completed, or as a result of revisions to the Permissible Annual Volume (PAV), some water will remain unallocated. Under the NRM Act, all unallocated water is held by the Crown and within the constraints set by the relevant water allocation plan can be allocated to any licensee. The question that needs to be asked is whether or not this water should be

- Allocated to all existing shareholders on a pro-rata basis;
- Allocated to the Minister in the form of a Ministerial reserve or some similar arrangement that formally defines the size of this interest;⁸ or
- Made available to people interested in holding a water access entitlement.

Before considering the most appropriate answer to this question the reader may like to consider what happens in situations where a management area is over-allocated and the fact that this situation exists in some parts of the South East Catchment.

⁸ If a decision is made to place the unallocated water in a Ministerial Reserve then the Minister would subsequently be able to use or distribute this in any way permitted by the NRM Act. Under section 165 of the NRM Act a regulation setting out the requirements for allocation of water from the Reserve needs to be made and passed through parliament. To date, no such Regulation has been made and no water from the Minister's Reserve has been allocated (although some has been set aside for offset against plantation expansion).

Table 8 Evaluation of choices associated with unallocated water

Issue Six – What should happen to any under-allocation?		
	Pro-rata among existing shareholders	Ministerial Reserve
Implications for irrigation industry		
Implications for community	Profit and opportunity remains in the region but distributed among existing licensees	If water is auctioned the money received returns to consolidated revenue
Implications for Board and DWLBC		
Criteria that most support the option	Administrative Costs	Policy Consistency
Criteria that do not assist in choosing between options	Efficient Investment Sustainable Yield Transaction Costs Distributive Equity Salinity Control	
Preferred option before consideration of consequential effects	Ministerial Reserve. The Board may, however, hold the view that a pure market model should be used. If this is the case, then any unused water should be distributed amongst all shareholders – including the Minister – on a pro-rata basis	

4.7. Issue Seven – How should any over-allocation be handled?

In the same way that it is necessary to consider how any under allocation should be dealt with it is necessary to consider how any over-allocation should be dealt with. Normally, the process used during a share allocation process is to allocate shares in proportion to each licensee's existing volumetric allocation and then make a separate decision about how to manage over-allocation. Methods used to reduce over-allocations include

- An immediate pro-rata cut in allocations so that use is reduced to sustainable yield as part of the share allocation process
- Provision of bridging allocations either to all or a selected sub-set by allowing possible draw-down of the aquifer⁹
- Introducing opportunities to borrow and carry forward allocations so that individuals can distribute impacts between years.

While consideration of this issue is strictly outside the terms of reference of this project and is really an issue that should be resolved during the volumetric allocation process, the following observations are offered.

Under the pro-rata reduction option irrigators would be forced to secure additional allocations from people who hold but are not using allocations. At present in the South East, all over-allocated management areas have sufficient unused allocations in them to make it possible to use trading as a way to attain access to the resource they have been using. Those forced to buy allocations that they originally had access to may object to such a process. The issue is one of wealth and income redistribution.

Similarly, and depending on the extent of the problem, a decision to provide bridging allocations in excess of sustainable yield may only cause licensees' to postpone the day when they will need to buy allocations from other water access entitlement holders.

Finally, a decision to proceed either to a volumetric or share allocation system changes the total nature of the water access entitlement as during the process the water access entitlement is changed to one where irrigators are forced to manage the impacts of drought and, also, variation in the volume of water available for use on a year by year basis. In contrast, under the area-based allocation system irrigators are free to take as much water as they need without considering seasonal conditions.

In a drought, for example, under an area-based allocation system an irrigator is free to take much more water. In practice, they have a system that allows them to carry forward and/or borrow as much water as they like from season to season.

Once a volumetric or share system is introduced rules about the degree of carry-forward and borrowing that will be permitted needs to be resolved.

⁹ These could be the same as current bridging volumes are defined.

Table 9 Evaluation of choices for resolving over-allocation problems in any management area where the sum of all volumetric water access entitlements is greater than the PAV

Issue Seven – How should any over-allocation be handled?			
	Immediate pro-rata cut	Bridging allocation	Increase borrowing and carry-forward provisions
Implications for irrigation industry	Forces individuals that are using their full allocation to start buying unused allocations from other water access entitlement holders		Necessary for efficient allocation of water among seasons
Implications for community		May be seen by those using their full allocation as more equitable	
Implications for Board and DWLBC			Carry forward and borrowing needs to be managed. Borrowing in excess of that permitted needs to be penalised.
Criteria that most support the option	Sustainable Yield		Efficient Investment
Criteria that do not assist in choosing among options	Transaction Costs Administrative Costs Distributive Equity Salinity Control, Policy Consistency		
Preferred option before consideration of consequential effects	Immediate pro-rata cut in PAV to align with sustainable yield coupled with the introduction of appropriate carry-forward and borrowing rules.		

4.8. Issue Eight – How often and how should allocations per share be reviewed and announced?

While just as applicable to a volumetric allocation system as a share system, the last issue to be resolved is the question of how and in what manner, the Board should decide to revise a share allocation system.

Figure 1 summarises changes in the amount of water available for distribution to water users in Perth over the last century. The key point is that in retrospect it is clear that the mean sustainable yield for this system suddenly dropped by 51% in one year and has not recovered. Experts believe this sudden change is due primarily to two factors – a shift in seasonal rainfall patterns and the effect of increased forestry in the region. Whatever the reasons for this change, it is suggested that the Board should consider carefully what the most appropriate decision to make is if the same set of conditions that occurred in Western Australia during the mid-1970s occurred in the South East.

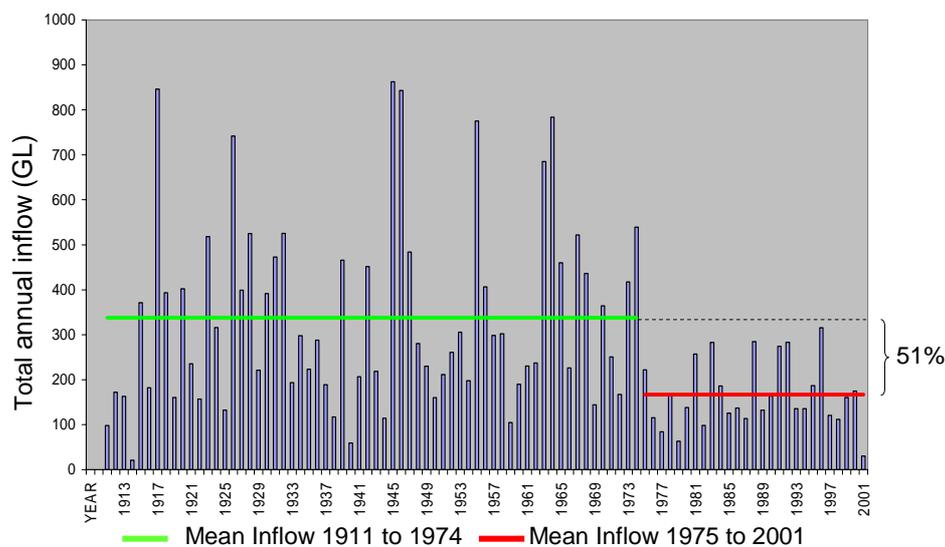


Figure 3 Changes in the volume of water available for consumptive use in Perth’s main water supply during the 20th Century

When considering the most appropriate action to take careful consideration needs to be given to carry-forward and borrowing provisions. If no carry-forward or borrowing is contemplated, then arguably the Board should consider managing allocations so as to make more water available in dry years and less in wet years. Mechanisms could be designed to do this, but it is likely that more efficient investment and lower administrative costs would be achieved by all if the Board maintains a policy of setting allocations at their best estimate of the long run moving average of sustainable yield and irrigators are left to manage annual fluctuations using a combination of carry forward and borrowing policies coupled with the purchase of allocations from other irrigators as and when necessary. In effect, the board would be responsible for identifying the nature of longer run variations and trends.

An issue of particular concern to the board is the question of how often it should consider revising the allocation per share it makes each year. At present the Board is required to conduct a review every 5 years. While a major review of the entire system is necessary, there is a strong case for the Board to consider the need or case for changing the allocation made each year so that the risk of a long term decline is signalled as early as possible.

Assuming that reasonable carry-forward and borrowing arrangements will be put in place as part of the volumetric conversion process, options include

- Only reviewing and hence only changing the allocation per share every 5 years;
- Reviewing every 5 years but reserving the right to adjust at an earlier point in time if the Board has reason to suspect that a climatic shift may be occurring; and
- Making an annual announcement every year and underpinning this with a thorough review of allocation policy every 5 years and adopting a moving average approach to smooth out the effects of change.

Table 10 Evaluation of options associated with the frequency of allocation decisions

Issue Eight – How often and how should allocations per share be announced?			
	Every 5 years	5 years but an option to make an earlier variation	Five year moving average of annual announcements underpinned by a thorough 5 year review
Implications for irrigation industry	Sudden dramatic changes should be expected	Dramatic changes would be phased in	Continuous signalling of the direction of change
Implications for community			
Implications for Board and DWLBC		Obligation to watch for early signals of a climate change	Rolling process that encourages all to accept that both climate and weather change continuously
Criterion that is most consistent with each option	Administrative Costs		Efficient Investment Sustainable Yield Transaction Costs
Criteria that do not assist in choosing among options	Distributive Equity Salinity Control, Policy Consistency		
Preferred option before consideration of consequential effects	Announce allocations annually on the best available assessment of the direction of long term sustainable yield, convert these announcements into a 5 year moving average and coupled with a 5 year review of aquifer hydrology.		

5. Options for consideration by the Board

5.1. Preferred model

Having considered the options for each of the issues raised in this report and evaluated them according to the criteria established at the start of this report, the preferred way to convert all water access entitlements in each management area into shares is judged to be a system that

1. Uses unit shares to define the proportion of the metered pool held by each licensee. Following completion of the Volumetric Conversion Project units should be issued at the rate of 1,000 units per megalitre or 1 unit per kilolitre of water access entitlement allocated as part of this project.
2. Defines each share or water access entitlement in “nett” terms.
3. Uses a surrender approach with a re-issue guarantee to off-set the effects of any significant non-metered water-affecting activities, like forestry, on metered water users. Any permit for a non-metered water-affecting activity should contain a guarantee that if the significant affect ceases and the permit for it surrendered, shares equivalent to the expected increase in the volume of water in the consumptive pool would be issued to the legal entity surrendering the permit. Consideration should be given to the merits of using an exchange rate premium to off-set the nature of the climate change insurance implied by this approach.
4. Allows the transfer of a re-issue guarantee from one permit to another permit without having to incur the administrative and transaction costs associated with re-issuing and then re-surrendering shares when the intent is simply to transfer this guarantee from one permit to another.
5. Defines each share holding on a separate share register.
6. Uses an independent use licence or similar use approval mechanism to manage salinity, aquifer draw down and other local effects on the environment, the aquifer and the interests of nearby land holders.
7. Establishes a separate set of water accounts for each water access entitlement holder. Whenever an allocation per share is announced, this amount should be recorded on the account and made available for use or transfer to another account holder from the day the allocation is credited to the account.
8. Establishes a single shared water pool for all metered water uses and makes no distinction between, for example, a water access entitlement held by rural and urban water users. Among other things, this will require holding and taking allocations to be dealt with in a consistent manner.

9. Allows individual water users to manage seasonal fluctuations in demand and climatic risk efficiently by introducing carry-forward and borrowing provisions to the accounting system.
10. Announces an estimate of sustainable yield annually and uses a 5-year rolling average of these announcements to signal trends in water availability coupled with a major 5 year review of the methods used to make annual estimates.
11. Following completion of the volumetric allocation project,
 - a) Allocates any unallocated water as shares to the Minister¹⁰; and
 - b) Uses carry-forward and borrowing arrangement to assist rapid alignment with the sustainable yield of a management area.

5.2. Relationship between the preferred model and existing legislative and administrative capacity

The terms of reference for this report require an assessment of necessary legislative changes and administrative capacity.

South Australia has committed to the NWI and, in response, the DWLBC is in the process of considering the nature of administrative and legislative changes necessary to achieve consistency with it.

5.2.1. Legislative considerations

While s150 of the NRM Act says that the Minister may fix a water (taking) allocation ... *in any other manner*

and the Act's interpretation section states that

“water allocation—

- (a) in respect of a water licence means the water (taking) allocation or the water (holding) allocation endorsed on the licence;
- (b) in respect of water taken pursuant to an authorisation under section 128 means **the maximum quantity of water** that can be taken and used pursuant to the authorisation.”

Prospects for encouraging investment and achieving consistency with the economic efficiency criterion would be greater if the Act was amended to make it clear that water access entitlements may be issued as shares. While a court may find that proportional shares are a valid way of defining a **“maximum quantity of water”** the probability of it finding that a unit share is a valid way of defining a maximum quantity of water is less certain. Rather than taking the risk of a challenge it would seem prudent to recommend amendment of the Act to make it clear that water access

¹⁰ The Board may, however, hold the view that a pure market model should be used. If this is the case, then any unused water should be distributed amongst all shareholders – including the Minister – on a pro-rata basis.

entitlements may be defined as unit shares. It is recommended that the Minister be advised that the NRM Act should be amended to allow the use of unit shares.

Separation of water access entitlements from use licences or approvals would require substantial amendment of the NRM Act 2004 and has ramifications that extend well beyond the South East. The South East could offer to trial the system.

5.2.2. Resource implications of the preferred model

With the exception of separation, the long run costs of implementing a share rather than a volumetric allocation system should be similar. Early communication of the concept will be critical.

In the long run, water allocation plan review costs should be lower under a share model.

Decisions about the frequency of review of the allocation per share are a matter for judgement. The Board could simply decide to adjust allocations in proportion to annual rainfall at the nearest official rain station or, alternatively, commission consultants to prepare complex models.

The State Government will however incur costs associated with the modification of its water access entitlement register and its accounting software. It will also incur costs associated with the amendment of the Natural Resource Management Act. As these modifications are required as part of the National Water Initiative, however, it would be wrong to argue that the full cost of implementing these changes should be attributed to the South East.

5.2.3. Implementation pathway

The terms of reference require identification and description of the steps involved in moving the South East of South Australia to allocations expressed as shares.

The first step in this process is to complete the volumetric allocation project. It is suggested, however, that this project be modified to enable differentiation between water that is evaporated, water that is transferred to another system and water that is returned to the aquifer from which it is extracted.

The second step is to recommend to the Minister that the NRM Act be amended to allow conversion of irrigation equivalents and volumetric allocations into unit shares, to allow surrender policies to be put in place for significant water-affecting activities and to allow separate use licence to be issued.

The third step is to amend all water allocation plans so that shares may be issued and individual water accounts established.

The second to last step is to amend the DWLBC water register "WILMA" so that it can record unit shares and use licences and establish an accounting system that records that amount of water at any time that is available for use or transfer to another entity.

The last step is to issue shares and use approvals and set up the accounting system.

6. References

NSW (2004) NSW Water Reforms: A secure and sustainable future Ministerial Statement. <http://www.naturalresources.nsw.gov.au/water/pdf/wms02.pdf>

Young, M. and Hatton MacDonald, D. 2000, *Who Dares Wins: Opportunities to improve water trading in the South East of South Australia*, final report to the South East Catchment Water Management Board, CSIRO Policy and Economic Research Unit.

Intergovernmental Agreement on a National Water Initiative between the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory.

Annex One: Extracts from the Intergovernmental Agreement on a National Water Initiative

PREAMBLE

1. Water may be viewed as part of Australia's natural capital, serving a number of important productive, environmental and social objectives. Australia's water resources are highly variable, reflecting the range of climatic conditions and terrain nationally. In addition, the level of development in Australia's water resources ranges from heavily regulated working rivers and groundwater resources, through to rivers and aquifers in almost pristine condition.

2. In Australia, water is vested in governments that allow other parties to access and use water for a variety of purposes – whether irrigation, industrial use, mining, servicing rural and urban communities, or for amenity values. Decisions about water management involve balancing sets of economic, environmental and other interests. The framework within which water is allocated attaches both rights and responsibilities to water users – a right to a **share** of the water made available for extraction at any particular time, and a responsibility to use this water in accordance with usage conditions set by government. Likewise, governments have a responsibility to ensure that water is allocated and used to achieve socially and economically beneficial outcomes in a manner that is environmentally sustainable.

....

Water access entitlements

28. The *consumptive use* of water will require a water access entitlement, separate from land, to be described as a perpetual or open-ended **share** of the *consumptive pool* of a specified water resource, as determined by the relevant *water plan* (paragraphs 36 to 40 refer), subject to the provisions at paragraph 33.

....

Water Planning

36. Recognising that settling the trade-offs between competing outcomes for water systems will involve judgements informed by best available science, socio-economic analysis and community input, statutory *water plans* will be prepared for surface water and groundwater management units in which access entitlements are issued (subject to paragraph 38). Water planning is an important mechanism to assist governments and the community to determine water management and allocation decisions to meet productive, environmental and social objectives.

37. Broadly, water planning by States and Territories will provide for:

- i) secure ecological outcomes by describing the *environmental and other public benefit outcomes* for water systems and defining the appropriate water management arrangements to achieve those outcomes; and

- ii) resource security outcomes by determining the **shares** in the *consumptive pool* and the rules to allocate water during the life of the plan.

....

Assigning Risks for Changes in Allocation

46. The following risk assignment framework is intended to apply to any future reductions in the availability of water for consumptive use, that are additional to those identified for the purpose of addressing known *overallocation* and/or *overuse* in accordance with pathways agreed under the provisions in paragraphs 41 to 45 above.

47. The Parties agree that an effective risk assignment framework occurs in the context that: the new share-based water access entitlements framework has been established; water plans have been transparently developed to determine water allocation for the access entitlements; regular reporting of progress with implementing plans is occurring; and a pathway for dealing with known *overallocation* and/or *overuse* has been agreed.

48. *Water access entitlement* holders are to bear the risks of any reduction or less reliable water allocation, under their *water access entitlements*, arising from reductions to the consumptive pool as a result of:

- i) seasonal or long-term changes in climate; and
- ii) periodic natural events such as bushfires and drought.

49. The risks of any reduction or less reliable water allocation under a *water access entitlement*, arising as a result of bona fide improvements in the knowledge of water systems' capacity to sustain particular extraction levels are to be borne by users up to 2014. Risks arising under comprehensive *water plans* commencing or renewed after 2014 are to be shared over each ten year period in the following way:

- i) *water access entitlement* holders to bear the first 3% reduction in water allocation under a *water access entitlement*,
- ii) State/Territory governments and the Commonwealth Government to share one-third and two-thirds respectively reductions in water allocation under *water access entitlements* of between 3% and 6%; and
- iii) State/Territory and Commonwealth governments to equally share reductions in water allocation under *water access entitlements* greater than 6%.

50. Governments are to bear the risks of any reduction or less reliable water allocation that is not previously provided for, arising from changes in government policy (for example, new environmental objectives). In such cases, governments may recover this water in accordance with the principles for assessing the most efficient and cost effective measures for water recovery (paragraph 79 (ii) (a) refers).

51. Alternatively, the Parties agree that where affected parties, including *water access entitlement* holders, environmental stakeholders and the relevant government agree, on a voluntary basis, to a different risk sharing formula to that proposed in paragraphs 48 - 50 above, that this will be an acceptable approach.

....

Interception

55. The Parties recognise that a number of land use change activities have potential to intercept significant volumes of surface and/or groundwater now and in the future. Examples of such activities that are of concern, many of which are currently undertaken without a water access entitlement, include:

- i) farm dams and bores;
- ii) intercepting and storing of overland flows; and
- iii) large-scale plantation forestry.

56. The Parties also recognise that if these activities are not subject to some form of planning and regulation, they present a risk to the future integrity of water access entitlements and the achievement of environmental objectives for water systems. The intention is therefore to assess the significance of such activities on catchments and aquifers, based on an understanding of the total water cycle, the economic and environmental costs and benefits of the activities of concern, and to apply appropriate planning, management and/or regulatory measures where necessary to protect the integrity of the water access entitlements system and the achievement of environmental objectives.

57. Accordingly, the Parties agree to implement the following measures in relation to water interception on a priority basis in accordance with the timetable contained in their implementation plans, and no later than 2011:

- i) in water systems that are fully allocated, *overallocated*, or approaching full allocation:-
 - a) interception activities that are assessed as being significant should be recorded (for example, through a licensing system);
 - b) any proposals for additional interception activities above an agreed threshold size, will require a *water access entitlement*.
 - the threshold size will be determined for the entire water system covered by a *water plan*, having regard to regional circumstances and taking account of both the positive and negative impacts of water interception on regional (including cross-border) natural resource management outcomes (for example, the control of rising water tables by plantations); and

- the threshold may not apply to activities for restricted purposes, such as contaminated water from intensive livestock operations;
 - a robust compliance monitoring regime will be implemented; and
- ii) in water systems that are not yet fully allocated, or approaching full allocation:
- a) significant interception activities should be identified and estimates made of the amount of water likely to be intercepted by those activities over the life of the relevant water plan;
 - b) an appropriate threshold level will be calculated of water interception by the significant interception activities that is allowable without a *water access entitlement* across the entire water system covered by the plan:
 - this threshold level should be determined as per paragraph 0(0) above; and
 - c) progress of the catchment or aquifer towards either full allocation or the threshold level of interception should be regularly monitored and publicly reported:
 - once the threshold level of interception is reached, or the system is approaching full allocation, all additional proposals for significant interception activities will require a *water access entitlement* unless for activities for restricted purposes, such as contaminated water from intensive livestock operations.

....

SCHEDULE B(ii): NATIONAL DEFINITIONS

....

consumptive pool – the amount of water resource that can be made available for *consumptive use* in a given water system under the rules of the relevant water plan.

consumptive use – use of water for private benefit consumptive purposes including irrigation, industry, urban and stock and domestic use.

....

water access entitlement – a perpetual or ongoing access entitlement to exclusive access to a **share** of water from a specified consumptive pool as defined in the relevant water plan.

water allocation – the specific volume of water allocated to water access entitlements in a given season, defined according to rules established in the relevant water plan.

....

SCHEDULE F: GUIDELINES FOR WATER REGISTRIES

The Parties agree that water registers will be established in each State and Territory and will:

...

6. enable resource managers to monitor and accumulate trade and water use volumes accrued under water access entitlements in a separate water accounting system.