Science guidelines to support water allocation plans – ecology, hydrology and hydrogeology

Part 1: Introduction and context

Department of Environment, Water and Natural Resources

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Government of South Australia
Department of Environment,
Water and Natural Resources

Department of Environment, Water and Natural Resources

GPO Box 1047, Adelaide SA 5001

Telephone National (08) 8463 6946

International +61 8 8463 6946

Fax National (08) 8463 6999

International +61 8 8463 6999

Website www.environment.sa.gov.au

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1 Context and purpose

1.1 Aim

The aim of the Science Guidelines is to provide guidelines regarding scientific investigations required for the water allocation planning process in South Australia. The intended audience of these guidelines includes all contributors to the development of water allocation plans on behalf of Natural Resources Management (NRM) Boards.

1.2 Assessments required when preparing a water allocation plan

Section 76 of the South Australian *Natural Resources Management Act 2004* (the *NRM Act 2004*) describes the types of assessments which must be undertaken, with the following typically requiring scientific investigations and/or research:

- **Environmental Water Requirements and Provisions**:
  - An assessment of the quantity and quality of water needed by the ecosystems that depend on the water resource and the times at which, or the periods during which, those ecosystems will need that water [s76(4)(a)(i)]**.**
  - An assessment of the capacity of the water resource to meet environmental water requirements [s76(4)(aab)(i)].
  - Information about the water that is to be set aside for the environment including, insofar as is reasonably practicable, information about the quantity and quality, the time when that water is expected to be made available, and the type and extent of the ecosystems to which it is to be provided [s76(4)(aab)(ii)].
  - A statement of the environmental outcomes expected to be delivered on account of the provision of environmental water under the plan [s76(4)(aab)(iii)].
- **Potential Impacts to other water resources: An assessment as to whether the taking or use of water** from the resource will have a detrimental effect on the quantity or quality of water that is available from any other water resource [s76(4)(a)(ii)].
- **Determine the consumptive pool(s):** Determine, or provide a mechanism for determining, from time to time, a consumptive pool, or consumptive pools, for the water resource [s76(4)(ab)].
- **Capacity of the resource to meet demands:** Assess the capacity of the resource to meet the demands for water on a continuing basis and provide for regular monitoring of the capacity of the resource to meet those demands [s76(4)(d)].

Figure 1 depicts how the Science Guidelines are structured to address each of these required assessments under the *NRM Act 2004*.

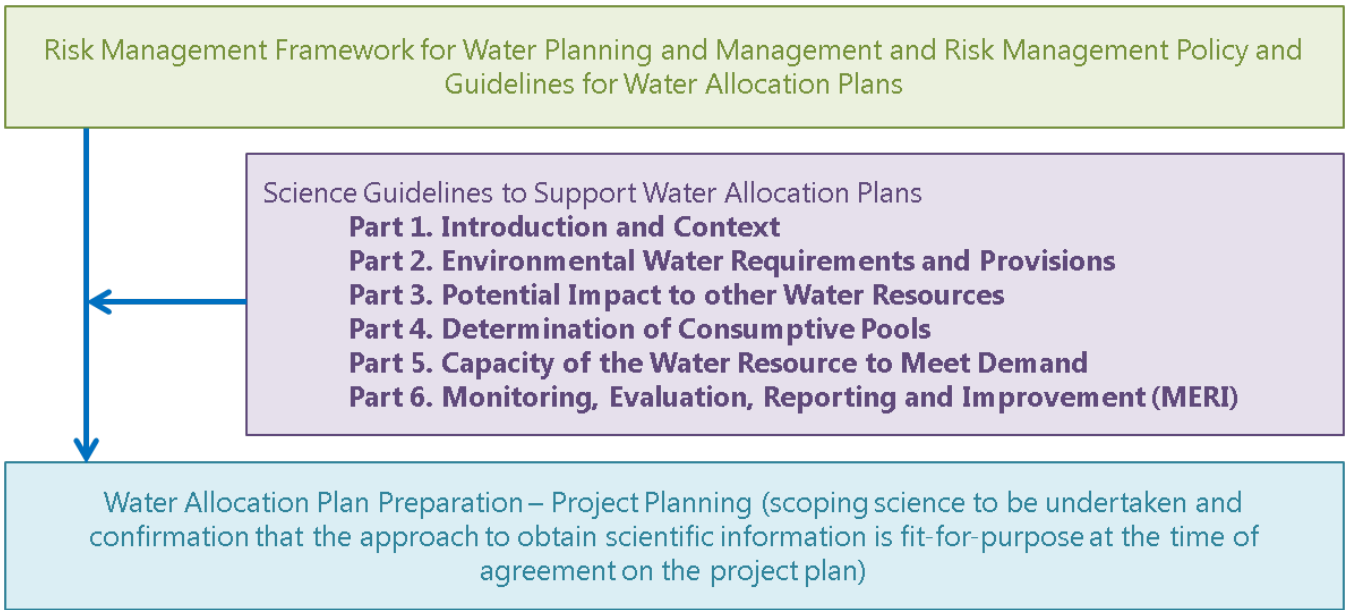

Figure 1. Context of how the Science Guidelines can contribute to the water allocation planning process

1.3 Science and Risk based water allocation plans

The Department of Environment, Water and Natural Resources (DEWNR) has endorsed a risk-based approach to the development of WAPs through publication of the Risk Management Framework for Water Planning and Management (2012a) and the Risk Management Policy and Guidelines for Water Allocation Plans (2012b). Together these documents outline key definitions, concepts and processes to support risk based water resource planning and management in South Australia. Figure 1 depicts how the Science Guidelines can be used in conjunction with these documents for the preparation of a water allocation plan (WAP) (Figure 1).

The Risk Management Framework for Water Planning and Management is a high level document describing general context and processes for risk management for all water resources and planning scales including for prescribed and non-prescribed areas. It endorses and builds on AS/NZS ISO 31000:2009 risk management guidelines. The Risk Management Policy and Guidelines for Water Allocation Plans (DEWNR 2012b) builds on this framework for prescribed areas and describes how the Water Allocation Plan (WAP) preparation process is informed by risk assessments. It also outlines how risk assessments address requirements of the NRM Act 2004.

These two risk frameworks aim to facilitate water resource policy decisions that are rigorous and transparent. They also provide a mechanism to direct investigations towards water resource questions where uncertainty most affects decisions. It should be noted that the risk frameworks do not alter the scope of investigations required to inform a WAP – they promote a generic and well established process and terminology for the way science may be engaged and communicated during the WAP development process.

1.3.1 Categories of risk to be assessed

The Risk Management Framework for Water Planning and Management establishes three broad categories of risk to be addressed by water planning and management activities, including:

- Risks to the resource (e.g. the potential for adverse changes impacting water quantity, water quality or the health of water dependent ecosystems)
- Risks to community values (e.g. the potential for changes in the condition of the water resource to cause impacts on economic development, water for human consumption, community amenity, and recreational, spiritual or cultural use)

- Risks to the effective operation of a plan (e.g. a Water Allocation Plan in accordance with the *NRM Act 2004*). Examples include the potential for outcomes of a plan not being achieved due to difficulties in implementing policies, legal challenges, lack of public support, non-compliance and extreme events.

It can be expected that science will play a key role in providing the tools and evidence to assess risks to water resources and water dependent ecosystems. Risk assessments will therefore draw on the types of investigations outlined in Figure 1. In fulfilling this role, science also contributes to assessment of risks to community values and risks to the effective operation of the plan.

1.3.2 Risk management process

In accordance with AS/NZS ISO 31000:2009 risk management guidelines, the framework defines risk as "the effect of uncertainty on objectives". The risk management process advocated by the framework consists of the following five steps informed by appropriate communication, consultation and monitoring and evaluation:

1. Setting context, which involves articulating objectives, setting the scope of risk management, identifying stakeholders, identifying parameters that affect risk and determination of risk criteria

2. Risk identification, which is concerned with finding, recognising and describing risks

3. Risk analysis, which involves comprehending the nature of risk and determination of the risk level expressed as a combination of likelihood and consequences

4. Risk evaluation, which involves comparison of the risk level with risk criteria to determine the tolerability or acceptability of risk, and

5. Risk treatment, whereby actions to modify unacceptable risk level are designed and implemented.

In the context of water allocation planning, science is a key stakeholder contributing to all steps of this risk management process. It can be anticipated that science is critical for the following risk management tasks:

- Description of the broad parameters affecting water resource risks and identification of key knowledge and sources of data (context setting)
- Identification of water resource assets, water dependent ecosystems and threatening processes that can impact the value of these assets (risk identification)
- Characterisation of how water resources and water dependent ecosystems respond to various hazards leading to determination of the likelihood and consequence of events (risk analysis)
- Design of policy options to modify the likelihood and/or consequences of water resource risks (risk treatment).

1.4 Contribution of Science to WAP development, implementation and review phases

Scientific investigations are important for all phases of WAP planning, implementation and review. **Figure 2** shows the relationships between the planning, implementation and review phases of a WAP, the risk assessments required in accordance with DEWNR's risk management framework for water planning and management and overall monitoring, evaluation, reporting and improvement (MERI). It also shows the types of scientific investigations that may be required at each of these phases. These Science Guidelines focus primarily on the investigations required during the planning phase.

In accordance with the Risk Management Policy and Guidelines for Water Allocation Plans, scientific investigations inform multiple points of the WAP preparation process right up to the point at which WAP is finalised. However, the majority of the scientific investigations are likely to be part of an iterative process contributing to assessment of the risks to the resource.

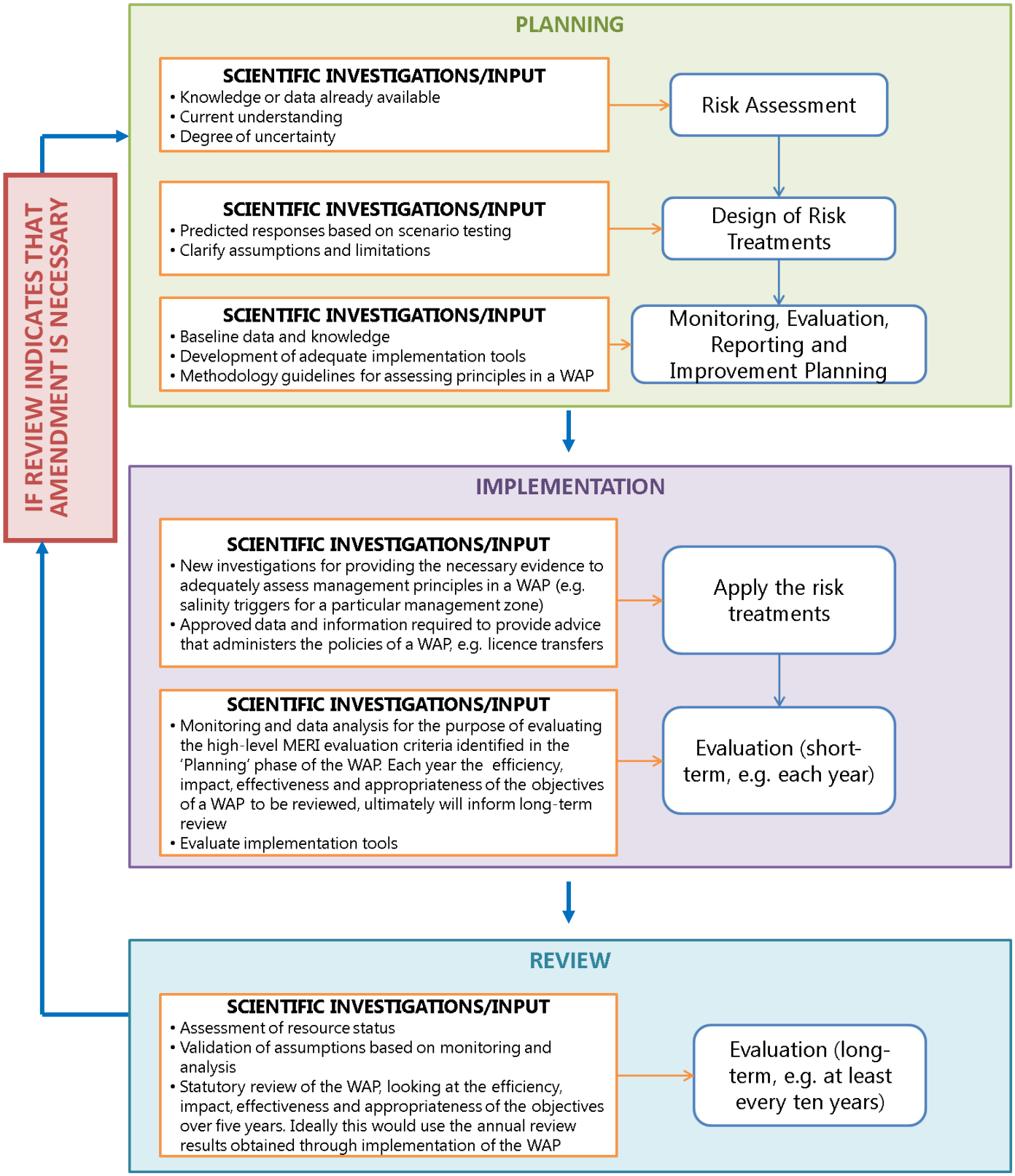

Figure 2. Relationship between WAP planning, implementation, review and the revision/amendment of a WAP in regard to potential scientific investigations and input

Text- DEWNR aims to do the following on behalf of the Minister for Water and the River Murray during the planning phase of the WAP process:

- ensure that the science input to the WAP is fit-for-purpose1
- ensure that the science is represented appropriately in the WAP
- ensure that the WAP policies can be implemented.

Results of scientific investigations can be taken into consideration when preparing the policy content of a WAP (i.e. the risk treatments) and can be the basis for creation of WAP implementation tools (e.g. results of scientific investigations can be used in the development of approved spatial datasets that are needed to implement principles in the WAP), as well as the assessment of risk to the resource.

1.5 Scope

The purpose of undertaking scientific investigations in the development of a WAP is to obtain information to support management (or policy) decisions. Scientific questions and methods that fall into the categories of Aquatic Ecology, Hydrology and Hydrogeology, as well as that which is necessary for planning for MERI, which can be used to formulate the policy of WAPs, are the key focus and scope of the Science Guidelines. Examination of the social and economic factors (i.e. social sciences) that influence policy decisions also need to be undertaken by NRM Boards, however this is outside the scope of the Science Guidelines. The guidelines focus on the science required for the planning elements of the WAP process (shown in green on **Figure 2**).

1.6 Limitations and assumptions

New scientific methods are continually being developed and the use of new and improved techniques is encouraged. However, if a method that is not included in the Science Guidelines is being considered, this should be discussed with the appropriate experts within DEWNR to explore the validity of the method and whether it is appropriate for the intended purpose.

The content of the Science Guidelines is intended to be instructive and not prescriptive. It is not the intention of the Science Guidelines to dictate the scientific methods that 'must' be used. This guide is not intended to stipulate the policy positions that should be taken as a result of scientific investigations.

It is assumed that the Science Guidelines will be used in conjunction with the *Risk Management Framework for Water Planning and Management* (DEWNR, 2012a) and the accompanying *Risk Management Policy and Guidelines for Water Allocation Plans* (DEWNR, 2012b), which will ensure that the necessary legislative requirements and policies have been adequately taken into consideration during the context setting step of the risk assessment. This assumption is significant as legislation other than the *NRM Act 2004* and particular policies greatly influence the scientific questions that are asked when formulating policy decisions for a WAP. For example, the *Intergovernmental Agreement on the National Water Initiative 2004*, the *Water Act 2007*, the South Australian Strategic Plan, State NRM Plan and the relevant Regional NRM Plans are all applicable to WAPs being developed throughout South Australia.

[1] **Fit-for-purpose science**: The scientific results that are the best available for addressing the water allocation plan requirements of the *NRM Act 2004*, having taken into consideration all of the associated risks.

1.7 Objectives of the science guidelines

The objectives of the Science Guidelines are to:

- Highlight how scientific investigations support a risk-based planning process for WAPs (in accordance with DEWNR's Risk Management Framework for Water Planning and Management and Risk Management Policy and Guidelines for Water Allocation Plans)
- Provide a point of reference when preparing the project plan for a WAP
- Provide a point of reference for scoping fit-for-purpose scientific investigations to inform WAP development
- Provide guidance regarding the various scientific investigations that could be used to provide the scientific information to fulfil the legal requirements of a WAP. Where applicable, this includes an analysis of strengths and limitations and sensitivity of models or methods at different scales or with different assumptions (i.e. confidence).
- Suggest appropriate options for scientific investigations in regard to different types of water resources
- Communicate data required to support robust scientific results in relation to the suggested scientific investigations
- Provide links to relevant technical reports, policies and guidelines
- Provide the means for water planners to have more certainty regarding the selection of scientific methods.

1.8 Fit-for-purpose science

The Science Guidelines are intended to assist with the process of negotiating the number, type and specificity of investigations that should be undertaken, to ensure the science undertaken for a WAP is fit-for-purpose. This means that scientific work planned for a WAP is appropriate for the particular circumstances of a specific WAP, especially in regard to the identified risks to the resource.

Listed below are key considerations and potential sources of risk that apply to most WAPs when negotiating what fit-for-purpose science means for a particular WAP:

- How much scientific information already exists: papers, reports, data, models, etc.?
- What level of detail is needed?
- How many people rely on the resource?
- How much economic output relies on the resource?
- What are the values of, and risk to, the ecosystems that depend on the resource?
- What are the social implications associated with the WAP (including potential positive and negative community opinion about the WAP)?
- What is the likely level of community interest and what information is needed for communications?
- How vulnerable/reactive is the resource?
- Is the resource relied upon for public water supply?
- What is the size of the resource/prescribed water resource area?
- What are the hazards associated with not doing scientific investigations to a certain level (i.e. consideration of cost versus effort versus outcome)?
- Are there any external influences, like imported water, that impact on the quantity and quality of the resources of the prescribed area?

Experience has shown that the process of deciding what scientific investigations are needed is just as important as undertaking these investigations. There should be appropriate negotiation and agreement between the relevant NRM Board and DEWNR to his effect. Development of a project plan to undertake the necessary scientific investigations is an ideal means of achieving this.

1.9 Relationship between Policy and Science

In regard to the planning phase identified in **Figure 2**, it should be recognised that undertaking scientific investigations to provide information for consideration in the decision/policy making process is iterative. All parties involved in WAP preparation should have realistic expectations about what this means when embarking on scientific investigations.

Other parts of the Science Guidelines summarise some of the scientific investigation options for obtaining information to support the policy development process in WAPs, in relation to each of the relevant sections of the *NRM Act 2004*. For example, *Part 2. Environmental Water Requirements and Provisions*, outlines a process that can be followed with existing information or new information to determine environmental water requirements and provisions in accordance with the *NRM Act 2004*.

In regard to the 'implementation' phase of the WAP process (see the purple box on **Figure 2**), the implementation of some WAP policies may require ongoing investigations or monitoring during the life of the WAP, to ensure that transparent management decisions can be made. While this type of science is undertaken during the implementation of the WAP, there needs to be consideration of this during the 'planning' phase. This is because baseline scientific data may be needed, or the scientific knowledge required to implement the policy may not be available on an ongoing basis and as such the initial scientific investigations may not be as specific, so that the investigations and assessments can be repeated with the available resources (i.e. funding) during the life of the plan.

2 References

Department of Environment, Water and Natural Resources (DEWNR) (2012a) *Risk Management Framework for Water Allocation Plans*, DEWNR, Government of South Australia.

Department of Environment, Water and Natural Resources (DEWNR) (2012b) *Risk Management Policy and Guidelines for Water Allocation Plans*, DEWNR, Government of South Australia.