

**Senate Standing Committee on Environment and Communications  
Legislation Committee**

Answers to questions on notice

**Sustainability, Environment, Water, Population and Communities portfolio**

Supplementary Budget Estimates, October 2010

**Question on Notice 40**

**Appendix M**

**PROJECT/CONSULTANCY BRIEF**

**(1) Project Title**

Cost Benefit Analysis of the introduction of Sustainable Diversion Limits in the Murray-Darling Basin

**(2) Project Background**

The Murray-Darling Basin Authority (MDBA) is developing a proposed Basin Plan which will set environmentally sustainable limits for the amount of water that can be taken from the Basin's water resources.

To assist the development of the proposed Basin Plan and determination of the social, economic and environmental implications of the proposed plan the MDBA is seeking to procure services in relation to undertaking cost benefit analyses.

In 2007, the Australian Parliament passed the Water Act 2007 (the Act), a statutory foundation for implementing the Murray-Darling Basin initiative. A key element of the Act is a requirement for the MDBA to prepare a Basin Plan.

The Act requires that the Authority establish sustainable diversion limits (SDLs) that reflect an environmentally sustainable level of take (s23(1)), that is a level of extraction that will not compromise the environmental water requirements of key environmental assets, including water-dependent ecosystems, ecosystem services, and sites with ecological significance; key ecosystem functions; the productive base; and key environmental outcomes for the water resource. Furthermore the Act (s3(c)) requires the Authority, in giving effect to relevant international agreements through determining sustainable diversion limits, to promote the use and management of water resources in a way that optimises economic, social and environmental outcomes.

The MDBA is required set long-term average SDLs for volumes of surface water and groundwater extraction and the conditions under which such diversions can occur.

The introduction of SDLs will mean that a substantially greater proportion of water is available to meet ecosystem requirements. This will support an environmental watering plan included as part of the Plan and address objectives and targets for water-dependent ecosystems across the Basin.

In accordance with the Act, SDLs must be based upon the best available scientific knowledge and must reflect a sustainable level of take. In the event that these proposed diversion limits are exceeded, key environmental assets, ecosystem functions and environmental outcomes of the productive base of the water resource would be compromised.

There is a wide expectation that SDLs will be set below current levels of consumptive water use. This reflects existing stresses on the Basin's ecosystems. SDLs will apply to overall water resources across the Basin as well as water at the sub-regional and catchment level.

**(3) Project Objectives.**

The Murray-Darling Basin Authority (MDBA) seeks proposals to undertake a suite of full (including extended environmental benefits) Cost Benefit Analyses of the effects of introducing sustainable diversion limits in the Murray-Darling Basin.

**(4) Project Approach and Methodology**

The successful tenderer will undertake the analysis and report on the following basis:

- Analyses will be undertaken for each of the nineteen regions within the Murray-Darling Basin and for the Basin as a whole
- Analyses will consider between three and five sustainable diversion limit scenarios
- Analyses will specifically consider the value of environmental costs and benefits alongside other social and economic costs and benefits
- The analysis will be conducted according to official Australian Government Department of Finance and Deregulation guidelines. See:  
[http://www.finance.gov.au/publications/finance-circulars/2006/docs/Handbook\\_of\\_CB\\_analysis.pdf](http://www.finance.gov.au/publications/finance-circulars/2006/docs/Handbook_of_CB_analysis.pdf)
- The analyses will incorporate, as far as practicable, all market and non-market costs and benefits associated with the SDL scenarios

**(5) Anticipated outputs and deliverables of this Project**

The following project deliverables are anticipated:

1. Inception meeting to clarify project objectives, methods and deliverables
2. A brief report outlining the proposed structure and content of the final reports, including summary reports
3. Ongoing liaison with MDBA staff with regard to SDL scenarios and access to relevant data and information
4. Draft summary and detailed reports on each cost benefit analysis, including any key information gaps
5. Final summary and detailed reports on each cost benefit analysis, including any key information gaps
6. An information store of all relevant data, information and meta-data used in the project
7. Presentation of outcomes to MDBA in Canberra

| Deliverable          | Required Date        |
|----------------------|----------------------|
| 1. Inception meeting | Within 5 days of the |

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in the Murray-Darling Basin**

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|                                                                                   |                                                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------|
|                                                                                   | project commencing                                        |
| 2. Brief report outlining the proposed structure and content of the final reports | Within 7 days of the project commencing                   |
| 3. Draft summary and detailed reports                                             | To be determined in consultation with successful tenderer |
| 4. Final summary and detailed reports                                             | To be determined in consultation with successful tenderer |
| 5. Presentation to MDBA                                                           | To be determined upon completion of draft project reports |

**(6) Anticipated outcomes directly resulting from this Project**

It is anticipated that the results of CBA will inform the Authority to determine the full costs and benefits of SDLs at regional and basin scales.

**(7) Anticipated start date, end date, duration, and other key dates**

The project is to commence as soon as practicable upon notification to the successful tenderer. The Services must be completed by before the release of the Guide to the Proposed Basin plan which is currently expected to be released towards the end of August 2010.

**(8) Estimated Project Cost**

Tenderers should indicate their anticipated overall costs for undertaking this work and the basis for costing.

Any subsequent and additional work that may be requested by the MDBA should be nominally quoted where possible.

**(9) Project management arrangements are proposed for the project.**

The project will be managed by the Research and Information section within the MDBA with regular guidance and direction from senior executives and Authority members.

The MDBA will:

1. Provide scenarios of the estimated reductions in the long run average water availability (sustainable diversion limits) under the proposed Basin Plan.
2. Require a prioritisation of the regions to be analysed, in discussion with the successful tenderer.
3. Provide some background information on the range of costs and benefits associated with introducing SDLs.

**(10) Risk management and indemnity**

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1. Suppliers will be required to demonstrate clear strategies for managing risk arising from the Services.
2. The selected supplier will be required to indemnify from and against any loss or liability, reasonably incurred or suffered by the Authority arising from any claim, suit, demand, action or proceeding by any person where such loss or liability was caused by a breach by the Supplier of the terms of the contract or any wilful, unlawful or negligent act or omission of the Consultant in connection with the contract.

**(11) Evaluation criteria.**

Tenders will be evaluated against the following criteria:

- i) *Capacity and resources to undertake the project in a tight timeframe and on budget*
- Clear definition of the responsibilities of each team member
  - Organisational and management experience

- ii) *Demonstrated track record in undertaking cost benefit analyses of a similar nature*
- Relevant expertise, qualifications and experience of the project team
  - Demonstrated understanding of MDB water resource management issues.

Resumes of not more than 2 pages each must be provided for each person proposed to undertake the Services

- iii) *Proposed Project Methodology*
- Demonstration of an understanding of the project context, background and objectives
  - Demonstration of a practical and strategic approach and methodology to fulfilling the objectives of the project brief, including in relation to valuing environmental benefits
  - Project timelines or work plans which detail commencement dates and clearly identifies both the key milestones and delivery dates

- iv) *Risk management strategies*
- Demonstration of a clear strategy for managing any risks which might arise from the Services.

- v) *Overall value for money*

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**Appendix N**

## PROJECT/CONSULTANCY BRIEF

(1) **Project Number**

(2) **Contract Number**

(3) **Project Title (20 words maximum).** Advice and assistance in the development of the socio-economic monitoring and evaluation program.

(4) **Project Background**

The *Water Act 2007* (Cth) instructs the Authority to prepare a proposed Basin Plan for consultation. Completion of the proposed Basin Plan is required by June 2010 and must include the establishment of environmentally sustainable limits for water extraction and Water Resource Plans that may influence socio-economic behaviour. In developing the Plan, Section 21(4)(b) of the Act states that best available scientific knowledge and socio-economic analysis must be considered. The Act also includes a program for monitoring and evaluating the effectiveness of the Basin Plan as mandatory content (Part 2, Section 22, Item 13).

The NRM Division Monitoring Evaluation and Compliance section has adopted best practice evaluation techniques where these meet the needs of the *Water Act 2007* and have developed a draft framework drawing on these approaches. As part of this draft framework, it has been identified that a project to inform the development of the socio-economic component of the Monitoring and Evaluation Program (MEP) is required. This project will consider socio-economic monitoring requirements within the overall MEP framework and guiding principles, and provide a review of the adequacy existing socio-economic information in assessing the effect of the Basin Plan on water users and communities.

The early impacts of changes to water availability are most likely to identify in changes to land management practices with significant impacts identified to changes in broader land use, such as a move away from irrigated agriculture. The evaluation of land use, land cover and land management practice over time will provide significant indicators to the success of the plan over time.

The project outcomes will include:

- a best practice and evidence-based approach to monitoring, evaluation and review with specific reference to socio-economic responses;
- ensuring that the requirements of the *Water Act 2007* are met with regard to socio-economic outcomes; and,
- developing a consistent approach to monitoring, evaluation and review with other Basin elements, including applying the approach of the socio-economic aspects of the description of Basin Water Resources (s22(1) item 1) and the impact assessment of the Basin Plan to the existing overall framework for the Basin Plan MEP;
- working with content groups in the MDBA and (if requested) other contractors, to achieve the above.

MDBA seeks to engage the professional services of a team, who together offer the following experience and skills:

- an ability to review and assess best practice monitoring and evaluation programs with specific relevance to socio-economic indicators of outcomes of water management;

- familiarity with the literature and practice of evaluation and review (and evidence-based approaches) of socio-economic monitoring and evaluation;
- an ability to harness the best available science and other technical input to an evidence-based approach relating to socio-economic monitoring, evaluation and review;
- an ability to develop an appropriate monitoring and evaluation framework for socio-economic responses to water resource management components at a Basin, valley and asset scale, using the existing overall framework for the Basin Plan MEP;
- an ability to become familiar with socio-economic outcomes relevant to assessing the effectiveness of the Basin Plan; and
- an ability to work with various Basin Plan content element teams in the MDBA and (if requested) with other contractors working on those elements, to achieve alignment solutions.

#### **(5) Project Objectives.**

The key objective of the project is to support the development of effective monitoring, evaluation and review of socio-economic factors in relation to water resource management as proposed within the Basin Plan.

The project will review existing monitoring and evaluation programs across the Basin and associated knowledge in relation to socio-economic issues and assess how these may assist Basin Plan needs. The project will also assess current best practice and evidence-based approaches for monitoring, evaluating and reviewing socio-economic responses to meet the Basin Plan needs, including the need to measure the effect of changes to water availability and Water Trade. The developed socio-economic monitoring and evaluation framework will also identify appropriate approaches to the 1, 5 and 10 year reporting and review periods.

The project will apply the work already developed for socioeconomic impact analysis and benchmarking, to the existing draft framework and principles for the Basin Plan MEP, to identify a relevant framework for evaluating the effectiveness of the Basin Plan in achieving outcomes consistent with the Act and the board's draft objectives.

The project contractor will provide advice on coordination, sourcing expertise and further related advice as required to support development and finalisation of the socio-economic monitoring and evaluation component of the Basin Plan up to 30 June 2010.

#### **(6) Project Approach and Methodology.**

The detailed project methodology will be developed and documented by the supplier/tenderer.

The successful supplier/tenderer will be expected to work with the materials already developed by the Monitoring, Evaluation and Compliance Section of the Basin Plan Division, including:

- MDBA Sustainable Diversion Limits Issue Paper;
- draft principles and framework for the monitoring and evaluation program;
- work undertaken by (or on behalf of) the MDBA's socioeconomic team (Research and Information section) on socioeconomic impact analysis and benchmarking;
- draft scoping paper and workplan;
- ;
- Board Papers and decisions; and,
- other relevant materials.

The project and supporting materials are all subject to the strict confidentiality, between MDBA and the successful tenderer.

**(7) Anticipated outputs and deliverables of this Project**

The contractor will work with, and provide advice to, the Monitoring, Evaluation and Compliance and other basin Plan Division teams through providing:

1. a socio-economic monitoring and evaluation framework and guiding principles consistent with the existing framework provided by the Monitoring, Evaluation and Compliance team. The approach must be based on a best-practice and evidence-based approach to monitoring, evaluation and review of socio-economic responses to the implementation of the Basin Plan;
2. an analysis of likely impacts the Basin Plan in the socio-economic context;
3. a review of the adequacy of existing socio-economic information in meeting the monitoring and evaluation requirements of the Basin Plan;
4. measurable and predicted socio-economic outcomes that are linked to Basin Plan objectives and inputs. This will include the development of a conceptual model identifying causal pathways relating the immediate effect of water availability, as determined through the Basin Plan, and societal and economic outcomes;
5. key socio-economic evaluation questions to inform 1, 5 and 10 year reviews of key Basin Plan elements including Sustainable Diversion Limits, Water Trade, Critical Human Water Needs, Environmental Water Plans and Water Quality and Salinity Management. This includes identification of indicators and source data for each evaluation question and outcome; and,
6. work closely with Monitoring, Evaluation and Compliance, Resource and Information teams, other MDBA teams as required, other consultants and relevant reports.

**(8) Anticipated outcomes directly resulting from this Project**

Best practice, practical, efficient and effective socio-economic monitoring, evaluation and review arrangements that is consistent with the overall Basin Plan, can be recommended to the Board and meets the requirements of the Act.

**(9) Who will be the users of the Project outputs?**

Staff and potentially the Authority will have access to the outputs.

**(10) What involvement will other organisations and the users of the Project outputs have in this project?**

Not applicable at this stage.

**(11) How will the Project outputs be disseminated to the user?**

Not applicable at this stage.

**(12) What measures will be put in place to ensure that the project outputs are applied and the outcomes are achieved?**

Not applicable at this stage.

**(13) Anticipated start date, end date, duration, and other key dates**

**Anticipated start date: 15 December 2009**

**Anticipated end date: 30 June 2010**

NOTE: Availability of the contractor is sought until 24 December 2009 and from 4 January 2010. This is critical to inform a board paper due date in mid-January 2010. The successful supplier may be determined on this basis.

**Key dates:**

**10 January 2009: Preliminary advice on the socio-economic framework, including consistency, best practice and deficiencies.**

30 January 2010: Further advice.

30 June 2010; Final advice if required.

**(14) Estimated Project Cost**

\$33,000 (GST inclusive)

**(15) What project management arrangements are proposed for the project (steering committee composition, chair etc.)?**

Lisa Thurtell to be the contact officer.

Director Monitoring, Evaluation and Compliance (David Winfield) to approve completion of content of the major project deliverables.

A/g General Manager REM (Jo Kneebone) is the delegate.

**(16) Project risk**

Risk may exist in relation to the short time-frame available for the development of the Plan.

Other identified risk is poor advice. Hence mitigation is to require successful tenderer to have experience as detailed in project background.

No Cap on liability to consultant will be accepted.

**(17) Ownership and management of project IP**

IP will remain 100% in the ownership of the Authority.

**(18) O H & S issues**

NIL

**(19) Other issues**

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**Appendix O**

## **PROJECT SPECIFICATIONS REQUIRED FOR THE PREPARATION OF CONTRACTS**

### **Schedule of Project Details**

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. PROJECT<br/>/SERVICES TITLE</b> | Advice on definition of climate scenarios for use in Basin Plan modelling to guide development of the first Basin Plan during 2009.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>2. DESCRIPTION OF<br/>SERVICES</b> | <p>A range of hydrologic, environmental and socio-economic modelling is anticipated to be undertaken during 2009 to guide development of the first Basin Plan. The assumptions around climate and climate change will be a fundamental determinant of the outputs of this modelling work. Because of the short timeframe within which this modelling work can occur, decisions about climate and climate change scenarios need to be made before July 2009, with a view to populating the climate data for these scenarios in July—August 2009. The decisions around climate and climate change scenarios need to be made by the MDBA, but need to be made with a clear understanding of current climate science as well as on the basis of and agreed position on how references to climate change in the Water Act will be considered in the Basin Plan. There are three aspects of climate and climate change that it is envisaged will need to be considered the modelling work undertaken to guide the development of the Basin Plan. These three aspects are described below under the objectives for this work. The advice sought needs to reflect any major divergence of current scientific opinion, but also provide recommendations based on the balance of current evidence. Concise advice is sought – a report not exceeding ten pages of written text.</p> <p><b>MDBA Objectives for this work:</b></p> <ol style="list-style-type: none"> <li><b>1.</b> To obtain scientific advice on the options and recommended approach to defining a ‘baseline’ climate scenario for use in modelling. This scenario would provide the basis for describing the “size, extent, connectivity, variability and condition of the Basin water resources” as required in Mandatory Content 1 of the Basin Plan of (Section 22, Water Act).</li> <li><b>2.</b> To obtain scientific advice on the options and recommended approach to defining climate scenarios that enable determination of “<b>long-term</b> average sustainable diversion limits” in the context of an assessing the “risks to the availability of Basin water resources... that arise from the effects of climate change”.</li> <li><b>3.</b> To obtain scientific advice on the options and recommended approach for climate scenarios for use in modelling to assess the water resource, environmental and socio-economic implications of proposed diversion limits (sustainable and temporary) over</li> </ol> |

|  |                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------|
|  | the expected period of implementation of the first Basin Plan prior to required review (10–15 years). |
|--|-------------------------------------------------------------------------------------------------------|

## 7. TASKS TO BE UNDERTAKEN

|    | Date Due                             | Task Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <b>Prior to 20<sup>th</sup> June</b> | Compile key overviews of current climate science relating to climate scenarios for water resources applications, particularly research in CSIRO, Australia Bureau of Meteorology, South Eastern Australian Climate Initiative and CSIRO Sustainable Yields projects.                                                                                                                                                                                                                           |
| 2. | <b>Prior to 20<sup>th</sup> June</b> | Convene a half-day workshop with no more than ten Australian hydroclimate experts and several MDBA representatives to discuss current climate science and uncertainties in future climate scenarios to make an informed decision on scenarios for use in the Basin Plan modelling. This decision will be constrained by the need to generate the climate data required for the hydrological modelling across the MDB and data and scenarios that are already available from the MDBSY project. |
| 3. | <b>26<sup>th</sup> June</b>          | Write a short report or paper (no more than ten pages of written text) summarising the above to provide advice on definition of climate scenarios for use in the Basin Plan modelling.                                                                                                                                                                                                                                                                                                         |

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**Appendix P**

**PROJECT SPECIFICATIONS REQUIRED FOR THE PREPARATION OF  
CONTRACTS**

**Schedule of Project Details**

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. PROJECT<br/>/SERVICES TITLE</b> | Preliminary determination of environmental water requirements for the Coorong.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>2. DESCRIPTION OF<br/>SERVICES</b> | <p>A core part of the technical work required to guide development of the Basin Plan will be the determination of environmental water requirements for key environmental attributes. Sustainable diversion limits will be set on the basis of having first determined these environmental water requirements. This project will be a preliminary exploration how current data, models and knowledge might be used to determine environmental water requirements for the Coorong in the context of the requirements for the Basin Plan set out in the Water Act 2007.</p> <p><b>MDBA Objectives for this work:</b></p> <ol style="list-style-type: none"> <li>1. To obtain preliminary scientific advice on how environmental objectives for management of the Coorong could be articulated given current understanding, and with due regard to the implications of the Ramsar-listing of the Coorong and Lower Lakes.</li> <li>2. To obtain a demonstration of how the hydrodynamic and ecosystem state models for the Coorong developed as a part of the CLLAMMEcology cluster might be used to determine environmental water requirements.</li> <li>3. To obtain a demonstration of how climate change can be considered in determinations of environmental water requirements for the Coorong.</li> <li>4. To obtain an early indication of the likely gross magnitude of environmental water requirements for the Coorong, in order to consider the potential implications for a sustainable diversion limit for the entire MDB.</li> </ol> |

## 7. TASKS TO BE UNDERTAKEN

|           | <b>Date Due</b> | <b>Task Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.</b> | <b>1 June</b>   | Run the CSIRO hydrodynamic model for the Coorong to investigate salinity and water level responses under exploratory flow scenarios provided by the MDBA.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>2.</b> | <b>15 June</b>  | Apply the ecological modelling framework developed through the CLLAMMecology Cluster to determine the likely distribution and sequence of ecological states that will arise from the modelled hydrodynamic responses in both lagoons of the Coorong.                                                                                                                                                                                                                                                                                                                       |
| <b>3.</b> | <b>20 June</b>  | Following consultation with MDBA around initial flow scenarios, develop flow scenarios that will allow further exploration and refinement of the watering requirements of the Coorong to achieve prescribed distributions of ecological states. Consultation would include a half day meeting between the modellers and the MDBA to discuss what the scenario analysis means in terms of ecological outcomes for birds, fish, invertebrates, aquatic vegetation, and physical-chemical parameters, to present results achieved thus far, and to discuss future directions. |
| <b>4.</b> | <b>30 June</b>  | Prepare report summarising the results of the project and recommendations on how the approach might be further developed to support the process of setting environmental water requirements for the Coorong in the context of the Basin Plan.                                                                                                                                                                                                                                                                                                                              |

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**Appendix Q**

**PROJECT SPECIFICATIONS REQUIRED FOR THE PREPARATION OF  
CONTRACTS**

**Schedule of Project Details**

|                                   |                                                                                                                          |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>1. PROJECT /SERVICES TITLE</b> | <b>CSIRO Surface Water modelling support for the Basin Plan</b>                                                          |
| <b>2. DESCRIPTION OF SERVICES</b> | <b>Surface Water modeling, software engineering and data provision for development of the Murray Darling Basin Plan.</b> |

**7. TASKS TO BE UNDERTAKEN**

|            | <b>Date Due</b>  | <b>Task Description</b>                                                                                                                                          |
|------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.</b>  | 30 October 2009  | Install MDBSY integration framework on the Authority computers, ensure all models run in the framework and train the Authority staff in the use of the framework |
| <b>2.</b>  | 27 November 2009 | Develop data management processes and systems to support MDB-wide modelling. Initiate these on the Authority computer systems                                    |
| <b>3.</b>  | 30 October 2009  | Generate river model inflow time series for all MDB river models for wet extreme, median and dry extreme 2030 climate scenarios                                  |
| <b>4.</b>  | 30 October 2009  | Provide IQQM and REALM modelling support to include representation of new environmental water demands in IQQM and REALM models                                   |
| <b>5.</b>  | 31 March 2010    | Provide modelling support for MDB REALM models and for the Upper Murrumbidgee IQQM                                                                               |
| <b>6.</b>  | 27 November 2010 | Develop link between report production spreadsheet and summary database.                                                                                         |
| <b>7.</b>  | 31 March 2010    | Develop interface for integration framework (and MDB models) to enable "trajectory" modelling to be undertaken                                                   |
| <b>8.</b>  | 18 June 2010     | Project Management                                                                                                                                               |
| <b>9.</b>  | 18 June 2010     | High level technical guidance on all tasks                                                                                                                       |
| <b>10.</b> | 18 June 2010     | Provide an assessment of the fitness for purpose (in particular, for defining SDLs) of all MDB river models                                                      |
| <b>11.</b> | 18 June 2010     | Provide documentation of model integration framework, model enhancements and data management systems                                                             |

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**Appendix R**

## PROJECT BRIEF

**Project number**

**Contract number**

**MD27**

**Project title**

**DEVELOPING A BAYESIAN NETWORK FOR BASIN WATER RESOURCES RISK ASSESSMENT**

**Project background and context**

***Water Act 2007 requirements***

1. The *Water Act 2007* (the Act) requires the Murray-Darling Basin Authority (MDBA) to develop a Basin Plan and the Act requires the Basin Plan to contain a range of items, including:
  - an identification of risks to the condition or continued availability of the Basin water resources (section 22(1) item 3); and
  - strategies to be adopted to manage or address the risks identified (section 22(1) item 5).
2. The Act specifies (section 22(1) item 3) that the risks deal with must include the risks to the availability of Basin water resources that arise from:
  - the taking and use of water (including through interception);
  - the effects of climate change;
  - changes to land use, and
  - the limitations on the state of knowledge on the basis of which estimates about matters relating to Basin water resources are made.
3. The Basin Plan must also include the requirements that water resource plans (WRPs) - prepared by jurisdictions for each water resource plan area (WRPA) - must comply with in order to be accredited (section 22(1) item 11). These requirements must include requirements in relation to the broad approaches to the way risks to the water resources of a WRPA should be addressed (section 22(3)(h)).

***MDBA work to date***

4. A risk assessment architecture<sup>1</sup> has been approved by the MDBA Board, outlining the proposed approach to meeting the requirements of the Act in relation to risks. This approach involves assessing risk at several spatial scales:
  - the Basin-scale;
  - the water resource plan area WRPA scale (i.e. regional scale); and
  - for a particular key environmental assets (KEAs).
5. The risk assessment will assess risks to relevant Basin Plan Objectives<sup>2</sup> relating to:

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<sup>1</sup> A copy of this risk architecture paper will be made available to tenderers on a confidential basis on written request (refer paragraph 40 of the RFT).

<sup>2</sup> Further details will be provided to tenderers on a confidential basis.

- i. protecting key environmental assets and ecosystems of the Basin and conserving biodiversity; and
  - ii. protecting and enhancing water quality to ensure it is sufficient to meet the environmental values of the Basin water resources.
6. KEAs are currently being identified by the MDBA, and WRPAs are in the process of being defined. A preliminary indication of what these might be will be provided to the successful tenderer in confidence.
  7. An initial examination of risks to water resources has been undertaken, identifying major risks and several levels of contributing factors (hazards), i.e. the activities and processes which contribute to the risks. This has indicated the complex nature of the interactions between the large number (about 140) of hazards identified to date. This complexity is increased by the fact that hazards operate differently at different spatial scales.
  8. The presence of significant gaps in the knowledge/data available to assess risks adds an additional element of complexity, and expert opinion is likely to be a major (if not the primary) input at different scales.

#### ***Use of a Bayesian Network approach***

9. Initial investigations have shown that a Bayesian Network approach offers the greatest possibility to understand and measure the complex linkages between hazards, and consider (and transparently document) both quantitative and qualitative information from a variety of sources.
10. The MDBA's preliminary examination of the risks and hazards (refer paragraph 7) will form the basis of the conceptual model (influence diagram) which will underpin the Bayesian Network. This conceptual model will form the basis for undertaking risk assessments at all spatial scales.

#### ***Time considerations***

11. There are immovable and tight timelines for development of the Basin Plan, of which this project will be an integral component. The proposed Basin Plan must be released for public consultation by 30 June 2010. Since time must be allowed for the legal drafting process, the technical content of the Basin Plan must be developed several months in advance of this date. The final Basin Plan is due to be in place by early 2011.

#### ***Responsibilities – MDBA vs jurisdictions***

12. The MDBA will complete the Basin-scale risk assessment, with relevant assistance via this consultancy. It is intended that the MDBA will undertake future modifications of the Bayesian Network and revisions of the Basin-scale risk assessment (adequate internal capacity will need to be built to enable this). Jurisdictions will undertake risk assessments at the WRPA-scale (and smaller scales) as part of the process of developing WRPs.

#### **Project objectives**

13. The objectives of this project are to:
  - a. develop a Bayesian Network for the hazards identified, and a methodology for applying this to assessing the risks to the Basin water resources at various scales.

- b. develop a tool (Bayesian Network<sup>3</sup> plus user guideline) for the MDBA to use in assessing risk at the Basin-scale. This will need to include the capacity to assess risks to specific KEAs which may be significant at the Basin scale.
- c. produce a Basin-scale risk assessment<sup>4</sup> using the Bayesian Network, to provide the basis for mandatory content of the Basin Plan (refer paragraphs 1 and 2).
- d. develop a tool (Bayesian Network<sup>3</sup> plus user guideline) for jurisdictions to use in assessing risk at the WRPA-scale, plus a detailed methodology which will form the basis for mandatory content of the Basin Plan (refer paragraph 3). The tool will need to include the capacity to assess risks to Key Environmental Assets.
- e. conduct trial risk assessments at the WRPA-scale using this tool, in order to ensure the tool is suitable, and amend this tool as required.
- f. determine if/how a Bayesian Network could be used to inform the development of management strategies for identified risks.

### **Project approach and methodology**

- 14. The following steps will be required and each step will require consultation with the MDBA Project Manager. The tenderer will be expected to provide a more detailed methodology. The MDBA will facilitate consultation with the appropriate officers in State/ACT agencies.
  - A. Conceptual model**
  - 15. Work with MDBA and relevant experts (including from State/ACT agencies) to refine conceptual model<sup>5</sup> of hazards to stated objectives, using work done by MDBA to date (refer paragraph 7) as a starting point.
  - B. Basin-scale risk assessment tool – develop and apply**
  - 16. Based on the conceptual model, develop a Bayesian Network risk assessment tool for the MDBA to use for assessing risk at the Basin scale. The tool will need to include:
    - i. a Bayesian Network risk analysis model<sup>3</sup>, and
    - ii. a set of guidelines outlining how the model should be used and updated, and how assessment results should be reported.
  - 17. Use the tool to undertake the risk assessment and then report the results, having regard to the mandatory requirements of the Act (refer paragraph 2).
  - 18. Development of the tool and undertaking the assessment will require the use of expert opinion (including from State/ACT agencies) and available data.
  - C. WRP risk assessment tool – develop, trial and refine**
  - 19. Based on the conceptual model, develop a Bayesian Network risk assessment tool for use by the States and the ACT in developing WRPs. This tool will have two components:

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<sup>3</sup> The same Bayesian Network may apply for both the Basin-scale and WRPA-scale tools.

<sup>4</sup> The definition of a “Basin-scale risk assessment” is provided at Attachment A.

<sup>5</sup> The MDBA is managing a project to develop a suite of conceptual models that will link ecological health and resilience of ecosystem components/units to flow regime (The Conceptual Models Project). The tenderer will need to ensure the results of the Conceptual Models Project are integrated into the Bayesian Network methodology, and the expert(s) involved in its development invited to participate in the development of the Bayesian Network.

- i. a Bayesian Network risk analysis model<sup>6</sup>, and
  - ii. a set of guidelines outlining how the model should be used, how assessment results should be reported, and the requirements for preparing a good risk management strategy.
20. State/ACT agencies will need to be closely engaged in this process to gain adequate “buy-in” and ensure the tool is useable and will meet their needs.
21. The tool will need to specify the requirements for a good risk management strategy and should be consistent with the AS/NZS 4360: Risk Management. Tenderers should also ensure the tool can cater for ways in which it might be improved in future versions, for example to be linked to GIS information.
22. Trial the use of this tool in preferably at least two WRPAs, ensuring that each trial incorporates consideration of risks to at least one KEA. This will require continued consultation with State/ACT agencies.
23. The trial should include the provision for testing against (notional) targets, such as will be derived by the MDBA through the Basin Plan’s Water Quality and Salinity Management Plan (WQSMP), Environmental Watering Plan (EWP) and Sustainable Diversion Limit (SDL).
24. Refine the risk assessment tool in close consultation with State/ACT agencies.

***D. Training***

25. Train relevant MDBA staff to use, update and refine both the tool used for WRP risk assessments, and the Bayesian Network used for the Basin-scale risk assessment.

**Anticipated outputs and deliverables of this project**

26. Anticipated project outputs and deliverables are as follows (documentation/reports may be combined where this makes sense for efficiency reasons)::
  - documentation of conceptual model as basis of Bayesian Network;
  - workshop(s) (or similar) relating to Basin-scale risk assessment;
  - draft and final Basin-scale risk assessment reports;
  - Basin-scale risk assessment tool, including user guideline;
  - workshop(s) (or similar) for developing and trialling WRP risk assessment tool, and report summarising outcomes of the workshop(s);
  - draft WRP risk assessment tool, including outline of user guideline;
  - final WRP risk assessment tool, including user guideline;
  - all relevant electronic files (Bayesian Networks, risk assessment tools, necessary software, data sets, etc);
  - documentation of advice regarding use of Bayesian Networks for development of risk management strategies, and
  - training activities for MDBA staff.

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<sup>6</sup> The same Bayesian Network may apply for both the Basin-scale and WRP-scale tools.

#### **Other issues/considerations**

27. In choosing the software for use in developing the Bayesian Network, tenderers should consider compatibility with any software already used in State/ACT agencies and any requirements to purchase licences.
28. Intellectual property will be owned by the MDBA; license to use it will be provided to relevant State and ACT agencies (and consultants), where required.

#### **Anticipated outcomes directly resulting from this project**

29. The MDBA anticipates the following outcomes as a result of the Project:
  - a credible and defensible Basin-scale assessment of the risks to the Basin's water resources;
  - a credible Bayesian Network for use in assessing risks to the Basin's water resources;
  - incorporation of risk assessment and management in future reviews of the Basin Plan (SDL, WQSMP and EWP);
  - risk assessment and management integrated into WRPs, and
  - improved knowledge and management of risks to water resources within the Murray-Darling Basin.

#### **Anticipated start date, end date, duration, and other key dates**

30. Given the tight time constraints, the MDBA would like the project to commence as soon as possible. The project must be completed by 31 May 2010, in order to meet the deadline of releasing the proposed Basin Plan by 30 June 2010. To facilitate the timely preparation of drafting instructions for the content of the Basin Plan, a number of interim deadlines are also relevant as outlined below.
  - project start – 28 September 2009 (sooner, if possible)
  - draft Basin-scale risk assessment report – 4 December 2009
  - advice regarding use of Bayesian Networks for development of risk management strategies – 4 December 2009
  - final Basin-scale risk assessment report – 22 January 2010
  - draft WRP risk assessment tool and outline of user guideline – 5 February 2010
  - final WRP risk assessment tool and user guideline – 26 February 2010
  - project completion – 31 May 2010

#### **Estimated project cost**

31. The maximum budget will be \$300,000 (GST inclusive), however, suppliers will be required to develop their own costing for the services and to demonstrate value for money.

#### **Project management arrangements**

32. The project will be managed by a Steering Committee established within the MDBA.

**Senate Standing Committee on Environment and Communications  
Legislation Committee**

Answers to questions on notice

**Sustainability, Environment, Water, Population and Communities portfolio**

Supplementary Budget Estimates, October 2010

**Question on Notice 40**

**Appendix S**

## ANNEXURE A

### PROJECT/CONSULTANCY BRIEF

- (1) **Project Number** (2) **Contract Number – MD1431**
- (3) **Project Title (20 words maximum)**  
Key Ecosystem Functions and their Environmental Water Requirements
- (4) **Project Background**

The Commonwealth Water Act 2007 requires the Murray-Darling Basin Authority (MDBA) to prepare and oversee a Basin Plan. The central legal requirement of the Basin Plan is to set environmentally sustainable limits on the amount of water that can be taken from the Basin's water resources, known as a "Sustainable Diversion Limit". The Water Act 2007 specifies that the Sustainable Diversion Limit must not compromise:

- key environmental assets;
- key ecosystem functions;
- productive base; or
- key environmental outcomes.

Collectively these components will guide the determination of environmental water requirements. For the purpose of developing the first Basin Plan it is proposed to assume that environmental water requirements associated with key environmental assets and ecosystem functions will also meet requirements for the productive base and key environmental outcomes. The environmental water requirements will therefore be determined based on key environmental assets and ecosystem functions. An assessment of the social and economic impacts will then occur and influence the sustainable diversion limit adopted in the Basin Plan.

Processes and methods have been developed for determining the key environmental assets and ecosystem functions and the associated environmental water requirements. This brief relates only to the identification of key ecosystem functions and their water requirements. The identification of key environmental assets and their water requirements will be handled separately.

#### Basin Plan Environmental Objectives

Environmental objectives for the Basin Plan have been drafted. These will be refined through the development of the Basin Plan. The overarching objectives are shown below, whilst the complete set of existing objectives are provided in Attachment A. Work is underway to extend these objectives into more specific targets for the purposes of determining environmental water requirements. It is anticipated that draft targets will be available near the beginning of this project.

#### *Objectives*

Conserve key environmental assets and water-dependent ecosystems and biodiversity of the Basin, by:

- Maintaining and improving key ecosystem functions and services.
- Improving their ecological resilience to threats and risks in a changing environment.

- Setting enforceable limits on the quantities of surface water and groundwater that can be taken from the Basin water resources so as to provide for an environmentally sustainable level of take.
- Setting environmental watering requirements at a whole of Basin level.

#### Principles and Criteria used in Developing the Method

The following principles and criteria have led to the development of the method for determining key ecosystem functions and their environmental water requirements.

- The method must enable rapid implementation – it must be largely completed in 2009
  - This implies it must be desktop based, and use existing data sets
- It must be appropriate for the Basin Plan
  - It needs to be founded on good science and defensible, but not necessarily undertaken at a fine resolution of detail
- It must be equally valid and applicable in regulated and unregulated streams
- The method must be compatible with, and enable assessment through hydrologic modelling
  - The performance of functions will therefore need to be represented by hydrologic indicators (or surrogates)

#### **(5) Project Objectives**

The objective of this project is to identify key ecosystem functions and their water requirements.

The project approach and methodology outlines the requirements of the project more fully.

#### **(6) Project Approach and Methodology**

##### Step 1 – Determine Key Functions

There are a multitude of interconnected and dynamic ecological functions that shape the Basin's aquatic ecosystems. They occur in a complex and hierarchical web. Understanding the full spectrum of ecological functions and their linkages is a difficult and complex task, and defining environmental water requirements for each of the functions would be difficult and complex, with a high degree of associated uncertainty. Instead of doing this, a simplified and "higher level" approach is proposed.

All ecological functions in a river system are underpinned by more fundamental physical processes that relate to the hydrology and geomorphology of the river system. These are much fewer in number and simpler to conceptualise and assess. The proposed approach is to identify the key physical (hydrologic and geomorphic) processes relevant to the Basin Plan (ie a water resource plan), and then define water requirements for those.

Determination of the key physical processes will be undertaken by developing a simple conceptual model of ecological functions and the associated underlying physical processes, and then selecting those functions and processes which will be key to the achievement of the Basin Plan's environmental objectives. In the interest of expediency, existing conceptual models should be reviewed and extended/adjusted to meet the requirements of this

project. Some examples of relevant models to be considered are those developed for the Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) and those being developed by the Independent Sustainable Rivers Audit Group (ISRAG) for the Basin Plan monitoring and evaluation program.

A subsequent step will be to determine which functions and processes can realistically be assessed within the time constraints of the Basin Plan. This step and the risks/consequences of any exclusions will need to be well documented.

The logic of this approach has been tested in a preliminary way. Table 1 sets out a simple example of a possible output. It also provides some examples of dependant functions/processes. The water requirements would be subsequently defined at the process level rather than the function level. The approach for determining the water requirements is further described later.

**Table 1: Initial Set of Physical Processes (to be refined)**

| Physical Process                               | Examples of Dependant Functions                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inundation of bed, bank and riparian strata    | Creation of physical habitats for aquatic and riparian biota<br>Mobilisation of carbon and nutrients                                                                                                                                                                                                                                      |
| Sediment mobilisation, transport and dispersal | Creation and maintenance of aquatic and riparian physical habitats (eg scouring of river beds to create pools, deposition of sediment to create bed formations such as riffles, and bank formations such as benches and terraces)<br>Mobilisation, transport and dispersal of minerals and nutrients to wetland and floodplain ecosystems |
| Lateral and longitudinal flow connectivity     | Transport of carbon, nutrients and minerals<br>Dispersal of propagules (eg seeds)<br>Migration of aquatic animals for reproduction or foraging<br>Export of pollutants (eg salt) from key parts of the river system (eg Murray mouth)                                                                                                     |

#### Step 2 – Develop Spatial and Temporal Model of Processes

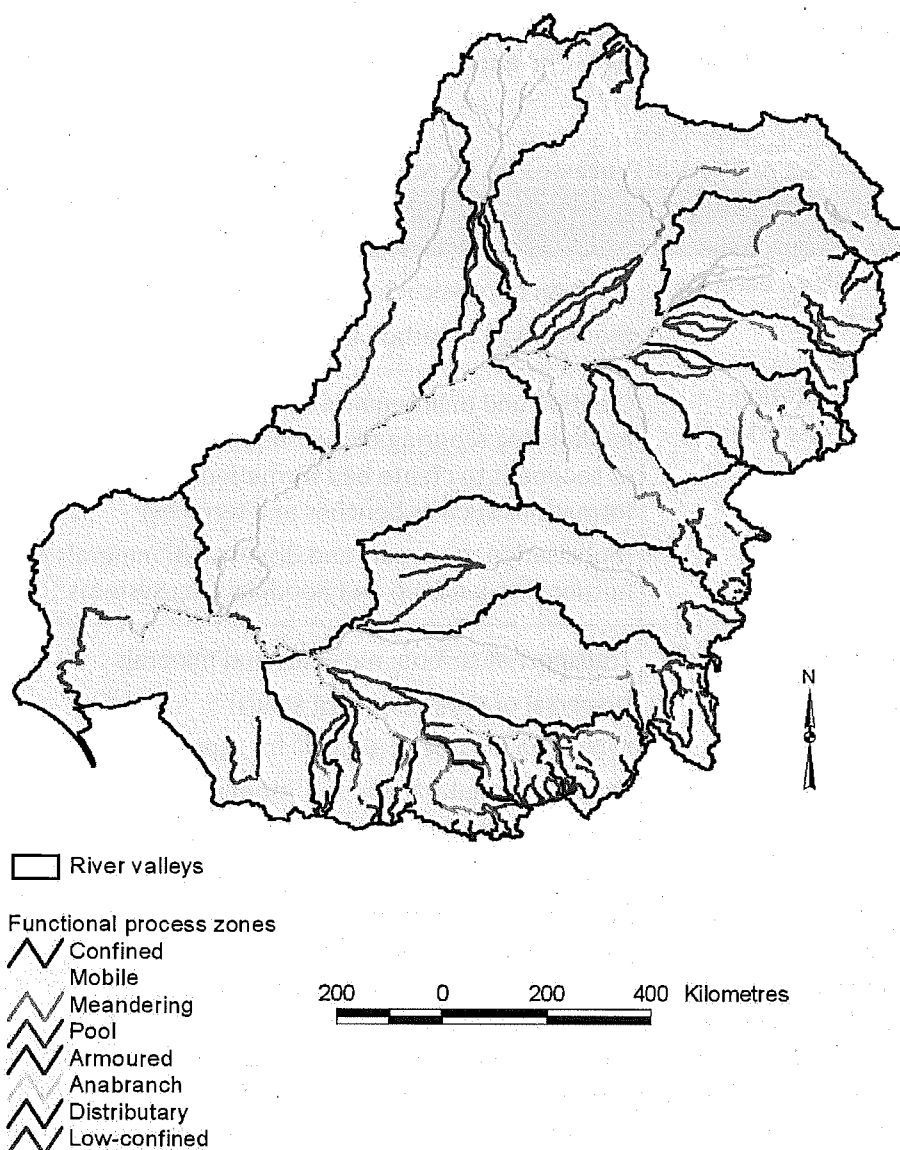
Once the key physical processes are determined, the next step is to determine where (spatial) and when (temporal) the processes occur. The performance of the processes will be modelled hydrologically and the processes will need to be represented by hydrologic indicators (surrogates). The temporal element of the processes should therefore be considered in terms of the types of flow (eg low flows, freshes, high flows) associated with the performance of the process. For example, if longitudinal connectivity is considered to be important, then the question becomes, in what types of streams is longitudinal connectivity important and what flow conditions are required to achieve it?

Step 2 has two parts:

- Part 1     Extension of the conceptual model developed in Step 1 to define the types of streams (spatial scale) where the processes occur and the flow conditions under which they occur (temporal scale).

Part 2 Using a functional categorisation of the Murray-Darling Basin, spatially map the process zones described in the conceptual model to the basin stream network at an appropriate resolution.

Some thought has been given to how this might be undertaken. Whittington et al (2001) categorised the streams of the Murray-Darling Basin according to a number of Functional Process Zones. This had a geomorphic focus, identified various attributes of the stream types (Table 2) and mapped them across the Murray-Darling Basin (Figure 1). This dataset is expected to be a key input.



**Figure 1: Functional Process Zones of the Murray-Darling Basin (Whittington et al 2001)**

Determining the flow required to achieve certain process outcomes is a key task. One option that has been identified to assist in doing this is to collate relevant outcomes/recommendations from the detailed environmental flow assessments that have been undertaken across the Murray-Darling Basin (and perhaps outside the Basin where the outcomes are considered transferable).

Table 2: Geomorphic Units and Conceptual Model of Various Attributes (Whittington et al 2001)

| Geomorphological Units                  | Upland zones<br>(sediment supply)                                                                                                       |                                                                                      |                                                                                      | Mid-slope zones<br>(sediment transfer)                                                                                |                                                                                                                                          | Lowland zones<br>(sediment deposition/storage)                                                                  |                                                                                                                 |                                                                                                                 |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|                                         | Pool                                                                                                                                    | Upland Gorge                                                                         | Armoured                                                                             | Mobile                                                                                                                | Meander                                                                                                                                  | Anabranch                                                                                                       | Distributary                                                                                                    | Lowland gorge                                                                                                   |
| Valley gradient/ Long profile           |                                                                                                                                         |                                                                                      |                                                                                      |                                                                                                                       |                                                                                                                                          |                                                                                                                 |                                                                                                                 |                                                                                                                 |
| Valley profile                          |                                                                                                                                         |                                                                                      |                                                                                      |                                                                                                                       |                                                                                                                                          |                                                                                                                 |                                                                                                                 |                                                                                                                 |
| Floodplain features                     | No floodplain                                                                                                                           | No floodplain                                                                        | Minimal floodplain development. Some high level terraces.                            | Point and lateral bars, benches, induced channels, anabranches, foodrunners                                           | Point and lateral bars, benches, induced channels, anabranches, foodrunners                                                              | Low level floodrunners, anabranch channels, extensive floodplain                                                | Disturbance channels                                                                                            | Floodplain independent of main channel                                                                          |
| Planform                                |                                                                                                                                         |                                                                                      |                                                                                      |                                                                                                                       |                                                                                                                                          |                                                                                                                 |                                                                                                                 |                                                                                                                 |
| Stream power                            | Valley Controlled<br>Stimosity = < 1.2                                                                                                  | Valley Controlled<br>Stimosity = < 1.2                                               | High                                                                                 | Moderate                                                                                                              | Moderate-Low                                                                                                                             | Low                                                                                                             | Low                                                                                                             | Valley Controlled<br>Stimosity = < 1.27                                                                         |
| Dominant sediments                      | Bedrock, boulder                                                                                                                        | Bedrock, boulder, cobble                                                             | Cobble and gravel surface layer protecting pointy zones finer sediments              | Bedrock, boulder, gravel particles                                                                                    | Sand                                                                                                                                     | Sand, silt, clay                                                                                                | Silt and clay                                                                                                   | ?                                                                                                               |
| Function (bedforms, habitats, dynamics) | Relatively immobile source area                                                                                                         | Highly mobile source area                                                            | Mobile source area                                                                   | Mobile transfer area                                                                                                  | Highly mobile transfer area. Some deposition of finer particles                                                                          | Deposition                                                                                                      | Deposition distributary                                                                                         | Deposition                                                                                                      |
| Key aquatic habitats                    | Pool, riffle chutes                                                                                                                     | Riffle and pool substratum                                                           | Riffle and pool substratum, high flow floodrunners, riparian vegetation, crops       | Riffle and pool substratum, point and lateral bars, induced channels, floodrunners, woody debris (snags), macrophytes | Pool substratum, point and lateral bars, former channels, anabranches, induced and local floodrunners, woody debris (snags), macrophytes | Pool substratum, channels, blabings, woody debris, macrophytes                                                  | Pool substratum, channels, blabings, woody debris, macrophytes                                                  | Pool substrate adjacent to channel, macrophytes                                                                 |
| Major components of carbon supply       | Allochthonous inputs: dominant CFCOM and FFCOM, minor primary production, microalgae (diatoms), some submerged and emergent macrophytes | Allochthonous inputs: dominant CFCOM and FFCOM, minor primary production, microalgae | Allochthonous inputs: dominant CFCOM and FFCOM, minor primary production, microalgae | Allochthonous inputs: CFCOM, FFCOM and local small primary production: emergent vegetation in pools, periphyton       | Allochthonous inputs: CFCOM, FFCOM and local small primary production: emergent vegetation in pools, periphyton                          | Allochthonous inputs: CFCOM, FFCOM and local small primary production: emergent vegetation in pools, periphyton | Allochthonous inputs: CFCOM, FFCOM and local small primary production: emergent vegetation in pools, periphyton | Allochthonous inputs: CFCOM, FFCOM and local small primary production: emergent vegetation in pools, periphyton |
| High flow                               | Pool depth increases, flushing reduces lateral connection                                                                               | Riparian vegetation, flushing, scouring and scouring flows                           | Small floodrunners, inundated increasing habitat, flushing and scouring flows        | Floodrunners, induced benches and benches, anabranches, increasing habitat and food resources                         | Floodrunners, induced benches and benches, anabranches, increasing habitat and food resources                                            | Floodrunners, induced benches and benches, anabranches, increasing habitat and food resources                   | Floodrunners, induced benches and benches, anabranches, increasing habitat and food resources                   | Pool depth increases, valley reduces lateral connection                                                         |
| Low flow                                | Pool depth decreases, no major habitat loss                                                                                             | Habitat area decreases                                                               | Habitat area decreases                                                               | Riffles and deep pools, sandy point bars, emergent vegetation                                                         | No riffles, large pools, sandy point bars, emergent vegetation                                                                           | Riffles, large pools, sandy point bars, emergent vegetation                                                     | Deep pools and riffles, point bars, habitat reduced to main                                                     | Water salinity increases from groundwater interruption                                                          |

### Step 3 - Determine Indicators Representing the Performance of the Functions

It is proposed to represent the performance of the functions using hydrologic indicators, or surrogates. These must be consistent with the capabilities of existing hydrologic models. The network of hydrologic models collated for the purpose of developing the Basin Plan can report hydrologic data at approximately 470 locations across the Murray-Darling Basin. A number of scenarios can be modelled and compared, representing different climatic (eg historic climate, various climate change scenarios) and operations conditions (eg natural, current level of river regulation). It should be noted the models operated at different time steps - some daily, some monthly.

It is proposed to use indicators of the type used for the hydrologic metrics in the MDBA's Sustainable Rivers Audit (SKM 2004, 2005, Davies et al 2008). These are non-parametric and range standardised. The structure of the metrics, and particularly their reference to a baseline (typically natural conditions) is useful because (with certain assumptions) it avoids the need to know certain site specific details (gathering such site specific data is outside the time constraints of the Basin Plan).

The SRA metrics are:

- High-Flow Metric = Change in magnitude of high flows;
- Low-Flow Metric = Change in magnitude of low flows;
- Zero Flow Metric = Change in proportion of time with no flow;
- Monthly Variation Metric = Change in coefficient of variation of monthly flows;
- Seasonal Period Metric = Change in timing of minimum and maximum flows;
- Mean Annual Discharge Metric; and
- Median Annual Discharge Metric.

Ultimately these may or may not prove to be of use. It is also expected that additional indicators will be required.

The coding of indicators into the hydrologic models of the Basin is a time critical activity and must be completed by the end of November 2009. The MDBA is working now to scope indicators to be coded into the models. This scoping is to be completed by mid November 2009. It is anticipated that the consultant will be appointed mid way through this process and be involved as much as is practical in selecting relevant indicators. It is recognised that there is a risk that the selected indicators may not align perfectly with the outcomes of this consultancy, but the time pressures of the project require this parallel approach. To minimise the risk the MDBA will select and code a large set of indicators with the expectation that this consultancy will determine that only a subset are required to represent the performance of key functions.

### Stage 4 - Develop Process Performance Targets

At this stage it is anticipated that the project will have delivered:

1. An agreed set of key processes, and a conceptual model of their relationship to ecosystem functions;
2. An understanding of the streams types and flow conditions that are important to the performance of the processes; and
3. Hydrologic indicators to represent the performance of the processes.

The remaining task will be to identify the required performance of the indicators. The recommended structure of the indicators will mean that this performance is relative to a benchmark, which is anticipated to be natural conditions.

The performance targets will be informed by the Basin Plan environmental objectives and targets, and based on the "best available science". However it is expected that the Basin Plan objectives and targets will need significant interpretation and extension. It is anticipated that a risk based approach will be adopted, and this will be developed with guidance from the MDBA and expert panel. An approach will be developed in parallel, and with input from this consultancy.

It is anticipated that a layered structure of performance targets will be required. The targets may vary according to:

- Different functions - some functions may be more important than others;
- Different categories of stream - different stream types will be more important in performing certain functions; and
- Other factors that will influence the performance of functions - perhaps land use, river/catchment condition etc.

#### **(7) Anticipated outputs and deliverables of this Project**

The following outputs are required:

1. Technical papers presenting the outcomes of Steps 1 to 4, for MDBA and expert panel review (if required). These will present the results/conclusion and sufficient background to explain the logic, key inputs and assumptions.
2. A draft final report for MDBA and expert panel review.
3. A final report, addressing comments on the draft final report.

The technical papers and final report must document key assumptions and limitations. This will be of critical importance in providing a robust report and project outcome.

Where possible the final report will make recommendations on mechanisms to address significant limitations or knowledge gaps.

All reports will be provided electronically in a format compatible with Microsoft WORD.

#### **(8) Anticipated start date, end date, duration, and other key dates**

The development of the Basin Plan has very short and inflexible time lines. This project must be completed in early 2010 for it to input into the Basin Plan. The technical papers will be key deliverables as they will provide outputs that link into other Basin Plan tasks (eg modelling). The timing of their delivery, particularly the delivery of all technical papers by 18 December is critical. Some flexibility exists around the draft and final report.

- Startup, inception meeting 9 November 2009 (indicative)
- Complete scoping of metrics 13 November 2009 (firm)

[Note the MDBA is managing this process but the consultant will be expected to have some input – see Section 6, Step 3, final paragraph]

- |                            |                               |
|----------------------------|-------------------------------|
| • Technical paper – Step 1 | 20 November 2009 (indicative) |
| • Technical paper – Step 2 | 27 November 2009 (indicative) |
| • Technical paper – Step 3 | 4 December 2009 (indicative)  |
| • Technical paper – Step 4 | 18 December 2009 (firm)       |
| • Draft report             | 15 January 2010 (indicative)  |
| • Feedback from MDBA       | 29 January 2010 (indicative)  |
| • Final Report             | 12 February 2010 (indicative) |

**(9) Estimated Project Cost**

An indicative budget of up to \$200,000 (inclusive of GST) is available for this project.

**(10) What project management arrangements are proposed for the project (steering committee composition, chair etc.)?**

The MDBA's Project Manager for this project is:

Ian Burns  
 Director, Environmental Works and Measures Program  
 Murray-Darling Basin Authority  
 GPO Box 1801 Canberra ACT 2601  
 Phone: (02) 6279 0514  
 Mobile: 0423 844 163  
 Email: [ian.burns@mdba.gov.au](mailto:ian.burns@mdba.gov.au)

The MDBA is aware and acknowledges that the timelines for this project are tight. The timelines will require the MDBA and consultant to work very closely throughout the duration of the project. The MDBA will make necessary resources available for this to occur effectively. A cooperative and open working arrangement will be required.

Expert Panel and Consultation

An expert panel is being convened to oversee and provide guidance on the determination of environmental water requirements, for both assets and functions. Ultimately the panel's endorsement of the work will be sought.

The panel will not have a project management role, but will provide technical advice and input into the work. The panel's involvement will be focussed on 3 tasks:

1. Review of the method;
2. Review of results of identifying key assets and functions; and
3. Review of results of identifying environmental water requirements.

In undertaking tasks 2 and 3 the expert panel will be asked to undertake a 'gap analysis', by assessing the comprehensiveness, representativeness and adequacy of the key assets and functions, and their environmental water requirements. This may result in some amendment to the key assets, key functions or their environmental water requirements.

The panel may be asked to provide guidance on additional specific tasks. Additional expert advice may also be required at key steps in the process. Tenders should acknowledge and make provision for this input, where appropriate.

The MDBA is also consulting with relevant State and Commonwealth Government agencies regarding this work. The consultant is not expected to participate in this consultation.

#### **(11) References**

Davies PE, JH Harris, TJ Hillman and KF Walker (2008) *SRA Report 1: A Report on the Ecological Health of Rivers in the Murray–Darling Basin, 2004–2007*. Prepared by the Independent Sustainable Rivers Audit Group for the Murray–Darling Basin Ministerial Council, Murray Darling Basin Commission, Canberra.

SKM (2004). *Priority Ranking for Improved Stream Management. Formulation of Hydrologic Stress Index*. Sinclair Knight Merz. Armadale, Victoria.

SKM (2005). *Development of a Flow Stressed Ranking Procedure*. Final Report to Department of Sustainability and Environment, Victoria. Sinclair Knight Merz. Armadale, Victoria.

Whittington J, Coysh J, Davies P, Dyer F, Gawne B, Lawrence I, Liston P, Norris R, Robinson W and Thoms M (2001). *Development of a Framework for the Sustainable Rivers Audit*. Cooperative Research Centre for Freshwater Ecology, Canberra.

## **Attachment A**

### **Proposed overall environmental objectives for the water-dependent ecosystems of the Murray-Darling Basin**

- 1 Protect and restore the wetlands and other environmental assets of the Murray-Darling Basin**
  - 1.1 Protect environmental assets and water-dependent ecosystems of the Basin that are a comprehensive, adequate and representative subset of all environmental assets and water-dependent ecosystems.**
    - 1.1.1 Flow regimes are sufficient to ensure that comprehensive, adequate and representative environmental assets and water-dependent ecosystems of the Basin are protected.
    - 1.1.2 Flow regimes are sufficient to ensure that the environmental assets and water-dependent ecosystems of the Basin are maintained in a condition that supports their resilience to threats and risks in a changing environment.
    - 1.1.3 Declared Ramsar wetlands that are Basin water resources receive water regimes that protect them consistent with their ecological character descriptions.
    - 1.1.4 Water-dependent ecosystems that depend on the Basin water resources and support the lifecycles of species listed under the Bonn Convention, CAMBA, JAMBA or ROKAMBA receive water regimes that protect or restore their condition such that they continue to support the species listed.
    - 1.1.5 Flow regimes are sufficient to ensure that wetlands with episodically high productivity are provided with water regimes that support this productivity and the ecological dispersal of that productivity.
  - 1.2 Restore environmental assets and water-dependent ecosystems of the Basin that are a comprehensive, adequate and representative subset of all environmental assets and water-dependent ecosystems.**
    - 1.2.1 Flow regimes are sufficient to ensure that comprehensive, adequate and representative environmental assets and water-dependent ecosystems of the Basin are restored.
    - 1.2.2 Flow regimes are sufficient to ensure the key environmental assets and water-dependent ecosystems of the Basin are restored to a condition that supports their resilience to threats and risks in a changing environment.
  - 1.3 Protect biodiversity dependent on the Basin water resources**
    - 1.3.1 Water-dependent ecosystems that depend on the Basin water resources and support the lifecycles of a listed threatened species or a listed threatened ecological community receive water regimes that are sufficient for their protection and, if necessary, their restoration so they continue to support those lifecycles.
    - 1.3.2 Flow regimes are sufficient to ensure that viable populations and communities of endemic biota are protected and restored.
    - 1.3.3 Flow regimes are sufficient to ensure that refuges that provide for survival of populations during times of stress and subsequent re-colonisation are protected.

- 1.3.4 Flow regimes are sufficient to prevent loss of water dependent biodiversity, including as a result of incursion of dryland weed species.

## **2 Protect and restore the ecosystem functions of water-dependent ecosystems.**

### **2.1 Connectivity within and between the component water-dependent ecosystems that depend on the Basin water resources is protected and restored.**

- 2.1.1 Flow regimes are sufficient to ensure hydrologic connectivity that supports the diversity, dynamics and distribution of geomorphic structures, water-dependent ecosystems, habitats, species, and genes is protected and restored.
- 2.1.2 Flow regimes are provided to protect and restore ecological processes that are dependent on hydrologic connectivity along the rivers and laterally between rivers and with floodplains (and associated wetlands).
- 2.1.3 Flow regimes are sufficient to permit the operation of natural passage mechanisms that transport physical materials including salt and sediments through the Basin, in particular mechanisms that transport salt to the ocean.
- 2.1.4 Flow regimes are sufficient to permit the Murray Mouth to be open at frequencies, for durations, and with passing flows sufficient to ensure the conveyance of salt, nutrient and sediment from the Basin to the ocean.
- 2.1.5 Flow regimes are sufficient to permit the natural passage of biological resources through the Murray-Darling Basin, including carbon and nutrients.
- 2.1.6 Flow regimes are sufficient to protect or restore the natural passage of biota and ecosystem resources through the Murray-Darling Basin.

### **2.2 Natural geomorphologic processes are protected and restored.**

- 2.2.1 Flow regimes are sufficient to maintain the natural balance of erosion and deposition at a range of scales, including slack water, river reach and across floodplains.
- 2.2.2 Flow regimes provide for a diversity of landscapes, including floodplains, channels etc.
- 2.2.3 Flow regimes provide for natural processes that protect landforms, such as the formation and maintenance of soils.

### **2.3 Natural flow regulation processes are protected and restored.**

- 2.3.1 Floodplain inundation provides natural flow regulation and flood mitigation.
- 2.3.2 Flow regimes facilitate floodwater exchange, retention and infiltration in the floodplain within natural bounds.
- 2.3.3 Flow regimes facilitate the exchange of surface water and groundwater within natural bounds.

### **2.4 Flow regimes provide spatial and temporal habitat diversity for biota at a range of scales, including at Basin scale, riverine landscape scale, river reach scale and asset class scale.**

### **2.5 Components of flow regime (such as magnitude, timing, frequency, flow sequence, inundation and recession rates of rise and fall), that protect ecosystem functions are provided within natural bounds.**

- 2.6 Flow regimes are sufficient to maintain the food webs that sustain water-dependent ecosystems that are dependent on Basin water resources.
  - 2.6.1 Flow regimes are sufficient to maintain energy, carbon and nutrient dynamics, including primary production and respiration, within natural ranges.
- 2.7 Flow regimes are sufficient to protect or restore ecosystem functions that maintain populations, such as reproduction, regeneration, dispersal, immigration and emigration.
  - 2.7.1 Flow regimes, including sequences of flows, and inundation and recession events are provided consistent with ecological requirements such as cues for migration, germination and breeding.
  - 2.7.2 Flow regimes are sufficient to protect or restore natural passage for biota
  - 2.7.3 Flow regimes are sufficient to maintain habitat diversity that supports the life history of biota of water-dependent ecosystems such as habitats that protect juveniles from predation.
- 2.8 Flow regimes are sufficient to protect and restore community structure and species interactions.
  - 2.8.1 Flow regimes are sufficient to protect or restore predator-prey, host-parasite/disease and competition relationships to within natural bounds.
- 2.9 Flow regimes are sufficient to ensure that the ecological functions are protected or restored throughout the whole of the Basin including to the end of Basin estuarine complex.
  - 2.9.1 Flows regimes at the end of Basin estuarine complex are sufficient to ensure that the Murray Mouth is open at frequencies and for durations that ensure that the Coorong to receives tidal exchanges that ensures that water quality in the Coorong, and in particular salinity levels, are within the tolerance of the ecosystem's resilience.
  - 2.9.2 Flow regimes in each water resource plan area to protect the ecological functions of the whole river system (including terminal wetlands and lakes where these exist) and for downstream catchments.
- 2.10 The water of the Basin water resources is of a quality that does not negatively impact on water dependent ecosystems.
- 3 Water dependent ecosystems are resilient to risks and threats.**
  - 3.1 Water dependent ecosystems are resilient to climate change and climate variability, such as drought, is improved.
  - 3.2 Flow regimes are sufficient to protect refuges that provide for survival of populations during drought and for subsequent re-colonisation in order to support long term resilience of these populations.

- 3.3 Wet/dry cycles do not extend the interval between ecologically relevant wetting / inundation beyond the tolerance of the ecosystem resilience or the threshold of irreversible change.
- 3.4 Flow regimes mitigate anthropogenic threats such as the impact of alien species, the impact of algal blooms and degraded water quality.
- 3.5 Water regimes that mimic natural hydrologic connection are provided to ensure that fragmentation is minimised and ecosystem resilience is maximised.
- 4. **The water resources of the Murray-Darling Basin are managed as an integrated system to achieve the best overall outcomes for the water dependent ecosystems of the Basin.**
  - 4.1 Improved management of environmental water at the Basin scale
    - 4.1.1 Clear objectives and principles for the coordinated management of environmental water
    - 4.1.2 Environmental water is managed adaptively and is responsive to monitoring and improvements in scientific knowledge.
  - 4.2 Management based on regional scale conceptual models of ecosystem functioning / processes
  - 4.3 Inter valley flows are proportional to natural water regimes.

Notes:

Objectives listed under "4 The water resources of the Murray-Darling Basin are managed as an integrated system to achieve the best overall outcomes for the water dependent ecosystems of the Basin" are objectives relevant to the management framework for environmental water (s.12(2)(c) NOT for WDEs but are included for completeness.

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**Appendix T**

**ORDER FOR SERVICES NO.: 1**

**Provision of specialist scientific advice and products on key environmental assets to assist with development of the Basin Plan**

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Title of required services ("the Services")</b> | Ecological Condition of Basin Regions and Indicator Environmental Assets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description of the Services</b>                 | <p><b>1. Basin Plan Regions</b></p> <p>Assess condition of the Basin Plan regions by reviewing the following set of ecological themes across each of the Basin regions: fish, macroinvertebrates, vegetation and hydrology.</p> <p>The Sustainable Rivers Audit will provide information on fish, macroinvertebrates and hydrology and recently completed NVIS assessments will provide information on riparian and catchment condition.</p> <p>Where readily available and directly relevant, other ecological data may also be used.</p> <p>The MDBA will provide this data and associated assessments for each of the SRA catchments. Ecological Associates will re-interpret this data to align with the 19 Basin Plan regions. The SRA team will assist in developing an appropriate methodology to complete this re-interpretation.</p> <p><b>2. Indicator Key Environmental Assets (IKEAs)</b></p> <p>The condition of the 18 IKEAs will be described using the best available data, which will vary from asset to asset. Information will be sought for the following themes: vegetation, fish, waterbirds; macroinvertebrates, water quality, soil chemistry and hydrology. Information will be sought from management plans and site descriptions. The MDBA has identified many relevant data sources and where possible these can be provided to Ecological Associates. Condition will be described against a reference (i.e. pre-disturbance) condition; and where the asset is a Ramsar site, against the condition at the time of listing as well. The reference condition will be inferred in many cases because data on pre-disturbance or Ramsar benchmark condition will be lacking. Each asset will need to be given a condition rating.</p> <p><b>3. Final Report</b></p> <p>The final report will detail the condition of the Basin Plan regions and assets with a summary sheet which shows the condition rating of the regions and assets.</p> <p>The final report will need to declare the data, information and method used to create the assessment for Basin Plan and IEKA</p> |

*Murray-Darling Basin Authority*  
*MD1583: Ecological Condition of Basin Regions and Indicator Environmental Assets*

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                    |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
|                                                            | <p>condition, describe which components or condition ratings can be compared between the IKEA's and describe any assumptions and information gaps.</p> <p>The Services will be conducted in accordance with the Consultant's Proposal of 23 March 2010 which is included as Annexure A to this Order for Services. If there is any inconsistency between this Order for Services and Annexure A, then the Order for Services will prevail over Annexure A to the extent of the inconsistency.</p>                                                                                                       |                 |                    |
| <b>Format of any deliverables</b>                          | <p>The following deliverables will be provided as MS WORD documents which may be submitted electronically on CD or as attachments to emails.</p> <ol style="list-style-type: none"> <li>1. Draft of all IKEA condition assessments</li> <li>2. Draft of all region condition assessments</li> <li>3. Final report with final discussion and recommendations plus any data analysis, spatial information and metadata used or created for the project</li> </ol>                                                                                                                                         |                 |                    |
| <b>Due date/s</b>                                          | The due dates for deliverables and payments are as follows:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                    |
|                                                            | <b>Deliverable</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Due date</b> | <b>Payment</b>     |
|                                                            | Draft of all IKEA condition assessments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 26-3-10         | \$17,468 incl. GST |
|                                                            | Draft of all region condition assessments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 9-4-10          | \$22,154 incl. GST |
|                                                            | Final Report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 16-4-10         | \$3,080 incl. GST  |
| <b>Issues to be considered in undertaking the Services</b> | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |                    |
| <b>Special instructions</b>                                | <p>All information provided by MDBA for the Services must be treated as Confidential and must not be disclosed to any other organisation or used for any other purpose without the prior written approval of the MDBA.</p> <p>All material prepared for the Services may be used only for the Services and all copies must be returned to the MDBA following completion of the Services.</p> <p>Ownership of all Intellectual Property created by the Services vests in MDBA immediately on its creation. Ownership of Intellectual Property in Consultant material or third party material remains</p> |                 |                    |

*Murray-Darling Basin Authority*  
*MD1583: Ecological Condition of Basin Regions and Indicator Environmental Assets*

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|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                               | <p>with the original owner. If required the Consultant will provide to MDBA or obtain a licence for MDBA to use the Consultant material or third party material in conjunction with material produced for the Services.</p> <p>Invoices must be sent to the MDBA Accounts Payable Officer and must include the following information:</p> <ul style="list-style-type: none"><li>(a) the title of the Services;</li><li>(b) the agreement number MD1583;</li><li>(c) the Purchase Order number (PD00nnnn);</li><li>(c) details of the Milestone to which the charges relate.</li></ul> |
| <b>Agreed Cost for Services including GST</b> | \$ 42 702 including all professional fees, reimbursable costs and disbursements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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**Appendix U**

- #### (4) Project Background

- a. Come to an agreement on the classification process and ensure that they are comfortable with the proposed process.
  - b. Resolve any issues around the State data (such as standardising existing classifications).
  - c. Further the application of a regionalisation of the classification.
  - d. Further the development of targets for the classified WDE.
  - e. Agree on a process to resolve targets for the classified WDE.
5. Run the identified classification and regionalisation process.
  6. Reporting and outputs as described below.

**(7) Anticipated outputs and deliverables of this Project**

1. One or a series of workshops with the above stakeholders to further develop the method as well as targets for the classified ecosystems.
2. Report outlining the application of the method for classification and a method for regionalisation as well as the results of the application.
3. A shapefile of the applied classification method across the MDB.
4. A shapefile of the regionalisation layer.
5. Intellectual property will be owned by the MDBA but there is an expectation that the outputs will also be available to the States.

**(8) Anticipated outcomes directly resulting from this Project**

This project is an essential component of key environmental asset identification and review as agreed by the MDBA Board.

**(9) Who will be the users of the Project outputs?**

The users of the project outputs will be the MDBA as part of their considerations of KEA identification as well as the States.

**(10) What involvement will other organisations and the users of the project outputs have in this project?**

Each Basin State will be represented at the workshop to clarify the process for the classification and regionalisation. CSIRO will also be represented as they are a key source of data.

**(11) How will the project outputs be disseminated to the user?**

Project outputs (Q7 above) will be disseminated to all users at the end of the project, users will also be kept informed, via regular updates, on the progress of the project.

**(12) What measures will be put in place to ensure that the project outputs are applied and the outcomes are achieved?**

Not applicable

**(13) Anticipated start date, end date, duration, and other key dates**

This project will start at sign-off of project brief and Reg9 acceptance with preliminary outputs by January 2010.

**(14) Estimated Project Cost**

Using expected timeframes (identified during the 18<sup>th</sup> November workshop) we expect that there is approximately 40 days for a consultant. At an expected rate of \$1650/day (including GST) it is estimated that consultant costs will be < \$70,000.

**(15) What project management arrangements are proposed for the project (steering committee composition, chair etc.)?**

Internally the project will be managed by Jeff Richardson, Assistant Director Environmental Watering Plan. Management of day-to-day dataset collation and analysis as well as stakeholder engagement will be managed by the consultant in consultation with Jeff Richardson.

**(16) Project risk**

| Risk Description |             |             |                                                |                                |            |                                                                                |
|------------------|-------------|-------------|------------------------------------------------|--------------------------------|------------|--------------------------------------------------------------------------------|
| Likelihood       | Consequence | Risk Rating | Activity                                       | Due Date                       | Risk Owner | Status                                                                         |
| Unlikely         | Major       | Significant | Delay in stakeholder engagement                | 31 <sup>st</sup> December 2009 | Consultant | Early conversations with the States makes this unlikely                        |
| Unlikely         | Major       | Significant | Stakeholders not agreeing on process           | 31 <sup>st</sup> December 2009 | MDBA       | Tracking, though 18 <sup>th</sup> November workshop indicates this is unlikely |
| Unlikely         | Major       | Significant | Datasets held by external bodies not available | 31 <sup>st</sup> December 2009 | MDBA       | Tracking, though 18 <sup>th</sup> November workshop indicates this is unlikely |
| Possible         | Major       | Significant | Analysis not completed within timeframes       | January 2010                   | MDBA       | Tracking                                                                       |

**(17) Ownership and management of project IP**

Intellectual property will be retained by the MDBA but the outputs of this project will be shared with key stakeholders.

**(18) O H & S issues**

Not applicable for this project.

**(19) Other issues**

None for this project.

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**Sustainability, Environment, Water, Population and Communities portfolio**

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**Appendix V**

## CONSULTANCY BRIEF

(1) Project Number 68 (2) Contract Number MDBS

(3) Project Title (20 words maximum).

### **Murray Darling Basin Authority - Salinity Targets Review**

(4) Project Background

There are currently two significant initiatives within the Murray-Darling Basin Authority (MDBA) requiring a substantive review of the existing salinity targets in the Murray-Darling Basin:

- **Water Quality and Salinity Management Plan (WQSM):** The MDBA must include salinity objectives and targets in the Basin Plan (Water Act 2007, Part 2, Division 1, Section 25 (1) (b)). These targets, together with other water quality targets, are part of the mandatory content of the Plan and will be used to monitor the condition of key environmental assets and the health of the Basin system overall. In undertaking this function, the MDBA must have regard to the National Water Quality Management Strategy.
- **Basin Salinity Management Strategy (BSMS):** The MDBA has established a series of End-of-Valley salinity targets, including a Basin Salinity Target at Morgan, South Australia. The MDBA must, at intervals of not more than 5 years, review the adequacy and appropriateness of each End-of-Valley Target (Water Act 2007, Schedule 1, Schedule B, Part III, Clause 9).

This project is to both review the suite of BSMS End-of-Valley Targets, and to recommend salinity objectives and targets for adoption in the WQSM. Please note that this review is different to the rolling five-year reviews of each catchment, which assess the impact of actions on in-river salinity.

In addition, the 2007 Mid-Term Review of the BSMS recommended investigation of options for targets that are more closely integrated with the accountability framework and allow for adaptive real-time salinity outcomes. The Water Act 2007 allows for targets to be specified in terms of a particular level of salinity being met for a particular percentage of time. The recommended suite of objectives and targets will need to consider both these matters.

Salinity targets need to be robust and meaningful from the Federal, State, regional and local communities' perspectives, to enable timely monitoring, reporting and evaluation into the future, and should include a transparent process for the revision of targets by ensuring that the Targets are SMART (Specific Measurable Attainable Realistic Timely).

States have found it difficult to provide adequate information in their annual reports on the End-of-Valley Targets. The reasons have differed but are generally considered to be due to the inadequacy of models, technical information on landscape processes, human technical resources, robust data or monitoring being undertaken. The evaluation of End-of-Valley Targets will identify limitations or risks to the Contracting Governments to meet their monitoring and reporting obligations (Water Act 2007, Schedule 1, Schedule B, Part VI, Clause 25, 26, 29, and 30). It will also help the Contracting Governments to prepare for their Rolling Five Year reviews required under section 30. Similar requirements are documented in the Basin Salinity Management Strategy Operational Protocols version 2 (2005) – Section 2.4.

## **(5) Project Objectives.**

Objectives of the consultancy:

### **1. In-river salinity data**

#### **1.1. Review BSMS End of Valley salinity data**

- 1.1.1.** Analyse End of Valley salinity monitoring data (and any other available in-river salinity monitoring data) to interpret salt load (exports) behaviour from all of the catchments within the Murray Darling Basin (refer to Independent Audit Group-Salinity (IAG) 2007/2008 Report, Appendix 3 for further information).
- 1.1.2.** Identify gaps and limitations of the existing BSMS End of Valley monitoring data (including BSMS End of Valley monitoring site location).

### **2. Salinity Targets**

#### **2.1. Review BSMS End of Valley targets**

- 2.1.1.** Review current BSMS End of Valley Targets; consider their adequacy and the appropriateness of each target to:
  - 2.1.1.1.** Contribute toward achieving the Basin Salinity Target at Morgan (South Australia) and therefore the BSMS objectives.
  - 2.1.1.2.** Minimise the risk of salinity impacts on key Basin assets – consistent with the WQSMP.

#### **2.2. Recommend a consistent Basin-wide approach to establish a suite of salinity objectives and targets for the WQSMP and BSMS**

- 2.2.1.** Recommend a consistent Basin-wide process to develop a suite of salinity objectives and targets (SMART) – in accordance with the WQSMP and to meet the needs of the BSMS.
- 2.2.2.** Recommend a suite of Basin-wide salinity objectives and targets for the WQSMP and BSMS, which may incorporate complementary real-time, or operational, targets.
- 2.2.3.** Recommend a suite of salinity monitoring sites which allow:
  - 2.2.3.1.** Reporting on the progress towards achieving SMART salinity targets; and evaluating the effectiveness of salinity management actions; and
  - 2.2.3.2.** Recommend any amendments or additions to the existing network of salinity monitoring sites.

### **3. Schedule B protocols and Salinity Strategy guideline document**

#### **3.1. Review the existing BSMS Operational Protocols and appendices related to End of Valley monitoring sites and targets**

- 3.1.1.** Make recommendations to assist the development of Schedule B protocols and a Salinity Strategy guideline document.
  - 3.1.1.1.** Develop a procedural guide to how the 'new' salinity objectives and targets are applied to BSMS Implementation.
- 3.1.2.** Review the existing minimum standards for salinity monitoring gauging stations (BSMS Operational Protocols Appendix 2.2 and 2.3).

**(6) Project Approach and Methodology.**

The setting of salinity objectives and targets must meet the requirements under the Water Act 2007 for the Water Quality and Salinity Management Plan (including having regard to the National Water Quality Management Strategy) and the Basin Salinity Management Strategy 2001-2015.

At project initiation the tenderer will determine, in consultation with the MDBA, an explicit set of definitions of objectives and targets. This will ensure consistency between the Water Quality and Salinity Management Plan, Basin Salinity Management Strategy and the National Water Quality Management Strategy.

The development of objectives and targets should utilise the best available science, and should be established to protect the high value environmental and beneficial uses of water, and other assets, that are at risk from salinity. A robust monitoring network will enable the Authority to assess progress towards achieving targets and therefore meeting objectives at a catchment and Basin scale.

The following list of documents is the primary reference list to be used for this consultancy:

*Assessment of Historical Data for the Murray-Darling Basin Ministerial Council's End-of-Valley Target Stations – CSIRO 2002.*

*Basin Salinity Management Strategy 2001 – 2015,*

*Hydrographic Review – End of Valley ECOWISE -2002*

*Independent Audit Group – Salinity, 2008*

*MBDC Exceedence Report 2003,*

*Mid Term Review Stocktake, 2007,*

*Mid Term Review, 2007,*

*Mid Term Review Independent Review Panel, 2007*

*Real-time salinity management in the Murray River: Review of current practices, 2008*

*Water Act 2007, 2007*

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Tenderers will need to demonstrate:

1. expertise in water management issues, particularly salinity
2. ability to analyse in-river water quality data
3. sound understanding of salinity management within the Murray Darling Basin
4. a sound understanding of the historical issues surrounding this project

The successful tenderer will be required to work in cooperation with the Natural Resource Management Division – Salinity Strategy Section and Basin Plan Division - Water Quality and Salinity Management Plan Section. There will be a requirement to seek cooperation from Jurisdictional NRM departments including, but not limited to, the provision of data collection.

The timing of this consultancy is to inform the draft Basin Plan which is due for internal review in December, 2009. Therefore, the project will be working to tight timelines. At a minimum, weekly progress phone meetings and monthly face to face meetings are required. The work will need to be designed so multiple tasks can be undertaken simultaneously with each task having full documentation completed by the milestone date. The Authority will be using the information immediately for both planning and implementation purposes.

The consultancy will have access to the End-of-Valley monitoring time-series data and GIS End-of-Valley Targets data provided by MDBA.

A **mandatory** briefing will be held on Friday 10 July 2009 at the MDBA Offices (51 Allara Street, Canberra). Representation at the briefing is mandatory for tenderers. The briefing will include provision of: the documents in the primary reference list; a supplementary tender document (to be returned by non-successful tenderers) providing background to BSMS salinity targets and a recommendations and issues table; and other associated documentation. The recommendations and issues (and associated questions) outlined in the supplementary document will need to be addressed as part of the consultancy project. Please contact Simon Russell (Project Manager) on (02) 6251 7783 to register your intent to attend.

(7) Anticipated outputs and deliverables of this Project

| Milestone | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Deliverable                                                                                   | Completion date  |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------|
|           | <i>Workplan</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                               |                  |
| 1         | Workplan including approach to engage with key stakeholders                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Workplan accepted by MDBA                                                                     | 22 August 2009   |
|           | <i>Part 1 – In-River Salinity Data</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                               |                  |
| 2         | 1.1 - Review BSMS End of Valley salinity data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Draft technical study report accepted by MDBA                                                 | 15 October 2009  |
|           | <i>Part 2 – Salinity Targets</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                  |
| 3         | 2.1 – Review BSMS End of Valley targets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Draft technical study report and presentation to the MDBA and Basin partners accepted by MDBA | 15 October 2009  |
| 4         | <p>2.2 - Recommend a consistent Basin-wide approach to establish a suite of salinity objectives and targets for the WQSMP and BSMS</p> <p>2.2.1 - Recommend consistent Basin-wide process to develop a suite of salinity objectives and targets (SMART) – in accordance with the WQSMP and meet the needs of the BSMS.</p> <p>2.2.2 – Recommend a suite of Basin-wide salinity objectives and targets for the WQSMP and the BSMS, which may incorporate complementary real-time targets.</p> <p>2.2.3 - Recommend a suite of salinity monitoring sites.</p> <p>Please note: all identified geo-reference points are to be provided to MDBA in ESRI GIS format, including the linkage between the reference attribution and the selection criteria, as specified under Annexure C of the contract.</p> | Draft technical study report and presentation to the MDBA and Basin partners accepted by MDBA | 30 November 2009 |
|           | <i>Part 3 – Schedule B protocols and Salinity Strategy guideline document</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                               |                  |
| 6         | 3.1 – Review the existing BSMS Operational Protocols and appendices related to salinity monitoring sites and targets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Draft report accepted by MDBA                                                                 | 29 January 2010  |
|           | <i>Final project report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                               |                  |
| 7         | Final report – including finalising the 5 draft milestone reports; and<br>Including documentation to demonstrate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Final project report and presentation to                                                      | 19 February 2010 |

|  |                                                                                       |                                          |                                       |
|--|---------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------|
|  | what issues and recommendations have been addressed from identified salinity studies. | MDBA and Basin Partners accepted by MDBA |                                       |
|  | Phone meetings                                                                        | Meeting achieved (unless face to face)   | Regular weekly time to be established |
|  | Face to face monthly meetings                                                         | Meeting achieved                         | Last Friday of the month              |

**(8) Anticipated outcomes directly resulting from this Project**

1. Robust information to enable substantial progress towards achieving the Basin Salinity Management Strategy and the Water Quality and Salinity Management Plan.
2. Salinity objectives and targets (Water Act 2007, Division 1, Part 2, Section 25)
3. Requirements met (as required of the Authority) to review End-of-Valley Targets (Water Act 2007, Schedule 1, Schedule B, Part III, Clause 9)
4. State Contracting Governments assisted to meet their monitoring and reporting obligations (Water Act 2007, Schedule 1, Schedule B, Part VI, Clause 25, 26, 29, 30)
5. Requirements met (as required of the Authority) under the Basin Salinity Management Strategy 2001-2015, Operational Protocols – Section 2.4
6. Assist the Authority to make and/or amend protocols to give effect to Schedule B.
7. A robust system of risk management for high value assets and values will have commenced.

**(9) Who will be the users of the Project outputs?**

**MDBA – Programs:**

- Water Quality and Salinity Management Plan (Basin Plan);
- Salinity Strategy;
- Water Resources Group undertaking salinity modelling;
- GIS Team

**Contracting Governments:**

- salinity planners and implementation staff in State Departments

**Regional:**

- NRM and local organisations responsible for planning and implementation of salinity management

**Local:**

- Groups applying for funding to implement integrated NRM works where salinity is a priority issue.

**Basin contractors:**

- Installing equipment, measuring and analysing salinity monitoring data.

**(10) What involvement will other organisations and the users of the project outputs have in this project?**

All the Users listed Section (9) to varying degrees will provide input and comment into parts relevant to them.

**(11) How will the project outputs be disseminated to the user?**

The outputs of this project will be distributed through:

1. MDBA Basin Salinity Management Advisory Panel,
2. Basin Plan consultation phase (2010), and
3. Internal Inter-sectional liaison

**(12) What measures will be put in place to ensure that the project outputs are applied and the outcomes are achieved?**

Outputs of this project will be used in the development of the Water Quality and Salinity Management Plan and the implementation of the Basin Salinity Management Strategy 2001-2015.

The ultimate outcome of this project is for the successful adoption of salinity objectives and targets to minimise the impact of salinity on key Basin assets and environmental values.

**(13) Anticipated start date, end date, duration, and other key dates**

**Indicative Dates**

| Contract Milestone | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Completion date  |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
|                    | Tender brief released                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3 July 2009      |
|                    | Tender Briefing Canberra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 10 July 2009     |
|                    | Tenders submitted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 24 July          |
|                    | Tenders evaluated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 28 July          |
|                    | Winning tender announced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 31 July          |
|                    | Contracts exchanged and signed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10 August 2009   |
|                    | <i>Workplan</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |
| 1                  | Workplan Including approach to engage with key stakeholders                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 22 August 2009   |
|                    | <i>Part 1 - In-River Salinity Data</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |
| 2                  | 1.1 - Review BSMS End of Valley salinity data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15 October 2009  |
|                    | <i>Part 2 - Salinity Targets</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |
| 3                  | 2.1 - Review BSMS End of Valley targets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15 October 2009  |
| 4                  | 2.2 - Recommend a consistent Basin-wide approach to establish a suite of salinity objectives and targets for the WQSMP and BSMS<br><br><i>2.2.1 - Recommend consistent Basin-wide process to develop a suite of salinity objectives and targets (SMART) - In accordance with the WQSMP and meet the needs of the BSMS.</i><br><i>2.2.2 - Recommend a suite of Basin-wide salinity objectives and targets for the WQSMP and the BSMS, which may incorporate complementary real-time targets.</i><br><i>2.2.3 - Recommend a suite of salinity monitoring sites.</i> | 30 November 2009 |

|   |                                                                                                                                                                                                        |                                       |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
|   | <i>Part 4 – Schedule B protocols and Salinity Strategy guideline document</i>                                                                                                                          |                                       |
| 6 | 3.1 – Review the existing BSMS Operational Protocols and appendices related to salinity monitoring sites and targets.                                                                                  | 29 January 2010                       |
|   | <i>Final project report</i>                                                                                                                                                                            |                                       |
| 7 | Final report – Including finalising the 5 draft milestone reports; and<br>Including documentation to demonstrate what issues and recommendations have been addressed from identified salinity studies. | 19 February 2010                      |
|   | Phone meetings                                                                                                                                                                                         | Regular weekly time to be established |
|   | Face to face monthly meetings                                                                                                                                                                          | Last Friday of the month              |

**(14) Estimated Project Cost**

The budget for this project is a maximum of \$350,000 (including GST) however tenderers should develop their own detailed costing.

**(15) What project management arrangements are proposed for the project (steering committee composition, chair etc.)?**

The Project Manager will be Simon Russell

A project steering committee will be provided by MDBA staff from the BSMS and Water Quality and Salinity Management Plan. The committee consists of:

Phil Cole (Director – Water Quality and Salinity Management Plan Section)

Alison Reid (Assistant Director – Water Quality and Salinity Management Plan Section)

Asitha Katupitiya (Acting Director – Salinity Strategy Section)

Simon Russell (Acting Assistant Director – Salinity Strategy Section)

This Committee will be Chaired by Simon Russell.

The Basin Salinity Management Advisory Committee is invited to attend the presentations and provide feedback on relevant parts of the work and liaise as necessary.

As required third party consultants may be used to independently provide advice and/or review the work.

**(16) Project risk**

This project is seen as having a low risk past the normal ones associated with any consultancies, i.e. staff issues and third party disruptions, and uncooperative partners.

**OH&S - Low**

This project will mainly be performed in offices.

The tender will include requirements addressing how any environmental issues will be managed.

**Financial - Moderate**

The cost of the project is expected to range between \$300,000-\$350,000, including GST.

**Senate Standing Committee on Environment and Communications  
Legislation Committee**

Answers to questions on notice

**Sustainability, Environment, Water, Population and Communities portfolio**

Supplementary Budget Estimates, October 2010

**Question on Notice 40**

**Appendix W**

**Annexure C – Project Brief**

**PROJECT BRIEF – Local biological effects (water quality)**

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**Project Title**

Evaluation of local biological effects (water quality)

**Project Background**

A core requirement in the development of the Water Quality and Salinity Management Plan (WQSMP) for the Murray Darling Basin is the articulation of water quality objectives and targets. For the purpose of the WQSMP the following definitions apply:

Water quality objective – A qualitative narrative statement, to be achieved, to maintain or restore the value or use of a water resource. This is similar to the 'Management Goals', as defined by the National Water Quality Management Strategy (NWQMS).

Water quality target – numerical values (or ranges) which if exceeded indicate an unacceptable risk in meeting the objective.

For example:

- To maintain the incidence of algal blooms at an acceptable level in the Lachlan River (**objective**)
- will require (*inter alia*) total P < 0.1 mg/l during baseflows (**target**)

Although objectives and targets are being developed for a number of uses, for the purposes of this project, consideration is given only to water quality impacts on aquatic ecosystems.

The NWQMS identifies a procedure for deriving water quality 'trigger' values for aquatic ecosystems. In order of preference:

1. Use locally relevant biological effects information;
2. Use local 'reference' water quality data;
3. Used default values in the 'Guidelines for Fresh and Marine Water Quality'

This project is to address the first point only. At a later stage, this information will be combined with information being separately gathered for 2 (above) to develop robust water quality targets for adoption in the WQSMP.

**Project Objectives**

To collate and analyse existing information on water quality sensitivity of aquatic ecosystems relevant for the Murray Darling Basin.

### **Project Tasks**

To meet the project objectives will require MDFRC to:

- Collate existing information relevant to the Murray Darling Basin that relates responses of aquatic organisms to specific water quality parameters;
- Collate existing information that relates responses of critical ecosystems processes such as carbon/ nutrient cycling to specific water quality parameters;
- Analyse and summarise the collated information with regard to:
  - Consistency among studies;
  - Reliability (e.g. direct measure of impacts would carry more weight than studies based on empirical relationships);
  - Plausibility of result – i.e. is the result consistent with current understanding.
- Other related activities to meet the requirements of the project objective.

### **Output**

In the first instance, only a simple output only is required. For example, an annotated table which summarises the information gathered and reliability.

### **Budget**

The Authority's budget is in the order of \$15 000.

**Senate Standing Committee on Environment and Communications  
Legislation Committee**

Answers to questions on notice

**Sustainability, Environment, Water, Population and Communities portfolio**

Supplementary Budget Estimates, October 2010

**Question on Notice 40**

**Appendix X**

## **Annexure C – Project Brief**

### **Project title**

*The establishment of water quality targets for the protection of aquatic ecosystems for the Murray– Darling Basin*

### **Project Objectives, scope and outcomes**

The overall aim of this project is to establish water quality targets for aquatic ecosystems for selected indicators across the Murray-Darling Basin.

The project builds on the outputs of the two previous consultancies:

- Evaluation of local biological effects
- Water quality summaries to support the establishment of water quality targets for the protection of aquatic ecosystems for the Murray-Darling Basin

These outputs, together with other relevant information, will be used in this consultancy to establish water quality targets for the protection of aquatic ecosystems for the Murray-darling Basin.

### **Project approach**

Six major tasks are to be undertaken:

1. From the data collected in the water quality summaries project, assess longer term trends in water quality data at ‘reference’ sites;
2. For each MDBA region tabulate reference data values, ANZECC/ARMCANZ guidelines, local guidelines and objectives and cause effect levels;
3. Determine water quality targets, including approaches for dissolved oxygen and water temperature;
4. Assess condition of sites across the basin and discuss regional water quality patterns;
5. Develop the approach to the water quality assessment program;
6. Produce final report incorporating comments.

### **Outputs:**

The major output of the project is the final report incorporating:

- Previously completed chapters from “Water Quality Summaries” project;
- Summaries of appropriate ANZECC/ARMCANZ guidelines for each MDBA region, where available State water quality guidelines and objectives for each region, cause effect information, and, the reference site data results for each region;
- Recommended water quality targets based on the data, information and expert judgement available for the basin;

- The assessment of sites across the basin against the recommended targets and an assessment of patterns across the basin;
- A water quality assessment program developed to provide adequate data to use the targets; and,
- Potential next steps to further refine basin targets.

### **Consultation with the Authority**

This project will require regular updates and consultation with the Murray-Darling Basin Authority and its nominated project manager. Engagement and consultation will be particularly important for tasks 3 and 5 (refer 'Project approach').