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Submission to the MDBA Sustainable Diversion Limit Issues Paper

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Introduction

The National Irrigators' Council (NIC) is the peak body representing irrigators in Australia. The NIC's objective is to develop projects and policies to ensure the efficiency, viability and sustainability of Australian irrigated agriculture and the security and reliability of water entitlements. NIC currently has 21 member organisations covering a variety of states, regions and commodities.

While this document has been prepared by the NIC, each member reserves the right to independent policy on issues that directly relate to their areas of operation, or expertise, or any other issues that they may deem relevant.

Overview

The National Irrigators' Council (NIC) welcomes the opportunity to have input into the development of the Murray Darling Basin Plan, in particular the issue of Sustainable Diversion Limits (SDLs).

It would appear that the process for managing the Basin's resources to "optimise the economic, social and environmental outcomes" (as the Object of the *Water Act 2007* puts it) should be relatively simple:

Quantify what water is available on average, take out critical human needs, and with the remainder determine what is needed to "optimise" outcomes for the environment and consumptive use.

In our submission, the latter process requires a balancing act that will ensure that while neither use is likely to have *all* of its needs met, each should be "optimised".

NIC is concerned however that the focus of other parts of the Act, and subsequently this issues paper, give far more weight to the needs of the environment at the expense of consumptive users such as irrigators. Our submission attempts to address this imbalance.

In this respect, we note the findings of the Productivity Commission in its draft study into Market Mechanisms for Recovering Water:

*"The ideal level of 'sustainability' is one that has regard for all uses of water and maximises the overall net benefits to the Australian community. Community preferences need to be recognised to get the right balance between competing environmental assets, and between competing environmental and consumptive uses."*¹

Irrigators support a sustainable industry working in tandem with the environment. The first principle in the NIC's platform states:

- *Irrigators care for the environment and the ecological health of the rivers and water resources that we rely on is of fundamental importance to us. Irrigated agriculture must be sustainable.*

¹ Productivity Commission Draft Research Report – Market Mechanisms for Recovering Water in the Murray-Darling Basin, pg XXVII

But having fought to have social and economic considerations taken into account during debate over the Act, irrigators are now concerned that these issues are to be paid lip service at best and will have little or no bearing on the setting of new SDLs. It would appear from this issues paper that the social and economic analysis to be included in the development of SDLs will be merely *descriptive* of what might happen when less water is available, but will not influence in any meaningful way decisions as to the quantum of the cut to entitlements that may be necessary.

It is akin to a bystander describing a house fire as it occurs but doing nothing to help.

Irrigators are very concerned that the production of food and fibre in an already hungry world is being paid scant regard and that the Basin Plan will go far beyond its aims of a return to environmentally sustainable levels of extraction and could indeed lead to the devastation of parts of inland Australia to this country's great detriment.

We use this strong language not to be alarmist but as a warning to the MDBA and the Commonwealth of the absolute imperative to get this right. Irrigators expect and demand that social and economic analysis is used as part of the decision-making process for setting SDLs, not merely included as a descriptor of what the impacts might be.

The NIC is very concerned about the timeframes involved in the development of the Basin Plan and the limited window available for input and scrutiny. We note numerous instances of "work to be done" identified in the issues paper (see Attachment A) and submit that if the MDBA is struggling to complete analysis in the time available, it should seek an extension of time from the Minister.

While the MDBA has been in operation for over a year, we have little over a month to provide comment on the very complex issue of SDLs. NIC will take a constructive approach to engagement and we welcome the opportunity for this early engagement, above and beyond that which is set out as formal consultation in the Act. While we acknowledge that this will not be the last opportunity for input, we are nonetheless concerned that on an issue of such significance to them, their businesses, their families and their communities, irrigators have only five weeks in which to respond.

3. Context and background

3.4 Quantifying the Basin's water resources

As stated above, NIC is concerned that the *Water Act 2007* places too much weight on environmental considerations. Nonetheless part of the object of the Act states:

3(c) in giving effect to those agreements, to promote the use and management of the Basin water resources in a way that optimises economic, social and environmental outcomes.²

In other words, the Act does not suggest that environmental aims must take precedence over all other outcomes, but each of them should be optimised. This will require balance between the respective considerations. Again we refer to the findings of the Productivity Commission as outlined above.

NIC is concerned at comments in the issues paper that “socio-economic studies will help determine the level of impact of changes in diversion limits and these findings will be included in products associated with the Basin plan” (our emphasis). In our submission this is not good enough. Social and economic impacts should not simply be quantified – they should be taken into consideration when setting the SDLs.

To give a hypothetical example, should the environmental requirements of a particular water resource area require a cut in consumptive use of 20 per cent, but social and economic studies show that the local community would suffer irreparable damage from anything greater than 15 per cent, then the level of cut should be reconsidered to account for those social and economic concerns.

NIC does not suggest this will be easy, but in our submission it is critical if we are to optimise all outcomes.

3.5 Identifying characteristics of environmentally sustainable levels of take

NIC believes that the definition of “key” environmental assets is critical to getting the balance right between environmental needs and economic use of water. We note that this discussion paper outlines how the MDBA intends to identify the key assets but has not yet done this. It is important that all parties understand that not every environmental asset in the Basin can be protected and in the interests of ensuring that understanding is reached by all parties, a list of the “key” assets (and the environmental performance measures associated with protecting and restoring them) is released as soon as possible.

It is also important to understand that the environmental assets of the Murray Darling are adaptable and the Environmental Watering Plan should reflect nature’s variability. Not every asset will require water every year.

NIC takes issue with the Authority’s definition of “productive base”. We believe this is not the definition that was initially intended in the drafting of the Act, where productive base referred to the economic characteristics of water, not environmental characteristics such as water quality and volume. Contrary to the Authority’s view, we believe this term does in fact refer to the “actual use of water” for purposes such as agricultural production.

² Water Act 2007, p 2

We believe that the wider community associates the term “productive base” with the capacity of the resource to contribute to the economic and social fibre of the community and that the Authority’s definition could lead to confusion.

3.9 Relationship between economic, social and indigenous assessments and SDLs

This section of the paper again highlights our concerns about the usefulness of social and economic analysis, as currently proposed. The paper states that once draft SDLs have been set, analysis of the social and economic implications will be undertaken and the advice provided to the MDBA Ministerial Council so that they can “make comments on the social and economic impacts of the Basin Plan”.

If social and economic analysis is to be undertaken only to describe what will happen, or to enable Basin States and other parties to “make comment” then the exercise will be pointless.

Such analysis must play a genuine role in the setting of SDLs.

NIC notes and supports the intention of the MDBA to undertake analysis at local scale in those areas most dependent on irrigation and therefore most likely to be affected. NIC would like to suggest that this analysis not be restricted to that level but be conducted for all irrigation areas, noting that some smaller areas might be impacted differently to larger ones. Basin wide analysis may be useful on some levels but will do little to demonstrate true impacts in areas most affected.

4. Issues

4.1 Which water resource plans should be used?

NIC concurs with the proposed approach of using existing state boundaries for WRPs. We note however that, as yet, Victorian WRPs have not been set under regulations to the Act. This is a significant concern for all irrigators, including those in Victoria, who need the certainty and security of knowing what constitutes their water resource plans for the purposes of the Basin Plan. We note that the issues paper identifies Victorian plans as being in place until 2019 - while this appears to be the commonly held view, we are perplexed as to how this can be reported as an official position. Until such plans are prescribed under the regulations, Victorian irrigators do not have any certainty and there is no guarantee of transparency and fairness for them or other irrigators right across the Basin.

In relation to catchments or groundwater areas that extend across state boundaries, we note the intention to treat them as whole units for the purposes of SDLs, before specific provisions for each state WRP are specified. It is NIC's understanding and expectation that any water recovered for the environment – either through purchase of entitlement or via infrastructure investment – will be used to offset reductions in SDLs *in the jurisdiction* from which it was recovered.

Regarding the establishment of expert panels for groundwater systems in each jurisdiction, NIC submits that at least one groundwater user should be included on such panels. Scientific advice is not the only legitimate source of information and groundwater irrigators would be able to bring significant practical experience to the table. NIC would be happy to suggest names.

4.2 Which forms of take should be limited by SDLs?

NIC concurs with most of the definitions of “take” as provided in the issues paper. We accept that all licensed or authorised activities should be included as “take” to the extent that these forms can be measured “more or less accurately”.

NIC also supports the principle that take should be based on “net” water use, noting that in some instances unused water is returned to the Basin.

It is our view that “incidental take” (afforestation or mining etc) should be authorised or licensed and therefore should not be seen as a separate category (assuming it is not temporary interception and therefore is a net “taker” of water). We also submit that the MDBA may need to further define this term – does its use of incidental allude to minor amounts of water or to the interception of water which is not the main purpose of the activity. If the latter, the volumes may still be significant, and in our view, should be authorised or licensed.

We do not agree that unauthorised take should be included in setting SDLs and we would ask why the MDBA has included this category at all. Does the MDBA have a plan in mind for unauthorised take that it has not yet revealed? Apart from the fact that, by definition, it is difficult to account for such water use, inclusion of illegal take is tantamount to acceptance of the practice. NIC is strongly of the belief that water theft is a crime that should not be tolerated. Rather than giving unauthorised take tacit approval, appropriate action should be taken against any water theft. Unauthorised take therefore cannot be included in setting SDLs.

4.2.1 *How should interception activities be treated?*

NIC submits that all licensed or authorised interception activities should be included in the SDLs. In saying this we recognise that some jurisdictions (ie NSW) have not yet licensed floodplain harvesting but it is authorised by the government in other ways, including by inclusion in Cap compliance calculations.

We accept that significant interception activities may need to be licensed if they are not already, but on the proviso that legitimate, historically accepted use of water should not be penalised due to jurisdictions having not yet met the water access entitlement provisions of the National Water Initiative (section 25 i).

4.3 *How should SDL provisions be determined in a way that optimises economic, social and environmental outcomes?*

As stated above, NIC is concerned at the apparent contradictions in the Act which have been reflected in this paper when it comes to social and economic impacts. In particular we take issue with the statement (pursuant to the Act) that the “Basin Plan is required to minimise social and economic impacts” through the temporary diversion provisions. This is clearly at odds with the object of the Act which states that economic, social and environmental outcomes should all be optimised.

NIC notes the intention of the MDBA to consider both within valley and inter-valley sharing to source water to satisfy environmental watering requirements and we support the approach of minimising any average reduction in water availability to entitlement holders and further refinement to consider specific impacts on water users.

However we are concerned at the reference to the “nature of the types of enterprises that would be affected” by reliability changes. A key principle is that all entitlements of a particular characteristic (ie; general security, high reliability, supplementary etc) should be treated the same. General security is general security, regardless of what you are using the entitlement for. With the development of markets, enterprises requiring different characteristics in their water entitlement (such as permanent plantings needing high security water) are able to purchase on the open market. Picking winners and losers should not be the role of the Basin Plan.

We strongly support any opportunities to ameliorate impacts while continuing to meet environmental objectives. There will no doubt be options available to ensure that the needs of the environment can be met without compromising the needs of irrigators, for example by the timing of environmental flows outside the peak irrigation season for instance.

4.3.1 *Inter-valley sharing of environmental water contributions*

Decisions on the source of water to meet environmental objectives should be made by environmental water managers, however they need to be made to remove or at least reduce any third party impacts caused by environmental watering. Environmental managers will make decisions based on matters such as proximity, delivery efficiency and capacity, and availability of held environmental water.

The prospect of social and economic considerations being used to determine how inter-valley sharing occurs is alarming. In NIC’s submission, it is entirely inappropriate to consider matters such as the gross value of irrigated agricultural production (GVIAP) or value per megalitre in a particular

valley when determining the source of environmental contributions. In relation to the latter, we refer the MDBA to an ABARE report that states:

“In addition, the view that some industries use water inefficiently is perpetuated by inappropriate and misleading measures of economic efficiency, such as megalitres of water used per hectare (or unit of output) or revenue earned per megalitre of water used.”³ (our emphasis)

Notwithstanding the fact that GVIAP in particular industries rises and falls constantly, in NIC’s submission the market is the mechanism by which water should be directed to its most productive use.

ABARE reinforces this view by continuing:

“The demand for water in any irrigated activity is a function of its price. Given this, the best way to ensure water is used efficiently across regions and industries is to let price signals prevail.”⁴

Not through an environmental plan that tries to pick winners and losers. Inevitably when governments try to do this, they fail.

4.3.2 *Proposed studies*

NIC notes the proposed social and economic studies but again reiterates that they cannot simply be used to describe the potential impacts, they must be used to balance the needs of the environment and the community. We note that “social” and “economic” are indeed different issues and while one may follow the other in some respects, they should be examined separately.

In conducting this analysis, NIC urges the MDBA to understand that a simplistic economic return argument cannot be the only basis for assessing impact in regions reliant on irrigation. The Authority must consider matters such as food security on a national and international scale, the size, value and employment characteristics of secondary and tertiary industries reliant on water, the adaptability of regions to change and their suitability for alternative industries (ie tourism, manufacturing etc) and the wider contribution of irrigated agriculture to national welfare.

NIC submits that while social and economic impact analysis will be vital, equally important will be the need to minimise that impact by ensuring that the science used to assess the needs of the environment is indeed the “best available”, factually credible and peer-reviewed. NIC is concerned at the proposed reliance on the CSIRO Sustainable Yields Audit given that our members have previously identified a number of factual inaccuracies in that work.

It is equally important words such as “key assets”, “protect” and “restore” are adequately defined so as to ensure balance between the needs of the environment and consumptive users. Again, it will not be possible to “protect” and “restore” every asset in the Basin.

The issues paper identifies the available timeframe as a challenge in gathering social and economic information. While this may be true, we note there is not a similar qualification for the

³ ABARE 09.4 – Irrigated agriculture in the Murray-Darling Basin: a farm level analysis by region and industry.

⁴ Ibid

environmental work which clearly will be undertaken in the available timeframe. Getting useful social and economic analysis completed might be hard, but it must be done.

NIC is concerned at the volume of analysis, as identified in the issues paper, which is yet to be completed by the MDBA. We attach a list of references from the paper at Attachment A. Given the size of this volume of work, NIC is concerned at the ability of the MDBA to undertake all that which is necessary before drafting the first Basin Plan. NIC suggests that if the MDBA is unable to complete the necessary work within the proposed timeframe, then it should seek an extension of time from the Minister.

In relation to engagement, we offer this advice to the Authority – if you are not serious about genuinely engaging with and responding to communities, then don't bother seeking our input. Previous attempts at consultation on water and other issues have led to serious disillusionment among communities when they realise their views have been completely ignored.

4.4 How should surface water-groundwater connectivity be dealt with?

NIC supports the intention to set separate SDLs for surface water and groundwater and appreciates the connectivity between the two.

We also understand that connectivity is not generally well understood, or at least is not as advanced as the science relating to surface water. In this respect, we expect that any decisions taken on groundwater should be based on peer-reviewed science so that irrigators are not penalised by decisions based on assumptions. If the science is not clear, then it must be developed further.

NIC also notes that a number of groundwater-use areas have already been the subject of programs to make them sustainable. These programs should be taken into account by the Authority when setting groundwater SDLs.

As noted earlier, NIC believes groundwater irrigators should be represented on any expert panels to be formed to provide advice on groundwater issues in each jurisdiction.

4.5 How should SDLs be set and expressed?

NIC notes the basic approach proposed by the MDBA which, as we understand it, is to:

- use existing models to determine historical water use and inflows and how these can be changed to meet environmental requirements;
- apply three future climate change scenarios to the models to see how the models perform; and
- set SDLs that allow environmental water requirements to be met through limits on long-term average diversions, annual take within the long-term average and the sharing of the risks of climate change.

NIC is not in a position to comment on the best models to use for this exercise but notes that they should be as transparent as possible so that the community clearly understands the approach being taken to manage water resources, including on an annual basis. NIC notes the MDBA's view on the mechanism currently used to calculate Cap compliance. However we are not convinced that that mechanism would not be useful, with some adjustment, for the purposes of setting and calculating SDLs and request that the MDBA review its position on the Cap mechanism.

As an aside, we note that the Basin Plan may present an opportunity for the adoption of sophisticated models that could provide more information to irrigators to assist in risk-management in their businesses. Water management tools that allow irrigators access to real-time information relating to their allocations would be extremely useful and we encourage the MDBA to consider these types of secondary advantages when choosing water management tools.

In using the basin's water resources it is clear that critical human needs (CHN) must be allocated first and that this will generally be a set volumetric limit (subject to change slowly over time to adjust for population growth).

However given the natural variability of Australian water resources, it would seem obvious that allocations for the environment and consumptive use should be based on a percentage of the available pool in any given year, as is the case now for consumptive use.

A fixed amount of water would not be appropriate or practical given the wide variability of Australia's climate. A percentage basis allows short term climate variability risks to be shared between the environment and consumptive use. Australia's environmental assets have always been subject to variability and are well adapted to our "droughts and flooding rains". There should be no intention to ensure the environment has access to the same amount of water every year.

Which brings us to another fundamental, long-term question – if future climate change means there is less water available overall, does the environment's share remain the same? NIC strongly believes that the answer must be "no". It is our position that percentage shares should be maintained so that, if predictions of less water availability in future are realised, the environment would share the reduction proportionately with irrigators. The environment has adapted and coped over millennia, and we should not now try and set the condition of environmental assets at some indiscriminate baseline level that may become impossible to meet in future.

In any event, the MDBA has made clear that the Basin Plan will not be a one-off document and that it will be an "ongoing and dynamic process"⁵. As such there is no need at this stage for the Basin Plan and SDLs to consider *potential* long-term impacts of climate change as these will be able to be considered in future revisions as more up-to-date and accurate information comes to hand. As the issues paper makes clear in Attachment A, there is a "high degree of uncertainty surrounding future climate"⁶ which only reinforces that decisions that will adversely impact on irrigators should not be taken now, when they can be made in future years with greater certainty.

END OF SUBMISSION

⁵ The Basin Plan – A Concept Statement, pg i

⁶ Page 46

ATTACHMENT A

Identification of unresolved Issues/work in progress/work yet to be completed as indicated in MDBA SDL Issues Paper

Table based on analysis originally completed by Coleambally Irrigation Cooperative Ltd

Issue	Reference
<ul style="list-style-type: none"> • Assess SDL options associated with meeting an initial draft set of environmental water requirements utilising hydrological modelling • Undertake economic and social assessments across the Basin as a whole and of those irrigation areas of the Basin which account for the largest proportions of current water diversions • Assess SDL options and economic and social assessment together to inform how, where and when water can be delivered to meet environmental requirements at least social and economic cost. • After consideration of SDL options and economic and social assessments, there may be a need to review the SDL options and re-run the hydrological modelling and the analyses of potential economic and social impacts. 	Pg 5
<ul style="list-style-type: none"> • Quantify the Basin water resources • Identify characteristics of environmentally sustainable levels of take • Determine environmental water requirements • Develop an environmental watering plan to coordinate the management of environmental water across the Basin • Develop a water quality plan and a salinity management plan that identifies the key causes of water quality degradation in the Basin and sets water quality and salinity objectives and targets for the Basin water resources • Understand which water resource plan areas should be used • Understand which forms of 'take' should be limited by SDLs • Determine how to determine SDLs which best optimise economic, social and environmental outcomes • Determine how to deal with surface water – ground water connectivity • Determine how SDLs should be set and expressed • Understand the relationship between the Basin Plan and state-based WRPs 	Pg 13
<ul style="list-style-type: none"> • Set out the requirements with which state WRPs will need to comply in order to be accredited. • Undertake river system modelling to quantify the surface water resources of the Basin, building upon the approach applied in the Murray-Darling Basin Sustainable Yields project 	Pg 14

<ul style="list-style-type: none"> • Using river system modelling, describe the size, extent, connectivity and variability of surface water resources at a range of scales from flow quantities and variability at specific locations, to catchment and whole of Basin water availability. • Using river system modelling, determine the impact of levels of use on the Basin water resources • Adapt the river system modelling used in the Sustainable Yields project for the purposes of developing the Basin Plan. • Describe groundwater resources of the Basin in terms of their average annual yield • Refine the recharge estimates for Basin groundwater systems produced in the Sustainable Yields project. 	Pg 15
<ul style="list-style-type: none"> • Better understand the profile of the Basin community, where water is used, where it is sourced from and the wealth that it generates, along with the benefits it provides to communities, including indigenous communities, in cultural and non-commercial values • Identify how key environmental assets, key ecosystem functions, the productive base and key environmental outcomes are interlinked and once identified, how they will be integrated and reviewed to ensure that they meet the requirements of the Water Act, and are consistent with the purposes of the Basin Plan. • Identify water-dependant ecosystems and sites with ecological significance by developing an inventory of recognised sites and water-dependent ecosystems in the Basin, and by mapping these back to physical locations in the Basin • Develop and apply criteria to determine which environmental assets are to be considered key for the purposes of the Basin Plan • Define ecosystem services as part of the environmental assets and ecosystem functions approach and to integrate this into the planning framework • Consult with Commonwealth, State, Territory, Regional bodies and scientific experts to identify additional environmental assets for inclusion in the inventory of key environmental assets. 	Pg 16
<ul style="list-style-type: none"> • Identify the fundamental physical processes relating to hydrology and geomorphology that underpin the key ecosystem functions of the Basin water resources • Identify the spatial and temporal scales at which the physical processes occur • Identify the spatial and temporal performance of the physical processes that is required to ensure that key ecosystem functions are not compromised. 	Pg 17
<ul style="list-style-type: none"> • Develop a conceptual model for the performance of physical processes underpinning key ecosystem functions, which will be applied consistently across the Basin according to a functional categorisation of its streams • Develop a layered set of performance targets for the processes, which can be applied spatially across the Basin 	Pg 18
<ul style="list-style-type: none"> • Assess on a case by case basis whether proposed SDLs ensure that sufficient water is available to protect the key environmental assets and 	Pg 19

<p>key ecosystem functions and to ensure that the productive base and key environmental outcomes of the water resource are not compromised</p> <ul style="list-style-type: none"> • After the environmentally sustainable level of take characteristics are identified and characterised, determine the environmental watering requirements of key environmental assets and key ecosystem functions as a key contribution to the calculation of the environmentally sustainable level of take and integrate the characteristics and undertake a Basin-wide review and gap analysis • Seek inputs from experts to provide scientific advice on the robustness and defensibility of the resulting network of assets and functions. • If needed, prioritise the critical gaps, seek further data to address these gaps, and revisit the inventory of water-dependent ecosystems and sites with ecological significance 	
<ul style="list-style-type: none"> • Using a hydrological regime., define the environmental watering requirements for key environmental assets • Use digital elevation models, outputs from hydraulic models, historic flood extents and vegetation maps to determine the possible extent of inundation extent and flow rates • Determine the flow regime required by the different plants and animals represented in the environmental objectives for each asset 	Pg 20
<ul style="list-style-type: none"> • Using a conceptual framework for the performance of functions, applied consistently across the Basin, determine the functional categorisation of its streams and establish and employ a layered set of performance targets for the functions which can be applied spatially across the Basin • Consider all aspects of an ‘environmentally sustainable level of take’. 	Pg 21-22
<ul style="list-style-type: none"> • Specify the overall environmental objectives for the water-dependent ecosystems of the Basin • Specify targets to measure progress against these objectives • Specify an environmental management framework for environmental water • Specify the methods used to identify environmental assets requiring water • Specify the principles and methods to be used in setting the priorities for applying environmental water • Specify the principles to be applied in environmental watering. 	Pg 22
<ul style="list-style-type: none"> • Address the unsustainable take of water for consumptive uses by limiting the amount of water that can be taken (through SDLs) and ensuring that the environmental water resulting from SDLs effectively contributes to achieving the environmental objectives 	Pg 23
<ul style="list-style-type: none"> • Develop salinity and water quality targets and a range of actions that will be required to achieve these targets 	Pg 24
<ul style="list-style-type: none"> • Give consideration to incorporating groundwater resources into catchment based WRP areas where the groundwater system lies wholly within the surface water catchment bound 	Pg 22
<ul style="list-style-type: none"> • Specify SDLs by using other elements of the Basin Plan, such as the environmental watering plan, WRP requirements and trading rules to ensure that some of the more broadly defined forms of take (e.g. 	Pg 29

releasing water from a wetland) occur in such a way that they do not contribute to compromising 'environmentally sustainable level of take characteristics'.	
<ul style="list-style-type: none"> • If required, assess the range of interception activities with, or with the potential to have, significant impacts on a Basin water resource, to determine whether they are consistent with the relevant WRP before they are approved by the Basin State • Determine thresholds of significance for each form of interception activity 	Pg 31
<ul style="list-style-type: none"> • Develop the valley environmental water sharing concept and then refine to focus on minimising any average reduction in water availability to entitlement holders, and subsequently examine and estimate as far as possible any specific impacts on water users. In the process, examine the nature of the changes in water availability in particular sequences (e.g. drought) rather than just the long-term average impact of such changes and examine changes in the reliability profile of water supply to particular entitlements (with a particular reference to the nature of the types of enterprises that would be affected). Explore opportunities to ameliorate impacts whilst continuing to meet environmental water requirements. 	Pg 32
<p>Undertake studies to:</p> <ul style="list-style-type: none"> • Describe the social, cultural and economic circumstances of the Basin to help build the MDBA's understanding of the context in which SDLs and the Basin Plan are being developed • Permit a quantitative assessment of the likely economic and (to an extent) social impacts of scenarios arising from various SDLs, to allow comparison of the likely implications of alternative SDL options • Permit a qualitative analysis of the likely social, economic and cultural impacts of adopting alternative SDLs, which will provide contextual information to enable better judgements to be made. 	Pg 33
<ul style="list-style-type: none"> • Set separate SDLs for surface water and groundwater that take account of current and future interactions between surface water and groundwater resources and prevent double accounting 	Pg 34
<ul style="list-style-type: none"> • Use river system and groundwater simulation models to determine SDLs that ensure adequate water is available for identified environmental water requirements (including requirements for water quality and salinity targets) in a way that optimises social, economic and environmental 	Pg 37
<p>In order to develop surface water SDLs using river system models:</p> <ul style="list-style-type: none"> • Determine the implications for the current patterns of consumptive water use of providing the environmental water requirements by investigating combinations of changes in hydrologic management strategies that would achieve these requirements. This step would initially be carried out using the historic climate scenario (1895-2009) • Investigate how the changed hydrologic management regime performs under a range of possible future climates in terms of sharing the risk of climate change, and adjust the hydrologic management strategies so that environmental requirements are met and, in doing so, social, economic 	Pg 39

<p>and environmental outcomes are optimised under each climate scenario.</p> <ul style="list-style-type: none"> • Specify SDLs and related elements of WRP requirements so that environmental water requirements are able to be achieved through limits on: <ul style="list-style-type: none"> • the long-term average amount of water that can be taken • the annual variability of take within the long-term average limit • the way in which long-term average diversions share the risk of climate change 	
<ul style="list-style-type: none"> • Undertake modelling on a catchment scale and a Basin scale using the framework developed by CSIRO for the Basin Plan. 	Pg 40
<ul style="list-style-type: none"> • Convert the results from modelling runs into specifications for SDLs and related WRP requirements • Develop compliance arrangements 	Pg 41