

Basin Plan Water Resource Plan Requirements Position Statement 3C Method for determining take

POLICY ISSUE	How will models included in the method to determine permitted take or the method to determine actual take be assessed?
REFERENCES	Basin Plan s10.10, s10.12, s10.15, s10.45 and s10.49

MDBA POSITION STATEMENT
<ol style="list-style-type: none"> 1. If a WRP uses a model to determine permitted or actual take, the model must meet the requirements of s10.10 (for permitted take) and s10.15 (for actual take) of the Basin Plan. 2. Models will be assessed using the criteria listed in Attachment 1. The criteria are based on requirements under the Basin Plan for a model used for the purposes of s10.10 or s10.15. <ol style="list-style-type: none"> a. Guidance notes are provided in Attachment 1 for each criteria to explain the supporting evidence sought. b. Providing the supporting evidence assists in demonstrating how the model development has been based on best available information (s10.49). c. MDBA will review the model, based on the assessment criteria, and provide the State with feedback via an assessment report. 3. It is not a requirement to provide a BDL model, however, the guidance notes include consideration as to whether the SDL model also supports a demonstration of BDL. 4. It is desirable to have models in SOURCE but it is not an essential requirement. 5. Where a model is used to determine actual take by estimating the quantity of water taken by a form of take, the estimate of actual take: <ol style="list-style-type: none"> a. must be done consistently with the method to determine permitted take under s10.10; b. be able to demonstrate how it will use the best available information, at the time each year, in order to estimate the quantity taken (s10.15(2)), and c. be able to demonstrate how it will account for any growth in use in a form of take included in the model (including under s10.13). 6. Where a model is provided as the method for determining actual take, the water resource plan must specify measures for maintaining, and the timeframe for improving where practicable, the proportion of take that is measured, where practicable (s10.45).

Rationale

Assessment Criteria (Item 2)

The assessment criteria listed in Attachment 1 are based on requirements under the Basin Plan for a WRP. The guidance notes are in the form of questions directed at establishing whether the criteria have been met. They are included to assist in the development of best practice models. They also indicate what information will be sought by MDBA in order for it to be satisfied that the criteria have been met, when it is assessing a WRP for the purposes of making a recommendation to the Minister about accreditation.

Assessment Report (Item 2c)

An assessment report will be provided to the State for review once MDBA has assessed the model against the criteria. The assessment process for SDL models is a bilateral process, whereby each State and the MDBA work together to ensure the State's WRP model will meet the requirements of the Basin Plan, as outlined in the criteria checklist in Attachment 1. The State will have the opportunity to explain any issues of concern to the MDBA or modify the model if required before the MDBA makes a recommendation about accreditation of the WRP.

BDL Model (Item 3)

Where the method for permitted take includes a model it is a requirement to provide an SDL model. The MDBA does not require a BDL model to be developed to meet this requirement; however where a State does develop a BDL model to support its demonstration of meeting the SDL guidance notes are provided in Attachment 1 for how the BDL will be considered.

SOURCE Model Practice Notes (Item 4)

The MDBA is developing, in collaboration with the Basin States, a set of practice notes for the development of models in SOURCE. These can be used as guidance to be followed for various elements of the SOURCE model development. If a SOURCE model provided to the MDBA does not follow the practice notes, MDBA will request an explanation of the reason for this. SOURCE practice notes are available separately (MDBA Reference: D15/60850).

Actual Take (Item 5)

Using a model for estimating actual take is acceptable where actual take is not measured, and an estimate is based on the best information available at the time. If a model is used for estimating actual take it must be consistent with the method or model accredited under s10.10 for determining permitted take.

It is noted that a determination of actual take must be made on the best information available at the time, and that it is expected that over time, measuring methods will improve. It is a requirement of s10.45 for a WRP to specify measures for maintaining and improving, where practicable, the proportion of take that is measured.

Where a determination of actual use for a form of take is to be made by estimating the quantity of water actually taken, the MDBA will seek evidence that establishes that the model will use

MDBA Reference:	D15/15099
------------------------	-----------

the best available information in order to estimate the quantity taken (s10.15(2)), including evidence that demonstrates that any growth in use in a form of take will be accounted for in the estimate. The type of evidence that might need to be provided would be discussed with the State at the time of assessing a WRP submitted for accreditation. Methods such as comparing water balance models of observed flow with modelled flow, conducting surveys or using satellite imagery, might be adequate.

Additional Issues to note

The way forward with cap factors may result in a broader discussion with States about their planning assumptions, in preparation for 2019. This planning assumptions work may bring forward aspects of the model accreditation work earlier than the current timetable for model accreditation.

MDBA Reference:	D15/15099
-----------------	-----------

(Note for the purposes of WRP assessment, a 'model' is assumed to be the software engine, system files, and all the input data used to operate to model).

BASIN PLAN CHAPTER 10		ASSESS	ASSIST	
Principle section	Related section(s)	REQUIRED UNDER BASIN PLAN	Guidance note #	GUIDANCE NOTES
		<ul style="list-style-type: none"> these criteria <i>must</i> be met as they are requirements for the models specified in s10.10, s10.12, s10.15, and; these criteria demonstrate the use of best available information as required under s10.49. 		<ul style="list-style-type: none"> these guidance notes are included to assist in the development of models which meet the requirements under the Basin Plan; and the development of best practice models. these guidance notes also indicate what information will be sought by MDBA in order for it to be satisfied that the criteria have been met, when it is assessing a WRP for the purposes of making a recommendation to the Minister about accreditation.
S10.10		ANNUAL DETERMINATIONS OF WATER PERMITTED TO BE TAKEN	1	DOCUMENTATION AND MODEL OVERVIEW
	s10.10(1)	Is the method – for determining the maximum quantity of water that the plan permits to be taken for consumptive use during a water accounting period – a model?	1.1	Has a complete model report been provided which documents all the matters necessary to allow peer review consistent with the Basin Plan and these evaluation criteria?
	S10.10(2)	<ul style="list-style-type: none"> Does the WRP set out the method, for example, by reference to a model report? 	1.2	Has sufficient effort been directed to documentation? (i.e. is the model report readable and clear?)
			1.3	Where previous reports, including any peer reviews, are essential to evaluation of the model, have copies of these reports been provided?
			1.4	Is there a clear statement of objectives in the report? Do the objectives include use of the model to compute SDL(s) (and BDLs) consistent with Chapter 10 of the Basin Plan?
			1.5	In the model report, has the definition of SDL in Schedule 2 of the Basin Plan been correctly interpreted and documented? Where interpretations or assumptions have been made concerning the application of Schedule 3, have these been documented and are they appropriate?
			1.6	Have the WRP area(s) and the SDL resource unit(s) to which the model has been applied been clearly and accurately defined? If the model is applied to only part of these area(s) or resource unit(s), have the areas of application been clearly defined?
	s10.10(3)(a) s10.12(1)(a)	Has the model accounted for all forms of take from the SDL resource unit and all classes of water access right?	1.7	Is there a clear statement, in the model report, which specifies the 'forms of take' that are included in the model and those which are not? ¹ Should other forms of take have been included in the model, given its coverage and application within the WRP(s)?
	s10.10(2)	Has the model been designed to be applied after the end of the relevant water accounting period, having regard to the water resources available during the period?	1.8	Has the model report established that the model can be used to provide a practical and reliable method to determine the annual permitted take in a water accounting period (for the forms of take to which the model is applied)?
			1.9	If these models were independently reviewed (e.g. when the model was applied as a cap model), have the recommendations of these reviews been considered in formulating the SDL model? If not, have the reasons been documented and are they appropriate?
			1.10	Have the diversion results been individually reported for each form of take simulated in the model? Where the model covers more than one surface water SDL resource unit, have the diversion results been reported for each SDL unit, and for each form of take simulated in the model?
	s10.10(1)	As per 10.10(1) above	1.11	Are the model report's conclusions and recommendations reasonable and supported by evidence?
S10.49		BEST AVAILABLE INFORMATION	2	DATA ANALYSIS
	s10.49(1)	Is the model based on the best available information?	2.1	Have all relevant data been collected and analysed? (surface water, groundwater, land use, diversions, climate, etc)
			2.2	Has information on the spatial and temporal extent, together with the quality of the relevant data, been provided?

¹ Refer to the seven components of the 'form of take' defined in Section 1.07 of the Basin Plan. It will be important that the modelled forms of take are clearly stated in the report so that the WRP's managers can ensure there is no double-counting of take (refer Section 1.11 of the Basin Plan).

POSITION STATEMENT 3C: Method for determining take

BASIN PLAN CHAPTER 10			ASSESS	ASSIST	
Principle section	Related section(s)	REQUIRED UNDER BASIN PLAN	Guidance note #	GUIDANCE NOTES	
			2.3	Has the recorded diversion data (for the forms of take simulated in the model) been analysed and reported in sufficient detail to allow calibration/ validation of the model? Are the accuracy/ limitations of this diversion data adequately described?	
			2.4	In respect of the relevant surface water, groundwater and climatic data used in the model, has the process of infilling data gaps and extending data beyond the period of record been properly documented? Where these data extensions relied on separate modelling, has this modelling been documented and provided for review?	
			2.5	Has the process of infilling gaps and extending data been carried out appropriately?	
			2.6	Have all locations been identified where recorded flow data already includes for upstream take (e.g. from runoff dams, groundwater usage or diversions from unregulated systems)? Have appropriate procedures been included to allow for this upstream take?	
S10.10 S10.12		ANNUAL DETERMINATIONS OF WATER PERMITTED TO BE TAKEN. MATTERS RELATING TO ACCOUNTING FOR WATER.	3	MODEL STRUCTURE	
	s10.10(3)(b)	Is the model consistent with the other provisions of the water resource plan?	3.1	Is there a clear description of the model structure and its spatial coverage? Is the model structure and coverage appropriate for SDL assessment?	
			3.2	Has a complete link-node diagram or other representation been provided to identify all the components of the model within each reach?	
	S10.10(3)(a) s10.12(1)(b) (c)(d)(g)(h)(i) s10.12(2) s10.12(3)	Does the method account for all matters in s10.12 of the Basin Plan?	3.3	Are all the system conceptualisations appropriate for a SDL model (and consistent with the WRP) when properly calibrated, including those required under Basin Plan s 10.12? This includes, but is not limited to, conceptualisation of: <ul style="list-style-type: none"> principle water inputs and outputs, flow routing, transmission losses/gains, storage operations, diversions for each form of take, permanent and temporary trade, water sharing rules, resource assessments, other management rules, procedures to manage HEW, carryover, return flows, water used for aquifer recharge and Is the model time step(s) appropriate? 	
	s10.12(1)(e)	Has the model accounted for water resources which have a significant hydrological connection to the water resources of the SDL resource unit?	3.4	Where there are water resources with a significant hydrological connection to adjacent systems (including groundwater systems), has the structure of the model been prepared appropriately? If this inter-connection has not been simulated, has the likely impact on model results been assessed? Is the model appropriately structured to interface with other SDL models (surface water and groundwater), both upstream and downstream? Where the model interfaces with other SDL models (upstream and/or downstream) are the linkages to these other models clearly described and appropriately established? Have the upstream models been independently reviewed and accredited?	
	s10.12(1)(f)	Has the model accounted for circumstances in which there is a change in the way water is taken or held under a water access right?	3.5	Has the conceptualisation of held environmental water (i.e. managed by CEWH, TLM, VEWH, OEH, Water for Rivers and others, if any) ² been sufficiently described? Is this conceptualisation appropriate for this SDL model, when properly calibrated?	
	s10.10(4)	Does the model demonstration relates to the SDL of each resource unit in such a way that, if applied over a repeat of the historical climate conditions, it would result in meeting the SDL for the resource unit, including as amended under section 23B of the Act?	3.6	Is the model flexible enough to demonstrate it will meet the SDL, including an adjusted SDL? Is a reason provided why, if this is not currently the case?	
			3.7	Is the model operated over historical climate conditions consistent with the requirements of the Basin Plan, for each form of take simulated in the model?	

² Some SDL models may need to simulate operations under 'cap', or held environmental water recognised in baseline modelling (i.e. The Living Murray, Water for Rivers and Wimmera-Mallee Pipeline Project) in order to fulfil the requirements of Schedule 3 of the Basin Plan. CEWH = Commonwealth Environment Water Holder, VEWH = Victorian Environmental Water Holder, TLM = The Living Murray, OEH = NSW Office of Environment and Heritage.

BASIN PLAN CHAPTER 10			ASSESS		ASSIST	
Principle section	Related section(s)	REQUIRED UNDER BASIN PLAN	Guidance note #	GUIDANCE NOTES		
S10.49		BEST AVAILABLE INFORMATION	4	CALIBRATION		
	s10.49(1)	Is the model based on the best available information?	4.1	Every model has different components that can be calibrated. These usually involve some or all of the following: flow calibration, storage calibration, diversion calibration and planted area calibration. For each of model components requiring calibration, has the calibration period been specified? Are the climatic and resource conditions over each of these calibration periods, described? Is the selection of these periods appropriate?		
			4.2	Has sufficient effort been expended to obtain data for calibration of each model component?		
			4.3	Has the calibration 'fit' been documented for each model component requiring calibration? Have an appropriate range of statistics of the 'fit' and time series plots of observed and predicted values been provided? Have the model parameters that were 'forced' during each component of the calibration been documented?		
			4.4	Is each component of the model sufficiently calibrated against spatial and temporal observations? Are the calibrated values plausible and resultant 'fit' appropriate?		
			4.5	If the calibration components share a sufficient common period, has the overall calibration been reported? What is the quality of the resultant 'fit'?		
			4.6	Has the robustness of the model to operate outside the calibration period been considered? What is the robustness likely to be having regard to the variability of climatic and other factors during the calibration periods?		
S10.49		BEST AVAILABLE INFORMATION	5	VERIFICATION/ TESTING		
	s10.49(1)	Is the model based on the best available information?	5.1	Where appropriate, have all reasonable avenues for verifying and testing the model been undertaken and documented? Alternatively if verification or testing has not been undertaken, have the reasons been documented and are they appropriate?		
			5.2	Have the climatic and resource conditions over the validation period, been described? Is the selection of this period appropriate and has its duration been maximised?		
			5.3	Have the initial conditions for the validation been documented and appropriately set? Has the extent of any other 'forcing' been described and justified? If present is such 'forcing' appropriate.		
			5.4	Have an appropriate range of statistics of the 'fit' and time- series plots of observed and predicted values been provided for all relevant model parameters? What is quality of the resultant 'fit'?		
			5.5	For periods when the development limits ³ are sufficiently similar to the historical infrastructure and management rules, has the model been run to compare annual take with the recorded take? Have these results been compared statistically? What is quality of the resultant 'fit' and what confidence can be placed in the resultant SDL (and annual take) determined by the model?		
S10.49		BEST AVAILABLE INFORMATION	6	PREDICTION		
	s10.49(1)	Is the model based on the best available information?	6.1	Has the procedure for establishing the initial conditions for a model run been described? Is this procedure appropriate?		
			6.2	Where the model relies on outputs provided by other SDL models, have the appropriate data sets been used?		
			6.3	Has the BDL and SDL estimate (for each form of take) been compared with that estimated by the Authority when developing the Basin Plan in 2012? Are the reasons for the differences documented? Are the differences plausible?		
			6.4	Has a water balance been provided which defines the magnitudes of all principal model inputs and outputs? Has a satisfactory water balance been achieved?		

³ This will include for each form of take, the 'development limit' and the period over which the take has to be simulated. The term 'development limit' is used in this review to refer to past state water management laws or other management conditions which determine the opportunities and constraints on take. For watercourse diversions and take by runoff dams (excluding basic rights), the development limit is based on the State water management law that was in existence by a particular date (usually 30 June 2009). This generally refers to a limit established by a water resource plan in place at the time.

POSITION STATEMENT 3C: Method for determining take

BASIN PLAN CHAPTER 10			ASSESS		ASSIST	
Principle section	Related section(s)	REQUIRED UNDER BASIN PLAN	Guidance note #	GUIDANCE NOTES		
S10.49		BEST AVAILABLE INFORMATION	7	SENSITIVITY AND UNCERTAINTY ANALYSES		
	s10.49(1)	Is the model based on the best available information?	7.1	Have the potential uncertainties in the model inputs been identified? Have the potential errors in the modelling processes been discussed?		
			7.2	Have the potential uncertainties in the model outputs been estimated, and in particular, the simulated annual take and SDL?		
S10.49		BEST AVAILABLE INFORMATION	8	MODEL IMPROVEMENTS		
	s10.49(1)	Is the model based on the best available information?	8.1	Where model development has been constrained by limitations in the available data, have these been identified?		
			8.2	Have the model's limitations been considered and has a potential list of improvements been prepared? Are these limitations and improvements appropriate?		
			8.3	Is it necessary to collect more data or obtain further information to improve the model? If so have these been documented and scheduled?		
			8.4	Where any model improvements are considered essential within a specified timeframe, has this timeframe been documented?		
S10.49		BEST AVAILABLE INFORMATION	9	QUALITY ASSURANCE		
	s10.49(1)	Is the model based on the best available information?	9.1	Has the model run number, the software version and all relevant model input been defined to enable the SDL model run to be repeated, at a later date, if required?		
			9.2	Where the model relies on input data generated by other models, have sufficient details been provided to uniquely define those other models and their operating assumptions. Has the source and date of supply of those other models' results been documented?		
S10.15		DETERMINATION OF ACTUAL TAKE MUST BE SPECIFIED	10	DETERMINATION OF ACTUAL TAKE		
	10.15(3)	If the determination for any form of take is to be made by estimating the quantity of water actually taken, is the method for making the determination consistent with the method set out in the WRP in response to the requirement in s10.10(1)?				
	10.15(4)(a)	Does the model demonstrate that the quantity of water taken includes water that was held environmental water which was disposed of and then used in the SDL resource unit for consumptive use?				
	10.15(4)(b)	Does the model demonstrate that the quantity of water taken excludes water sourced from the Great Artesian Basin and released into and taken from a Basin water resource?				