



*Special Cap Audit
Gwydir Valley
NSW Border Rivers*

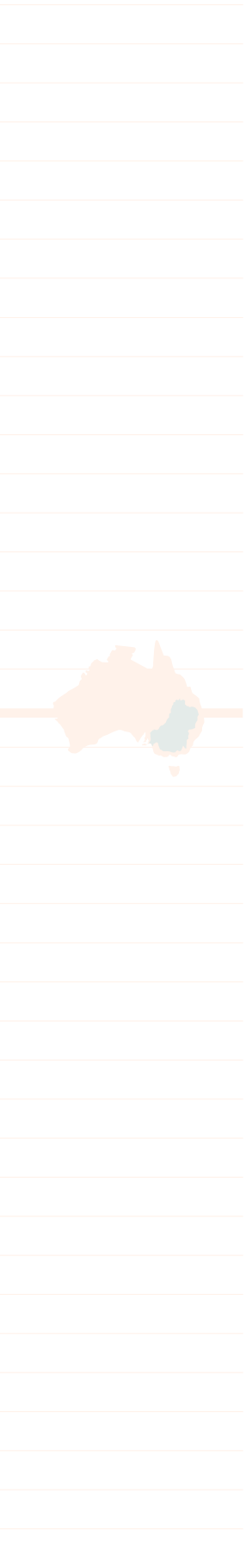
*Report of the
Independent Audit
Group*



Independent Audit Group Members

Dr Wally Cox (Chair)
Paul Baxter

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1. Introduction

The 1999/00 Review of Cap Implementation by the Independent Audit Group (IAG) identified that diversions for the NSW Border Rivers and the Gwydir Valley had exceeded the 20 per cent upper limit of the Cap and as a consequence Schedule F was breached.

Under Clause 14 of Schedule F a breach of Schedule F triggers a Special Cap Audit by the IAG.

This is the report of the IAG on the Special Cap Audit of the regulated NSW Border Rivers and the regulated portion of the Gwydir Valley.

AUDIT PROCESS

The IAG considered detailed reports submitted by the NSW Department of Land and Water Conservation (DLWC) as attached (**Attachment A, B**) and clarified aspects of the report by way of a conference call on 26 February 2001. A draft report was made available to the DLWC for comment prior to finalisation of the report.

AUDIT OUTCOMES

Gwydir Valley

Information on diversions and the Cap estimates derived from the Integrated Quality/Quantity Models (IQQM) are summarised in **Table 1**. These numbers differ from those in the NSW supplementary reports because they include an estimate of 11 GL/year for use on unregulated streams in the valley to make the figures consistent with those published in the annual Murray-Darling Basin Commission (MDBC) *Water Audit Monitoring Report*. The estimate of unregulated usage is poor and is likely to be revised in the future.

The cumulative difference is compared with 20 per cent of the long-term average Cap estimate to determine breach of Cap. The long-term average Cap estimate for the Gwydir is 348 GL. Twenty per cent of the long-term average Cap is 70 GL.

It is clear by comparing this figure with the cumulative difference that a breach first occurred in 1998/99 and was accentuated in 1999/00.

A breach would have occurred if only 1998/99 and 1999/00 data was used (81 GL versus 20 per cent of the long-term average Cap of 348 GL).

The breach was not detected in the 1998/89 IAG Review of Cap Implementation as the IQQM was not available at that time.

Diversions during 1997/98 to 1999/00 inclusive have been high as a result of high availability following wet climatic conditions.

Industry estimates, although not supported by DLWC estimates, suggest record crop areas.

It is estimated that on-farm storages have increased by about 10 per cent since 1993/94.

The DLWC has introduced environment flow rates (that reduce access to off-allocation) and the introduction of continuous accounting.

The IQQM has yet to be accredited by the MDBC but is the best tool available at present for comparing actual diversions and predicated diversions.

CONCLUSION

On the basis of available information the IAG determines that the Gwydir Valley is in breach of the Cap and recommends to the Murray-Darling Basin Ministerial Council that, as per Schedule F, the Council requests that NSW report to the MDBMC at its July meeting on how it intends to comply with the Cap.

NSW Border Rivers

Information on diversions and the Cap estimates derived from the IQQM are summarised in **Table 2**. These numbers differ from those in the NSW supplementary reports because they include an estimate of 16 GL/year for use on unregulated streams in the valley to make the figures consistent with those published in the annual MDBC *Water Audit Monitoring Report*. The estimate of unregulated usage is poor and is likely to be revised in the future.

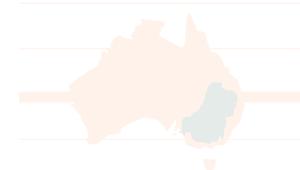


Table 1: Water diversions and Cap 1998/98 to 1999/00

Water year	Total diversions (GL)	Cap estimate (GL)	Cumulative difference (GL)
1997/98	535	494	41
1998/99	306	273	73
1999/00	445	397	121

Table 2: Diversions and Cap 1997/98 – 1999/00 (GL).

<i>Water year</i>	<i>Total diversions (GL)</i>	<i>Cap estimate (GL)</i>	<i>Cumulative difference (GL)</i>
1997/98	206	168	38
1998/99	181	179	39
1999/00	198	150	87

The cumulative difference is compared with 20 per cent of the long-term average Cap estimate to determine breach of Cap. The long-term average Cap estimate for the NSW Border Rivers is 204 GL. Twenty per cent of the long-term Cap is 41 GL.

On the basis of comparing cumulative differences with the critical limit of 41GL there was a near breach in 1998/99 and a clear breach by 1999/00. A breach would also have occurred if only 1998/99 and 1999/00 data or 1999/00 alone were used.

The NSW DLWC advised that water availability has been at a record high as a result of wet climatic conditions and the enlargement to Pindari completed in 1995. Irrigators have had access to 100 per cent of license entitlements.

Irrigated areas rose to record levels in 1996/97 as the enlarged Pindari storage became effective. There have been further increases in irrigated areas since 1996/97.

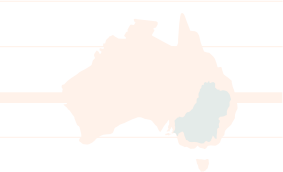
On-farm storage is estimated to have increased at about two per cent per year over the last five years.

The IQQM has yet to be accredited by the MDBC but is the best tool available at present for comparing actual with predicted diversions.

CONCLUSION

On the basis of available information the IAG determines that the NSW Border Rivers are in breach of the Cap. This is supported by underlying growth in irrigated areas and irrigation infrastructure.

The IAG recommends to Council that as per Schedule F Council requests NSW to report to it at its July meeting as to how NSW intends to comply with the Cap.



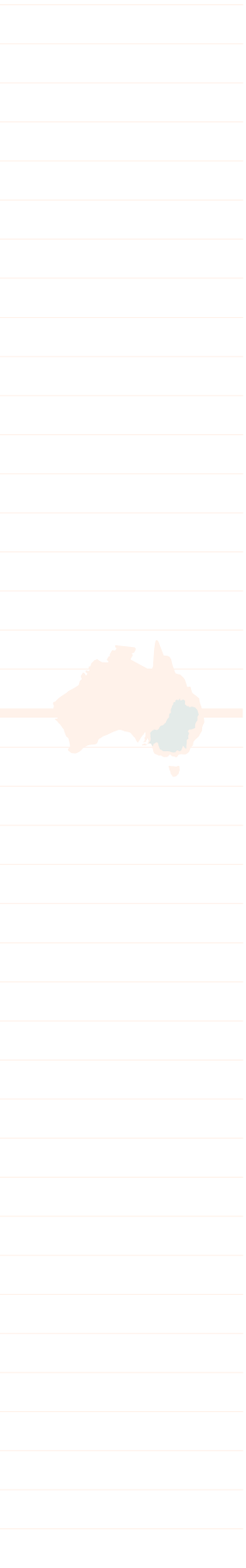


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On the Gwydir Valley***

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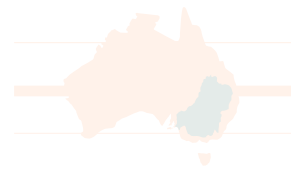
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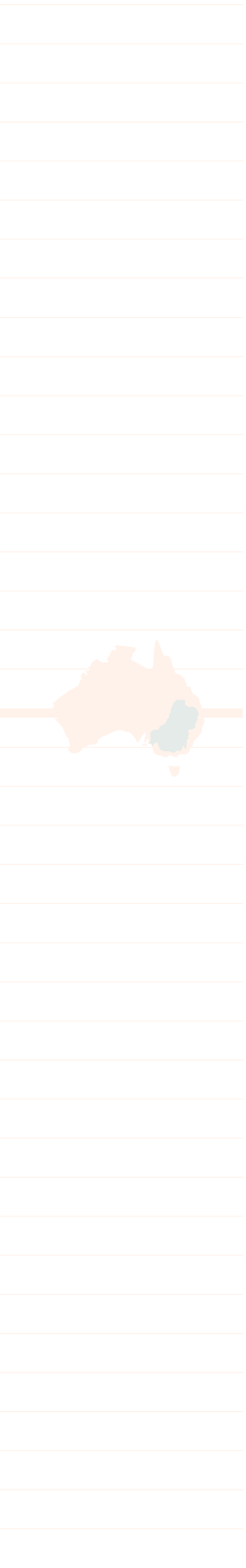




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Executive Summary

The *NSW Annual Cap Report*, submitted to the Murray-Darling Basin Commission (MDBC) in October 2000 for 1999/00, has indicated that the regulated Gwydir Valley water extractions may have exceeded the MDBMC Cap.

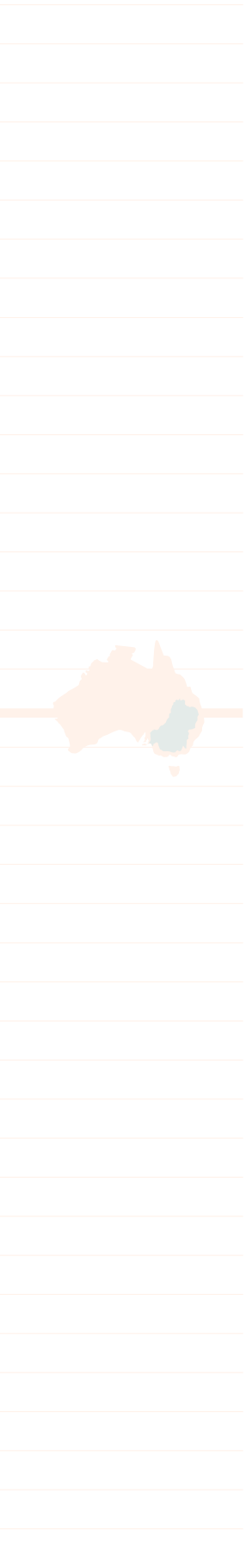
This report has been produced in response to a subsequent call by the MDBC, under clause 14 of Schedule F of the *Agreement*, for the Independent Audit Group (IAG) to undertake a Special Cap Audit of the regulated Gwydir Valley.

This report presents information on irrigation development and on-farm storage development.

It also provides results from the Integrated Quality/Quantity Model (IQQM) modelling of the valley under Cap and current conditions.

Both of these results lead to the conclusion that diversions associated with the 1993/94 level of development have been exceeded in the period under review. In accordance with these findings NSW submits that the IAG, in its report to Council, must determine the regulated Gwydir Valley to be in breach of the Cap.





Introduction

Schedule F of the Murray-Darling Basin Agreement requires its member States to submit annual reports to the MDBC outlining:

- a) the season's water usage; and
- b) the water usage expected under the 93/94 level of development – the Cap figure

This requirement was met by NSW in its report *1999/00 MDBMC Cap Performance for NSW Regulated Streams* submitted in October 2000 covering the 1999/00 water year. An update of this report was provided in February 2001, which included final diversion totals and modelling results for 1999/00.

Schedule F, Clause 14 (b), allows for an estimate of error in Cap calculations and diversion measurements. This is the amount a valley may exceed the Cap without prompting further action under the Agreement. Information supplied in the 1999/00 report and subsequent update in February 2001 indicated that the estimate of error had been exceeded for the regulated Gwydir Valley.

In accordance with Clause 14 of the schedule, such an exceedance prompts the MDBMC to request the IAG to undertake a special audit of the relevant valley.

This report has been produced by NSW for input to the special IAG report for the regulated Gwydir Valley, prepared under the requirement of Clauses 14 and 15 of Schedule F of the Agreement. Summary information is presented regarding climatic conditions, water use in the period since the commencement of accounting under Schedule F, the areas planted and the crops irrigated. This is then compared with the latest model assessment of Cap performance.

1997/98 - 1999/00 Observed Information Summary

In general, water availability has been high over the 1997/98 – 1999/00 period, with announced allocations and off-allocation availability being higher than at any point since the mid-1980s. This has been the result of particularly wet climatic conditions over the last three seasons.

An allocation of 82 per cent announced on 24 October 1997, which was the highest allocation since the 1986/87 season. A high flow/flood event late in the 1997/98 season

spilled all carryover, but provided full individual accounts (150 per cent) for the start of continuous accounting in 1998/99. Usage and further allocation increments combined to result in individual accounts averaging 121 per cent of allocation at the end of the 1998/99 season, and 104 per cent at the end of the 1999/00 season.

Surveys of irrigated areas conducted by the NSW Department of Land and Water Conservation (DLWC) indicate that, following the severe drought during 1992/93 – 1995/96, irrigated areas rose quickly to a new record in 1997/98, and have since fallen away. The DLWC crop area survey results are compared with industry survey results in **Figure 1** below. Survey results produced by the cotton industry include cotton irrigated from unregulated and groundwater sources, as well as some areas in the top sections of the Barwon River. As a consequence, some difference between the two estimates (in favour of the cotton industry) is expected. However, the reduced areas over the last two seasons indicated by the DLWC surveys are not consistent with industry information or other cotton growing valleys.

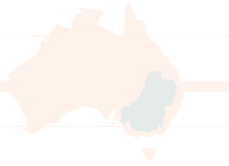
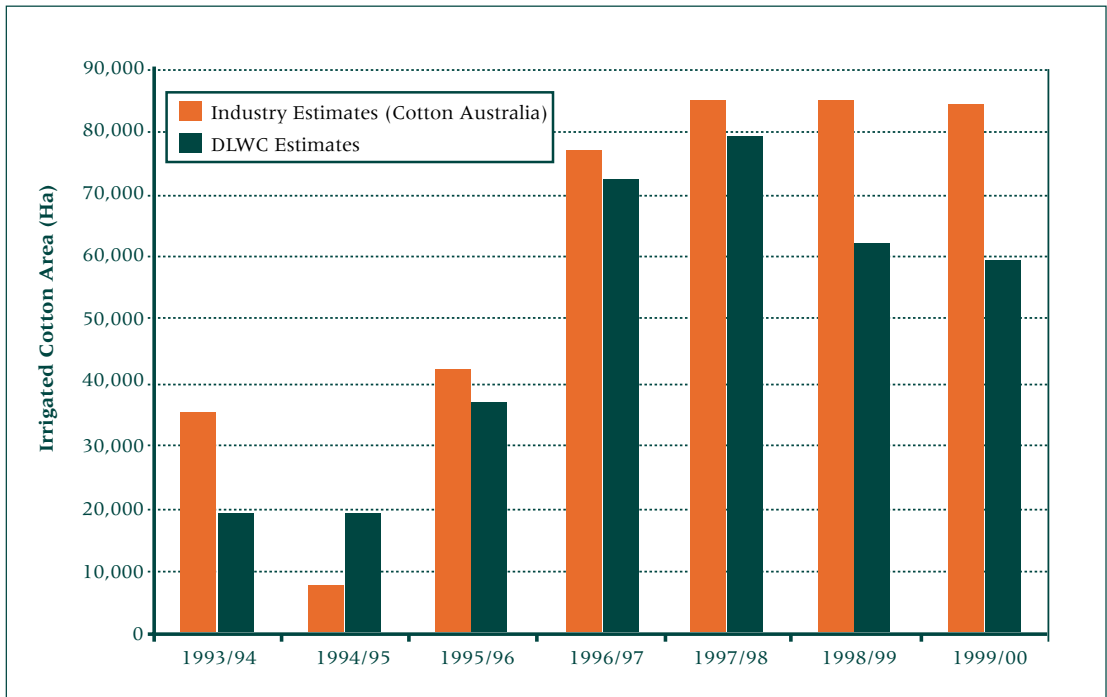
As indicated in the NSW submission to the 1999/00 *Review of Cap Implementation*, the percentage of water use which has crop statistics available has not reduced over this period. However, a reluctance by some irrigators to fully cooperate with the DLWC surveys in recent years has been observed, which may account for the lower reported areas in recent seasons.

On-farm storage capacities have increased by around 10 per cent since 1993/94, with around four per cent of the increase occurring during the Cap audit period. Given the significant volumes of allocated water available over the audit period, the 10 per cent increase in on-farm storage capacity is not thought to be significantly affecting the audit results.

Two management initiatives of significance to diversions have occurred during recent seasons. These are the introduction of a suite of environmental flow rules (which primarily reduce access to off-allocation) and the introduction of continuous accounting (which will affect carryover behaviour).



Figure 1: Comparison of DLWC and Industry Crop Area Surveys



CAP PERFORMANCE

As diversions within the Gwydir Valley are generally related to access as well as climate-driven crop demands, no climate-diversion relationship has been developed. During 2000 an IQQM capable of running 1993/94 conditions scenarios was developed and tested for robustness. Whilst this model has not been approved for Cap use by the MDBC, it has been used to provide preliminary estimates of Cap for the 1997/98 - 1999/00 period.

Annual Cap Performance

The cumulative estimate of the difference between observed diversions and the estimate of Cap provided by the Gwydir IQQM, commencing from 1997/98 are detailed in **Table 1**.

The (preliminary) Schedule F accounting indicate that the Cap has been exceeded in the Gwydir Valley.

Long-term Cap Performance

The climate during the Cap audit period has been significantly wetter than average, which is likely to ameliorate the effectiveness of the environmental flow rules. Consequently, NSW considers it essential to examine the long-term modelling of current conditions with the recently available IQQM. These model runs will indicate whether or not it is reasonable to expect that the environmental flow rules will have more of an impact on diversions.

A current conditions scenario is currently being prepared to examine the likely long-term behaviour with respect to Cap. As soon as this information becomes available, it will be forwarded for consideration.

CONCLUSION

Whilst the annual Cap estimates used in the (preliminary) Schedule F accounting indicates a Cap exceedance, NSW would consider that any conclusions regarding Cap exceedance may be premature without consideration of the results of long-term modelling of current conditions.

Under Clause 17 of Schedule F of the MDB *Agreement*, NSW would be required to notify the Ministerial Council of how it intends to comply with Cap at the next Ministerial Council meeting following a declaration of a breach of Cap. If the long-term modelling of current conditions confirms the annual Cap audits, NSW will be required to have Cap management strategies formulated in time for the following Ministerial Council meeting in July 2001.

Measures to ensure future Cap compliance, should they be necessary, would be developed with due regard to other processes occurring in the valley.

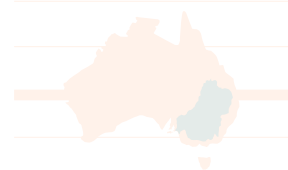
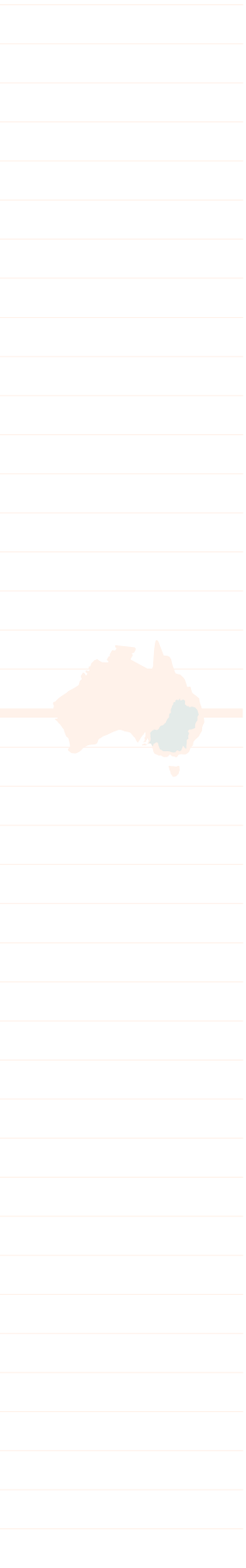


Table 1: Gwydir Valley Preliminary Schedule F Account

<i>Water year</i>	<i>Total diversions (GL)</i>	<i>Cap estimate from IQQM (GL)</i>	<i>Difference (GL)</i>
1997/98	521	483	38
1998/99	295	262	33
1999/00	434	386	48
Cumulative total	1248		119
Long-term average Cap estimate:			337
20% of long-term average Cap estimate:			67
Cumulative Cap performance:			Above Trigger



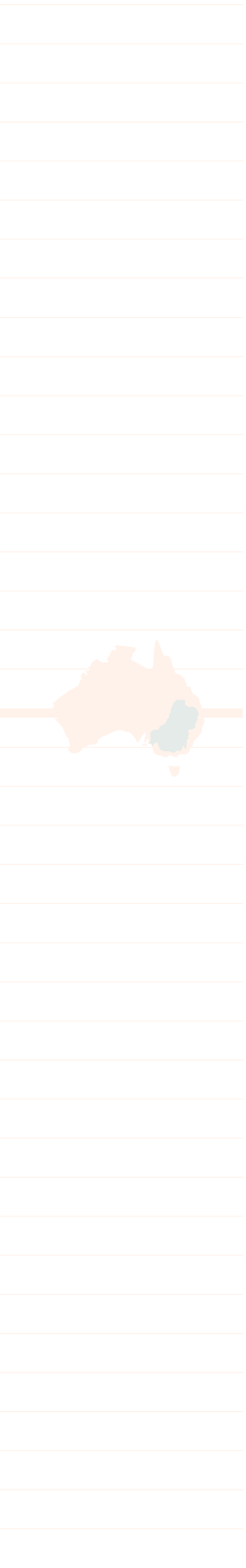


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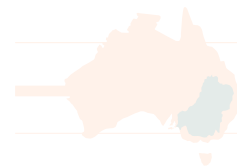
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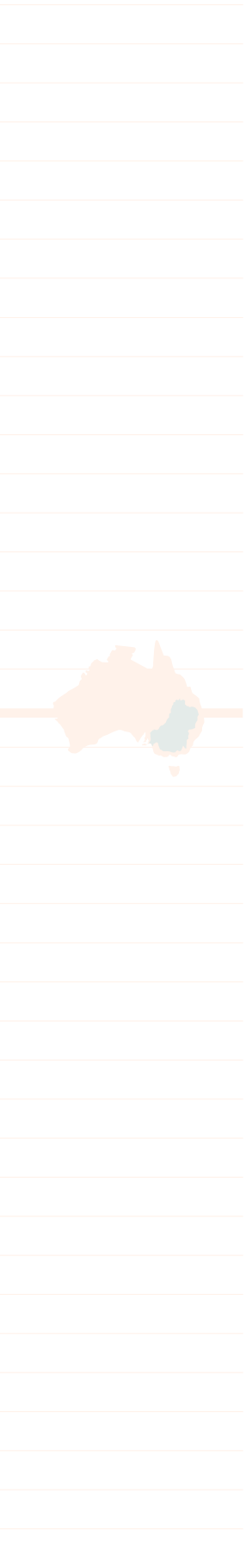




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Executive Summary

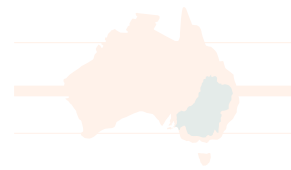
The NSW Annual Cap report, which was submitted to the Murray-Darling Basin Commission (MDBC) in October 2000 for the year 1999/00 has indicated that the regulated NSW Border Rivers water extractions may have exceeded the Murray-Darling Basin Ministerial Council (MDBMC) Cap.

This report has been produced in response to a subsequent call by the MDBC, under Clause 14 of Schedule F of the *Agreement*, for the Independent Audit Group (IAG) to undertake a Special Cap Audit of the regulated NSW Border Rivers.

This report presents information on irrigation development and on-farm storage development.

It also provides results from the Integrated Quality/Quantity Model (IQQM) modelling of the valley under Cap and current conditions.

Both of these results lead to the conclusion that diversions associated with the 1993/94 level of development have been exceeded over the period under review. In accordance with these findings NSW submits that the IAG, in its report to Council, must determine the regulated NSW Border Rivers to be in breach of the Cap.





Introduction

Schedule F of the MDB *Agreement* requires its member states to submit annual reports to the Commission outlining:

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This requirement was met by NSW in its report *1999/00 MDBMC Cap Performance for NSW Regulated Streams* submitted in October 2000 covering the 1999/00 water year. An update of this report was provided in February 2001, which included final diversion totals and modelling results for 1999/00.

Schedule F, Clause 14 (b), allows for an estimate of error in Cap calculations and diversion measurements. This is the amount a valley may exceed the Cap without prompting further action under the *Agreement*. Information supplied in the 1999/2000 report and subsequent update in February 2001 indicated that the estimate of error had been exceeded for the regulated NSW Border Rivers.

In accordance with the Clause 14 of the schedule, such an exceedance prompts the MDBMC to request the Independent Audit Group (IAG) to undertake a special audit of the relevant valley.

This report has been produced by NSW for input to the special IAG report for the regulated NSW Border Rivers, prepared under the requirement of Clauses 14 and 15 of Schedule F of the *Agreement*. Summary information is presented regarding climatic conditions, water use in the period since the commencement of accounting under Schedule F, the areas planted and the crops irrigated. This is then compared with the latest model assessment of Cap performance.

1997/98 - 1999/00 observed information

Water availability for the NSW Border Rivers over the 1997/98 – 1999/00 period has been higher than at any previous time, as a result of wet climatic conditions and the enlargement to the Pindari storage completed in 1995. Through a combination of carryover and announced allocation, NSW Border Rivers irrigators have effectively had access to 100 per cent of their licensed entitlements each year during the Cap audit period.

Surveys of irrigated areas conducted by the NSW Department of Land and Water Conservation (DLWC) indicate that, following the severe

drought during 1992/93 – 1995/96, irrigated areas rose quickly to a new record levels in 1996/97, as the enlarged Pindari storage became effective. Irrigated areas have since been increasing at a slightly slower rate.

Survey results produced by the cotton industry include cotton irrigated from unregulated and groundwater sources, as well as some areas in the top sections of the Barwon River. As a consequence, they do not compare well with DLWC survey results for the regulated system, with Industry estimates of total cotton areas almost twice that of DLWC estimates.

The proposed NSW Border Rivers Cap is based upon the observed areas following the enlargement of Pindari storage, during the 1996/97 and 1997/98 seasons.

Following strong growth up to around 1994/95, NSW on-farm storage capacity has been increasing at approximately two per cent annually over the last five years.

Cap Performance

As diversions within the NSW Border Rivers valley are generally related to access as much as climate-driven crop demands, no climate-diversion relationship has been developed. During 2000 an IQQM capable of running 1993/94 conditions scenarios was developed and tested for robustness. Whilst this model has not been approved for Cap use by the MDBC, it has been used to provide preliminary estimates of Cap for the 1997/98 - 1999/00 period.

Annual Cap Performance

The cumulative estimate of the difference between observed diversions and the estimate of Cap provided by the IQQM, commencing from 1997/98 are detailed in **Table 1**. For consistency, the figures quoted for both observed diversions and Cap estimates exclude floodplain harvesting. Both figures will include floodplain harvesting when physical monitoring of floodplain harvesting becomes practicable.

The 1997/98 Cap estimate used in **Table 1** excludes approximately 30 GL of floodplain harvesting diversions that have been produced by the Cap simulation. The floodplain harvesting process simulated within IQQM has not been able to be calibrated specifically due to a lack of observed data. The simulated floodplain process has been based on estimates of floodplain harvesting ability and river channel capacities that have been provided by



Table 1: Border Rivers Preliminary Schedule F Account

<i>Water year</i>	<i>Total diversions (GL)</i>	<i>Cap estimate from IQQM (GL)</i>	<i>Difference (GL)</i>
1997/98	188	152	36
1998/99	166	165	2
1999/00	182	134	48
Cumulative total	495	318	85
Long-term average Cap estimate:			188
20% of long-term average Cap estimate:			38
Cumulative Cap performance:			Above Cap

operations and field staff. There was also some evidence of floodplain harvesting identified during the model calibration process. Consequently it is considered difficult to place confidence in the relative split between simulated pumped and floodplain harvested diversions for the first year of the Cap audit.

The record irrigated area in 1999/00 supports the annual Cap simulation, which indicates that diversions have exceeded the Cap.

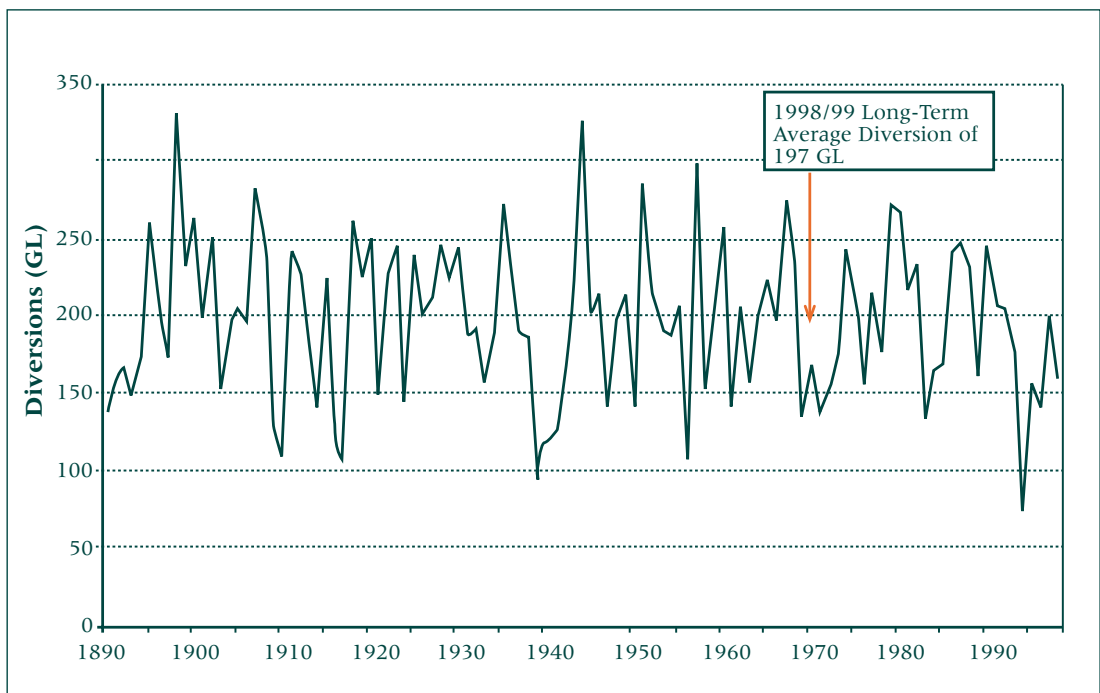
Long-term Cap Performance

The annual diversions under the Cap and ‘current’ (1998/99) scenarios are provided below and indicate that there is expected to be a slight

Cap exceedance in the long-term under current management arrangements and development levels. Reconfiguration of the Border Rivers IQQM to reflect the higher irrigated areas observed in 1999/00 has not been completed as yet. However, it is likely that this further modelling will show an increase in the extent to which long-term average diversions are above Cap.

NSW and Queensland are negotiating the possible implementation of water-management rules, which have the potential to affect long-term diversions. The Border Rivers IQQM will be used to assess the impact of any of the rules that come out of the current discussions between NSW and Queensland.

Figure 1: Modelled Border Rivers Current (1998/99) Conditions Annual Diversions



CONCLUSION

Both the annual Cap estimates used in the (preliminary) Schedule F accounting and the long-term modelling indicates that the NSW Border Rivers is in breach of the Cap.

Further, assessment of the underlying indicators of growth – irrigated crop areas and irrigation infrastructure – would suggest that growth above Cap levels has occurred in the NSW Border Rivers.

Under Clause 17 of Schedule F of the MDB *Agreement*, NSW will be required to notify the MDBMC of how it intends to comply with Cap at

the next Ministerial Council meeting following a declaration of a breach of Cap. Since NSW is likely to be declared to be in breach at the Commission's March meeting, NSW will be required to have Cap management strategies formulated in time for the following Ministerial Council meeting in July 2001.

Measures to ensure future Cap compliance will be developed with due regard to other processes occurring in the valley, including any environmental flow provisions.



