

**Environmental Management of Groundwater
Abstraction from the Gnangara Mound
July 2000 – June 2003 - Triennial Report**

Water and Rivers Commission

**Report by the Environmental Protection Authority
under section 48(1a) of the *Environmental Protection Act 1986***

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1. Introduction and background

Groundwater abstraction from the Gngangara Mound is subject to environmental conditions issued in Statement 438 - Gngangara Mound Groundwater Resources - and Statement 496 – Groundwater Resource Allocation, East Gngangara, Shire of Swan - by the Minister for the Environment on 6 February 1997 and 17 February 1999 respectively. The current nominated proponent for both statements is the Water and Rivers Commission (WRC).

Each of these statements can be viewed at the Department of Environment's website (www.environ.wa.gov.au).

The EPA has delegated responsibility under section 20 of the *Environmental Protection Act* to audit compliance by the WRC with the environmental conditions and commitments applying to groundwater abstraction from the Gngangara Mound. This delegation was gazetted on 26 September 2003.

This report provides the advice of the Environmental Protection Authority (EPA) to the Minister for the Environment in relation to compliance with environmental conditions.

The WRC submitted the Triennial Report for Environmental Management of Groundwater Abstraction from the Gngangara Mound July 2000–June 2003 to the EPA in March 2004. This report is available on the Commission's website (www.wrc.wa.gov.au).

The 2000/03 Triennial Report has been reviewed by an independent consultant to the EPA. The report of the Auditor is provided in Appendix 3.

Following a request from the WRC arising from concerns about consistent transgressions of some environmental conditions applying to the Jandakot Mound and the Gngangara Mound, the Minister for the Environment asked the EPA in 2001 to review and advise on changes to the existing environmental conditions under section 46 of the *Environmental Protection Act 1986*. The EPA agreed in 2001 to this section 46 being approached in two stages, with the first review dealing with some specific conditions where available information may provide sufficient basis for considering changes to criteria and the second stage review providing a more comprehensive review of environmental conditions applying to both groundwater mounds.

2. Compliance with environmental conditions

Section 48(1) of the *Environmental Protection Act 1986* provides for monitoring of implementation of a proposal for the purposes of determining whether the environmental conditions related to the proposal are being complied with. The EPA has an obligation under section 48(1a) to report non-compliance to the Minister.

The EPA has undertaken this compliance audit in two parts. The first was to appoint an independent consultant to review and report to the EPA on the WRC's Compliance Report (see Appendix 3). The WRC was then given an opportunity to respond to the auditor's report. This response is provided in Appendix 4. The second part was for the EPA to consider the auditor's report and WRC response, and to prepare this report on issues associated with the compliance audit.

WRC 2000/03 Triennial Report

The WRC Triennial Compliance Report (WRC 2004, p 5) acknowledges that a number of non-compliances with environmental conditions and proponent commitments occurred during 2000-2003. In relation to water level criteria applying through both statements, Table 1 indicates the annual number of non-compliances. Over the three year period of the triennial report, the proportion of non-compliances of water level criteria increased from 20 per cent to 39 per cent.

Table 1. Summary of non-compliances with Ministerial Conditions-Gngangara Groundwater Mound (from WRC 2004)

Environment component	Total No. of criteria	No. of non-compliances		
		2000/01	2001/02	2002/03
Wetlands	18	6	4	9
Terrestrial vegetation	23	3	4	7
Total	41	9	8	16

The WRC points out that, "While there have been a considerable number of non-compliances, the majority of these have been small, with over 80 per cent less than 0.5 metres. The maximum non-compliance was 1.2 metres." (WRC 2004, p 5)

Audit of Compliance Report

The WRC has submitted the 2000-2003 Triennial Compliance Report for the Gngangara Mound. This report has been reviewed by an independent consultant to the EPA. The report of the Auditor is appended as Appendix 3.

The Auditor has not only confirmed the non-compliances with water level criteria in Table 1 above, but has also identified a number of other instances of non-compliance with environmental conditions and proponent commitments.

In summary, the Auditor has provided the following advice and comments to the EPA:

“The (WRC) Report acknowledges that there has been non-compliance with the environmental water provision where minimum water levels in lakes and monitoring bores have been breached on 9 occasions in 2000/01, 8 occasions in 2001/02 and 16 times in 2002/03. In addition, this Audit has identified 25 other instances on non-compliance or possible non-compliance of a more administrative nature.

There are a number of deficiencies in the management of water abstraction from the Gngangara water mound. The prime concerns relate to the superficial aquifer. It has the greatest complexity, being most closely linked to the health of wetlands and vegetation on the mound, and having significant competing uses for the water (e.g. domestic bores, irrigated horticulture, pines and scheme water abstraction).

Not enough is known at present about the relationship between rainfall, recharge, abstraction and water levels or their effect on environmental health. Nevertheless, water levels are being used as the primary monitoring and reporting criterion, and viewed as a surrogate for the health status of the vegetation on the mound. The implied assumption is that if water levels drop “too low” from an environmental health point of view, this can be reversed by reducing groundwater abstraction.

What level is “too low” is not known. There are instances where the set minimum water levels have been breached while the health status of the vegetation remained unaffected. Historically low rainfall has had a significant impact on declining water levels so it is by no means certain that reducing water abstraction will reverse the trend. If the reduction is confined to the public scheme abstraction, leaving private well owners with fixed or increasing allocations, the likelihood is that the trend will not be reversed.

Faced with such concerns the management response has not been swift, appropriate or effective, partly because of a lack of clear understanding of responsibilities and partly because of a lack of appropriate tools to respond quickly to the identified problems. As a result there has been recurring non-compliance with the minimum water level requirements as well as observed declines in vegetation health, serious threats to some cave fauna and extreme concern over the possible acidification of some wetlands.

During the triennial period the reporting responsibilities for the environmental conditions have changed, with the move to amalgamate the Water and Rivers Commission (the proponent) with the Department of Environmental Protection (the agency with the responsibility for monitoring compliance with the conditions of environmental approval).

To address the perceived conflict of interest that this creates, the responsibility for monitoring compliance with the environmental approval for this project has been delegated to the independent EPA. However, this does not remove all concerns over conflict of interest, as noted below.

It appears from the Triennial report that the WRC has seen as part of its role as proponent, where a minimum level is breached, to negotiate with the Water Corporation for a reduction in water abstraction that balances the economic costs of such a reduction with the environmental concerns, so as to minimise the severity of the breach.

While the conditions remain unchanged, it is imperative that they be strictly complied with because the ongoing breaches would be likely to constitute offences under the Act.

There is good reason to believe that the failure to comply with the existing water level criteria and wetland management objectives is contributing to unacceptable environmental impacts. By the same token, complying with the criteria and objectives would undoubtedly have significant economic and social implications. WRC has commenced a section 46 review process under which these can be re-evaluated, but the timeline for this process is lengthy and the question of on-going non-compliance in the interim has not been adequately addressed.

A possible approach to expedite change would be for the EPA to split the s46 into two parts, the first of which recommends to the Minister, as quickly as possible, interim conditions that, with appropriate corrective action by the proponent, will address the non-compliance while the full s46 review is finalised.

The longer-term solution to the sustainable management of the Gngangara Mound is likely to require a whole-of-government approach.” (Malcolm 2004, p 1)

There has been a long period of continuous breaches of water level criteria on the Gngangara Mound. As can be seen from the Table 2, taken from the Auditor’s report (Figure 3), a number of sites have been in non-compliance for each of the past 3 years and several for a longer period.

Table 2. List of sites of non-compliance with water level criteria (from Malcolm 2004)

16						McNess
15						Egerton
14						MM55B
13						WM6
12						WM1
11						MM59B
10		MM59B	MM53			MM53
9		MM53	Melaleuca	Melaleuca	MM59B	Jandabup
8		Melaleuca	Lexia 94	Jandabup	Lexia 94	WM1
7		Lx94	Nowerup	Nowerup	Nowerup	MM59B
6		MM16	MM16	PM6	PM6	PM6
5		MM55B	Coogee	Coogee	Coogee	Coogee
4		Lexia 186	Lexia 186	Lexia 186	Lexia 186	Lexia 186
3		JB5	JB5	JB5	JB5	JB5
2		Joondalup	Joondalup	Joondalup	Joondalup	Joondalup
1	Mariginiup	Mariginiup	Mariginiup	Mariginiup	Mariginiup	Mariginiup
	1996/97	1997/98	1998/99	1999/2000	2000/01	2001/02
						2002/03

The auditor has also prepared a table (Table 1 Appendix 3) which summarises the issues identified and has recommended actions on each issue, although not all

recommended actions relate to actual non-compliances. This is presented later in this report, along with recommendations of the EPA to the Minister.

EPA's advice on compliance

It is obvious from the WRC's Annual Compliance Report and also the Auditor's report that there have been many instances of non-compliance with environmental conditions during the period July 2000 – June 2003. These have been documented in both reports and are listed in summary in Table 4 below.

The WRC Triennial Report has focussed on the number and causes of breaches of water level criteria indicated in Table 2 above. These are all related to water level non-compliance with Condition 3-1 of Statement 438 and Proponent Commitment 1 of Statement 496. This is discussed further in this report.

The Auditor has identified an additional eleven items of non-compliance that do not relate to meeting defined water level criteria. Table 4 also lists other instances where the Auditor considers that the WRC has not provided sufficient information to confirm that there has been compliance. In those instances, the Auditor has recommended that additional information be provided to the EPA.

The WRC has requested clearance of some of the conditions and commitments in Statements 438 and 496 because the action has been satisfactorily completed. Table 3 lists these, and indicates the Auditor's and EPA's conclusions in relation to those requests.

Table 3 Conditions and commitments that the WRC considers have been completed

Code	Description	Auditor's comment	EPA recommendation
438: P15	The Water and Rivers Commission will continue to report every three years to the Department of Environmental Protection on the management of groundwater within the Study area of the Gngangara Mound. This will include information on the operation of groundwater schemes and private groundwater use, and environmental impacts. In those years when a triennial report is submitted, the Water and Rivers Commission will report to the Department of Environmental Protection on compliance with environmental conditions.	Agree this requirement is similar to M10-1. However P15 has a more detailed specification of the content of the reports that should not be lost. The wording of M10-1 could be amended to incorporate the elements of P15 specifying report content. P15 could then be cleared. The condition could be changed as part of the s46 review.	Note that EPA is now the delegated auditor for this Statement. Recommend this be amended under section 46C Agree to use section 46 process to amend commitment
496: M2.1	Implement the consolidated environmental management commitments documented in schedule 2 of the Minister's statement.	Agree this condition appears to duplicate condition 496: M1.1. They could be consolidated. The EPA could recommend to the Minister that this be done.	Recommend this be addressed in section 46 review
496: M4.1	Provide evidence to the Minister before 17 February 2004 that the proposal has been substantially commenced.	Agree, this condition can be cleared	Agree, this condition can be cleared

Code	Description	Auditor's comment	EPA recommendation
496: M4.2	If the proposal has not been substantially commenced before 17 February 2004, the approval to implement the proposal as granted in this statement shall lapse and be void.	Agree, this condition can be cleared	Agree, this condition can be cleared
496: M4.3	Make an application to the Min for Environment for any extension of approval for the substantial commencement of the proposal beyond 17 February 2004 at least 6 months before 17 February 2004.	Agree, this condition can be cleared	Agree, this condition can be cleared
496: M4.4	If it demonstrated that the parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding 5 years for the substantial commencement of the proposal.	Agree, this condition can be cleared	Agree, this condition can be cleared
496: M5.2	Unless otherwise specified, the DEP is responsible for assessing compliance with the conditions, procedures and commitments contained in this Statement and for issuing formal clearances.	Agree the reference to DEP is no longer appropriate. The text "DEP" should be replaced with "EPA". The condition could be changed as part of the s46 review.	Recommend this be amended under section 46C
496: P11	Require the Water Corporation to Phase in production bores closest to phreatophytic vegetation.	The condition could be cleared once the phase-in is complete. The response does not make it clear that this is the case.	Provide additional information to confirm that the phase-in is complete

The EPA considers that several of these items should be addressed under the section 46 review or the provision of additional information, and that the remainder have been completed and can therefore be cleared.

Recommendations in the Audit of Compliance report

The Auditor's Report contains a number of recommendations to facilitate compliance. These are summarised below, along with the EPA's recommendation.

Table 4 Recommendations of the Auditor and EPA to address non-compliances (from Malcolm 2004, Table 1 Appendix 3)

	Issue	Auditor's Recommended Action	EPA Recommendation
1	Ongoing failure to comply with wetland management objectives and environmental water provisions (EWPs).	A new, expedited s46 to set interim criteria that can protect the environment in the short term and can be feasibly complied with in dry years. The present, more detailed s46 review to be completed and new, long-term sustainable management criteria set and complied with.	This is essentially the process already agreed to by EPA
2	Relationship between areas of increased abstraction and incidence of non-compliance not clear.	Ask proponent to present in a simple map form the changes in abstraction and the sites of non-compliance.	This could be useful but may not explain non-compliance

	Issue	Auditor's Recommended Action	EPA Recommendation
3	No measurement or estimation of private abstraction provided, only licensed amount.	Ask proponent why all licensed bores should not be metered, with a licence requirement to report actual water use.	WRC is developing a new metering policy. EPA considers that metering of all private licences greater than 5 000 kL per annum should be required, with implementation in sensitive areas as a priority
4	Rules used for the management of private water abstraction are different from those applying to public water abstraction and do not give priority to environmental water provisions.	Ask proponent to develop rules for the management of private abstractions that give priority to environmental water provisions over any new allocations and include a strategy for progressively applying a similar priority to existing allocations, including the take back of unused allocations.	Establishing more relevant sustainable allocation limits applying to Gngangara and Jandakot Mounds, with clear variation provisions (rules), should be undertaken as a priority
5	The 18 management initiatives are insufficiently proactive and insufficiently resourced to have the necessary impact in reducing private water abstractions.	Proponent develop interim new, more effective management options for influencing private abstraction, to be used in the 2004/05 summer when there is a predicted breach of water levels, to ensure no subsequent non-compliance.	Targeted initiatives proposed by WRC will not address all areas with criteria non-compliance.
6	No rainfall records for Wanneroo for most of the early and mid 1990s (rainfall a major influence on g/w levels).	Proponent ensure that the problem with reliability of rainfall data in the early and mid 1990s has been rectified.	Noted. This absence makes it more difficult to reflect accurately the possible consequence of declining rainfall.
7	FPC management of pine plantation may be in contravention of EPP (which over-rides Agreement Act – s5 of EP Act).	Proponent seek legal advice, EPA recommend that Minister write to Minister for Agriculture, Forests and Fisheries.	Compliance with the EPP is not part of this audit, but should be followed up
8	Several conditions no longer required due to amendments to the EP Act.	Delete those conditions as part of the s46 review.	Agreed, for consideration in the 2004 section 46 review
9	Possible failure to protect the integrity of groundwater dependent ecosystems.	Ask proponent to demonstrate to EPA's satisfaction that integrity has been protected.	Address this as part of the 2004 section 46 review
10	Possible failure to ensure the maintenance of ecological systems.	Ask proponent to demonstrate to EPA's satisfaction that ecological systems have been maintained.	Address this as part of the 2004 section 46 review
11	Failure to regularly review the basis of management decisions and criteria.	Commence more frequent, internal, transparent review procedures.	Address this as part of the 2004 section 46 review
12	"Wide publication" of the limits on groundwater availability by tabling at committee meetings and in annual reports is inadequate.	Publish more widely in the general community so attitudes to water use may be changed.	Supported
13	Indicator species not selected, similarity indices not calculated.	Ask proponent to comply or demonstrate to the EPA that the present form of vegetation monitoring is adequate.	Address this as part of the 2004 section 46 review

	Issue	Auditor's Recommended Action	EPA Recommendation
14	Research studies have not addressed minimising the impacts of groundwater abstraction.	Initiate studies to address minimisation of impacts.	Address this as part of the section 46 review
15	Several conditions and commitments address similar matters and could be amalgamated with minor re-wording	Consolidate the conditions as part of the s46 review.	Address this as part of the 2004 section 46 review
16	Artificial supplementation at Coogee Springs not commenced as required.	Ask proponent to comply or demonstrate to the EPA that the commitment should be changed.	Address this as part of the 2004 section 46 review
17	Review of EWPs not commenced within 6 years as required.	Section 46 review process must be expedited. Interim measures are needed to address ongoing non-compliance in the meantime.	EPA notes that the section 46 review initiated in 2001 has yet to be presented to EPA
18	Failure to use aerial photography for wetland vegetation mapping.	Recommend that Minister remove the requirement to use aerial photography.	Address this as part of the 2004 section 46 review
19	Possible failure to monitor water quality in some Lexia wetlands.	Ask proponent to demonstrate compliance or amend monitoring programme to comply.	Address this as part of the 2004 section 46 review
20	Several commitments require monitoring in specified months but it has been done in other months.	Ask proponent to comply or demonstrate to the EPA that the commitment should be changed.	Address this as part of the 2004 section 46 review
21	No evidence that impact of confined aquifer abstraction was monitored.	Proponent should use its powers to require Water Corporation to monitor impact.	Supported, if not already happening
22	Macro-invertebrate monitoring protocols submitted for EPA approval.	Seek independent expert review before approving.	Agreed
23	The requirements of a number of conditions and commitments have been met.	These conditions and commitments could be cleared.	Do as part of this audit (see Table 3)
24	For some commitments the response provided is inadequate to determine compliance.	Require proponent to provide additional information.	Agreed
25	Non-attendance and unknown whereabouts of Nyungah representative on Community Consultative Committee.	Proponent to seek a new representative.	Agreed
26	There are no quantitative criteria set for monitoring vegetation, macro-invertebrates or water quality.	Quantitative criteria for vegetation, macro-invertebrates and water quality should be developed as part of the s46 review.	Address this as part of the section 46 review
27	Significant differences in the approach of these environmental approvals for Gngangara and those for Jandakot and between the two Gngangara approvals.	The s46 review should be used to harmonise the approach and, if appropriate, bring the reporting together.	Address this as part of the section 46 review

(Shading indicates actual or possible non-compliance)

In its response to the Auditor's report the WRC has indicated (Appendix 4) that it supports the recommendations in the Audit Report and agrees that some action should be taken in relation to the above points. However, the WRC considers that the Auditor's recommendations in some instances may not achieve the desired outcome and that other options should be examined through the section 46 review that has been initiated by the WRC.

A specific response by the WRC against each of the twenty seven items is provided in Appendix 4.

3. Other Advice

This compliance audit is more complex than that related to the Jandakot Mound for a number of reasons. Firstly there are several statements with environmental conditions that are subject to audit. Secondly, although most focus in relation to compliance has been on groundwater levels at defined locations across the Gnangara Mound, there are other matters that the Auditor has reported as possible non-compliance. Thirdly, the Environmental Protection (Gnangara Crown Land) Policy 1992 covers most of the area and breaches of conditions are likely to also imply breaches of the EPP. Although this EPP is outside the scope of this audit, the EPA has provided comment in relation to several issues. Lastly, this audit has occurred at a time when the Gnangara Mound has become the most significant source of water for Perth and the Integrated Water Supply Scheme due to low dam inflows.

As part of the context of this review, the EPA has noted that section 4 of the *Rights in Water and Irrigation Act 1914* lists the following objects of the Act:

- (a) to provide for the management of water resources, and in particular —
 - (i) for their sustainable use and development to meet the needs of current and future users; and
 - (ii) for the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them;
- (b) to promote the orderly, equitable and efficient use of water resources;
- (c) to foster consultation with members of local communities in the local administration of this Part, and to enable them to participate in that administration; and
- (d) to assist the integration of the management of water resources with the management of other natural resources.

The WRC's Environmental Water Provisions Policy for Western Australia, Statewide Policy No. 5 indicates how the Commission would meet these requirements in relation to the priority allocation to the environment.

The EPA has previously identified a number of matters that are relevant to non-compliance in advice to the Minister on progress of the section 46, some of which are also noted in the Auditor's report. Matters upon which the EPA provides comment below include:

- On-going breaches of criteria and other environmental conditions and action taken by WRC to address these breaches;

- Progress on the Section 46 initiated by the WRC in 2001;
- Allocation and private licence decisions under circumstances of non-compliance; and
- The Environmental Protection (Gnangara Mound Crown Land) Policy 1992.

On-going breaches of environmental water criteria

One of the important requirements of both Statements is to meet water levels defined as environmental water provisions (EWPs). These are the water regimes (levels) that are provided as a result of the water allocation decision-making process taking into account ecological, social and economic impacts. They may meet in part or in full the ecological water requirements (EWRs). Ecological water requirements are the water regimes (levels) needed to maintain ecological values of water dependent ecosystems at a low level of risk (WRC 2000).

The WRC has advised the EPA over the past three years of actual and predicted breaches of water level criteria as part of its reporting on the progress of the Section 46 review. There has been a general trend over the period of falling water levels in many of the wetlands and bores, with the result that non-compliance with criteria has increased.

It should be noted that the WRC forecast in its 2003 Progress Report that “Twelve transgressions are considered likely on the Gnangara Mound, and these are generally expected to not be as severe as 2003/04. The transgressions include Loch McNess, Lake Nowergup and several in the Lexia area.” (WRC 2003, p ii). This change on the trend is a consequence of near average rainfall last winter rather than changes to land use or groundwater abstraction.

Having identified the instances of non-compliances during 2000-2003, the WRC points out that

“While impacts on some individual elements have clearly been greater than planned for in the *proposals*, the Commission considers that overall impacts on water dependent environmental systems as a whole have generally not been significantly greater than planned, and that they have not been excessive in terms of the overall environmental values of these systems. This is consistent with the fact that many of the non-compliances have not been large. Further, the extent of additional impacts on these systems due to water level changes have not been exceptional in comparison to other impacts on the systems from activities such as urban and rural development. Notwithstanding this, the Commission believes that under current abstraction, land use and rainfall conditions, close monitoring and management is necessary to ensure that significant permanent loss of values does not occur.” (WRC 2004, p6)

This reflects a view that the WRC has expressed for some time, viz, that non-compliance is not important provided the environmental values that are to be protected through the criteria are not lost or significantly threatened. However, environmental values have been lost (eg Coogee Springs) and others are under significant threat. As pointed out by the EPA’s Auditor in both his Jandakot and Gnangara reports, this is inconsistent with the basic legal requirement under the *Environmental Protection Act* to comply with criteria.

The possible impacts of declining groundwater levels on aquatic fauna within the cave pools and streams in Yanchep National Park is acknowledged by the WRC as being of such significance that immediate action has been required. However, this cave replenishment cannot replace the need to address the underlying causes of the decline in groundwater levels.

The details of those sites where non-compliance has occurred during the triennial period is provided in Table 5, which is derived from information in Tables 1, 2 and 3 of the WRC's Triennial Report (WRC 2004)

Table 5. Details of non-compliance with water level criteria during 2000-2003

Monitoring site	Criteria (mAHD)	No. of non-compliance (2000-2003)	Main cause of non-compliance
Groundwater Bore			
JB5	44.8 (Abs Min)	3	Climate change and private abstraction
MM53	33.3 (Abs Min)	1	PWS abstraction and climate change
MM55B	29.5 (Abs Min)	1	Climate change and PWS abstraction
MM59B	36.3 (Abs Min)	3	Climate change and PWS abstraction
PM6	53.5 (Abs Min)	3	Climate change (minor PWS abstraction?)
WM1	55.7 (Abs Min)	2	Climate change and PWS abstraction (minor pines?)
WM6	58.3 (Abs Min)	1	Climate change and PWS abstraction
Wetlands			
Loch McNess	6.95 (Pref Min) 6.90 (Abs Min)	1 -	Pumping to supplement cave water levels
Lake Joondalup	16.2 (Pref Min) 15.8 (Abs Min)	3 -	Climate change and private abstraction
Lake Mariginiup	42.1 (Pref Min Peak) 41.5 (Abs Min Peak)	3 -	Climate change and private abstraction
Lake Jandabup*	44.7 (Pref Min Peak) 44.2 (Abs Min Peak)	2 1	Climate change and private abstraction
Nowergup Lake*	17.0 (Pref Min Peak) 16.8 (Abs Min Peak)	1 2	Climate change and private abstraction
Coogee Springs*	12.0 (Pref Min Peak) 11.25 (Abs Min Peak)	3 1	Climate change and private abstraction
Lexia 94	45.8 (Pref Min) 45.5 (Abs Min)	2 -	Climate change
Lexia 186	47.5 (Pref Min) 47.2 (Abs Min)	3 3	Climate change
Egerton Seep	39.29 (Abs Min)	1	Climate change

Abs Min – Absolute minimum water level (end of summer)

Pref Min – Preferred minimum water level (end of summer-allowed below this level 2 in 6 years)

Pref Min peak – Preferred minimum water level (spring)

Abs Min Peak – Absolute minimum water level (spring)

PWS – Public water supply

* - wetland water level artificially maintained for part or whole of period

The WRC has suggested that the primary reason for non-compliance during this triennial period has been climate change, with a period of reduced rainfall leading to declining recharge and lower groundwater and wetland water levels. The WRC acknowledges that “the general reduction in water levels over most of the Gngangara Mound has continued since the previous triennial report” (WRC 2004, p. 21).

One clear example of where compliance has been difficult is in the East Gngangara area. When the proposed Lexia wellfield was approved in 1997, water levels in a number of significant wetlands had already been declining since at least 1994. By the time the Lexia wellfield commenced pumping in 2000/01, some wetland water levels were already in non-compliance and have remained so during this triennial period.

It should be noted that the EPA was aware of and supported the approach of temporary pumping of water from Loch McNess as a water source for trials to maintain artificially water levels within several Yanchep caves which contained threatened ecological communities. In this instance, the EPA accepted that the temporary pumping was unlikely to affect adversely the values of Loch McNess while the threat to the root mat communities within the caves was considered to be very significant.

In addition to the wetlands with criteria defined in the Statements, there are four additional significant wetlands where the WRC has defined interim (proposed) absolute minimum criteria or management objectives that have also not been met. These are listed separately in Table 6 as they are not matters of compliance with conditions, but rather are included to illustrate the significant extent of decline in wetland water levels. The information is taken from information in Tables 1, 2 and 3 of the WRC's Triennial Report (WRC 2004).

Table 6. List of other wetlands with WRC water level criteria

Monitoring site	Criteria (mAHD)	No. of non-compliance (2000-2003)	Main cause of non-compliance
Lake Wilgarup	4.8 (Pref Min)	3	Climate change and private abstraction
	4.5 (Abs Min)	-	
	6.10 (Pref Min Peak)	3	
	5.65 (Abs Min Peak)	2	
Pipidinny Swamp	1.60 (Abs Min)	-	
	2.70 (Pref Min Peak)	?	
	2.40 (Abs Min Peak)	1	
Lake Gngangara	42.0 (Pref Min)	3	Climate change and private abstraction
	41.3 (Abs Min)	-	
Edgecombe Seep	14.35 (Abs Min)	3	Climate change?

Two other drivers of non-compliance identified by the WRC are private and public abstraction. These are discussed later in this report.

Another issue in relation to compliance that has been claimed by some people to be the primary cause of declining levels has been the pine plantations on the Gngangara Mound. Although the WRC does not nominate the pine plantations as a primary cause in Table 4 above, there is certainly considerable effort being made to define more precisely their impact on groundwater levels and to address actively their impact. This issue is also discussed later in this report.

Progress toward resolving the appropriateness of criteria established under current environmental conditions has been unfortunately distracted by consequences of the recent period of poor dam inflows and declining groundwater levels.

While the WRC has no control over annual rainfall, it does have statutory control over allocation decisions. The EPA appreciates the complexity of setting and varying allocations, but points to the obligation of the WRC to meet its legal responsibilities, including compliance with environmental conditions. Deferring immediate action to achieve compliance is no longer legally nor environmentally acceptable.

Breaches of other environmental conditions

The Auditor's report (Table 4 in this report) advises that many of the environmental conditions and commitments under Statement 438 are subject to non-compliance to some level, while there is non-compliance with some conditions and commitments under Statement 496. In a number of cases, the issue relates to inadequate provision of information or lack of clarity of information in relation to compliance.

In a number of instances, the Auditor has suggested that the condition or commitment should be amended through the section 46 review.

The EPA has considered the Auditor's recommendations and response by the WRC on each of the twenty-six items where actual non-compliance has been established or possible non-compliance has been identified. As mentioned earlier, the WRC has advised that it supports the recommendations of the Auditor and seeks to resolve all instances of non-compliance. In many cases, the WRC intends to address these matters through the section 46 review initiated in 2001.

It needs to be recognised that an intention to future action acknowledges that there is an issue that has yet to be resolved. The EPA has also clearly stated that the propositions to be presented in the section 46 will need to demonstrate to the EPA and the Minister that environmental values will have improved protection and enhanced management before changes to the existing criteria and other conditions and commitments would be contemplated.

Progress on the Section 46 Review

The EPA noted in its advice to the Minister on the WRC's 2003 Progress Report that it continued to express increasing concern about the environmental consequences of continuing high levels of public and private water abstraction on the Jandakot and Gnangara Mounds, particularly the latter.

The WRC is working towards submitting a first stage section 46 review by August 2004 that will address a number of the criteria sites. A second, more substantial second stage section 46 review is expected in early 2005. Each document will be released for a period of public review, with an EPA report with recommendations subsequently being submitted to the Minister for the Environment.

Completion of the Section 46 has already taken longer than desirable and should be a specific priority for the WRC. A detailed timetable that addresses non-compliance should be agreed with the Minister as soon as possible.

There are a number of issues that should be addressed through the section 46 review. These include:

- how short-term and/or long-term variations in rainfall are incorporated in the water allocation decision-making process.
- the review and determination of sustainable allocations limits for the Gnangara and Jandakot Mounds, and the mechanisms for periodic revisions and amendment of sustainable allocations limits and licence allocations.
- whether the Perth Regional Aquifer Modelling System (PRAMS) model is currently able to provide sufficient predictive accuracy to adequately inform allocation and other management decisions. If this tool is unable to do so, what other tools are able to do so.
- artificial supplementation has been occurring at Lake Jandabup, Lake Nowergup and Coogee Springs for years, although this has recently ceased in Coogee Springs. It does not appear that supplementation has been effective for Lake Nowergup and Coogee Springs and raises questions about the use of this type of active management to mitigate adverse environmental impacts.
- each of the items in the Auditor's reports on Jandakot and Gnangara Mound where non-compliance has been identified or variation is sought by the WRC.

Allocation and private licence decisions under circumstances of non-compliance

The EPA has previously expressed concern about the lack of tangible improvements from initiatives aimed at influencing private abstraction on the Gnangara and Jandakot Mounds. The WRC is intensifying its programme to focus on 'hot spots' in the Wanneroo Groundwater Area, including the Carabooda sub-area. Private abstraction in the Carabooda sub-area is having obvious adverse effects on vegetation within portions of the Yanchep National Park and may be having an effect on levels within some of the caves in the Park. Other wetlands, such as Lake Nowergup, are more likely to be affected by private abstraction in the Nowergup sub-area. The southern wetlands such as Lakes Jandabup and Mariginiup are likely to be affected by a combination of private and public abstraction.

Management action by the WRC has been primarily directed at controlling public groundwater abstraction by the Water Corporation, which has the largest allocation. Licenced private allocations from the Wanneroo Groundwater area during the triennial period have been 34.5 GL, 35.3 GL and 35 GL in 2000/01, 2001/02 and 2002/03 respectively (out of a total allocation limit of 38.2 GL per year). The Water Corporation's abstraction from the Gnangara Mound (Wanneroo, Pinjar and Lexia schemes) for each of the three years has been 54.4, 56.06 and 48.59 GL (compared with a licenced allocation of 52.49 GL per year). The Water Corporation has been significantly limited in its abstraction of groundwater from the superficial aquifer of the Gnangara Mound, with many production bores being closed down for extended periods.

The WRC intends to use a groundwater model (PRAMS) to provide an improved quantitative understanding of the various factors influencing groundwater levels.

Based on the progressive decline in water levels experienced across the Gnangara Mound, lower water levels in many significant wetlands, and indications that the stresses on many environmental values are now causing loss of some of those values,

the EPA believes that the current total allocation limits and licenced allocation levels on the Gngangara Mound are too high. It is important that the sustainable limits for all groundwater abstraction from the Gngangara Mound are reviewed and revised urgently. Failure to do so would be likely to cause further and potentially irreversible damage to the Gngangara Mound.

The EPA notes that the State Government has recently announced an initiative for a three year study on the Gngangara Mound to enable the collection of data needed to manage the water resource and associated environmental problems. This initiative has arisen as a result of the recognition that the environment that depends on the Gngangara Mound is under stress, and there is the need for more accurate information on water use to estimate the relative impacts on lower groundwater levels of drier climate, private and public groundwater abstraction and the pine plantation.

Given the likely influence of climatic variability and also the predicted effect of the pine plantations on groundwater levels, it will be important for water allocation regimes to provide for and reflect the changing availability of water.

Environmental Protection (Gngangara Mound Crown Land) Policy

The Auditor has raised the possibility that the management of the pine plantations on the Gngangara Mound has not been consistent with the 1992 Environmental Protection (Gngangara Mound Crown Land) Policy (the Gngangara EPP).

This issue of the Gngangara EPP is not part of this compliance audit with Statements 438 and 496. However, the EPA believes that it should provide some comment at this time.

The Gngangara EPP applies to Crown land on the Gngangara Mound and has the purpose of protecting

- (a) the level and quality of groundwater on and under the policy area; and
- (b) native vegetation and wetlands in the policy area.

There are three provisions supporting the achievement and maintenance of environmental quality objectives in the Gngangara EPP which are relevant to this discussion. These are:

- the excessive abstraction of groundwater from the Policy area (clause 7(e));
- controlling activities which can cause the levels and quality of groundwater on or under the policy area to be reduced or degraded or the destruction of native vegetation or wetlands in the policy area (clause 9(e)); and
- management of the pine plantation being carried out in such a manner as to ensure that use of the groundwater by the pine plantation is no greater than the use of groundwater by native vegetation (meaning that the basal area of the pine plantation should not exceed an average of 11 square metres per hectare) (clause 9(d)).

In relation to wetland protection, most of the wetlands with exceedences of water level criteria listed in Table 5 above are also listed in Schedule 1 of the Gngangara EPP.

Specific reference is made in the Gngangara EPP to management of the pine plantations on the Gngangara Mound to avoid significant impact on groundwater resources. The pine plantations are part of State Forest 65, which is vested in the Conservation Commission of Western Australia, and are managed by the Forest Products Commission. The pines are also subject to the 2002 *Wood Processing (Wesbeam) Agreement Act*. This Act places obligations on the State for the supply of pines to the Laminated Veneer Lumber plant at Wanneroo.

The EPA reviewed and recommended continuation of the Gngangara EPP in 1999 (EPA 1999), with a view to revising the Gngangara EPP following amendments to the Environmental Protection Act and completion of other reviews in relation to environmental criteria. Any revision of environmental criteria arising through the section 46 review process will also lead to changes in the Gngangara EPP.

The current EPP has no penalties relating to the provisions for groundwater and wetland protection referred to above.

4. Conclusion

The number of water level criteria defined in Statements 438 and 496 which have not been complied with has increased substantially over the period 2000/01 – 2002/03. In addition, the WRC has been found to be in non-compliance with other environmental conditions and proponent commitments contained in these Statements.

Despite concerns about this situation being expressed by the EPA during this period, the WRC has not fully recognised its obligations as a proponent under the *Environmental Protection Act*. Instead, the WRC has expressed the view that non-compliance is not important if the environmental values that are to be protected through the criteria are not lost or significantly threatened. However, this is not consistent with the legal obligation under the *Environmental Protection Act* for the WRC to comply with environmental conditions and commitments.

The EPA appreciates that circumstances, especially those related to climatic variability, have made the task of compliance more difficult. However, the EPA notes that the *Rights in Water and Irrigation Act*, under which the WRC has primary powers related to water allocation, includes several objects which are complementary to the environmental objectives behind the Statements. Specifically, the WRC has the object of the management of water resources:

- (i) for their sustainable use and development to meet the needs of current and future users; and
- (ii) for the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them.

These are two crucial areas in which the EPA considers that the WRC needs to respond.

The EPA considers that deferring immediate action to achieve compliance is no longer legally nor environmentally acceptable.

In several instances, the EPA has recommended that the WRC address non-compliance through the forthcoming section 46 review. The EPA recommends that a detailed timetable for the section 46 be agreed with the Minister as soon as possible.

The EPA supports the recent State Government initiative to require metering of private licences greater than 5 000 kL per annum. This requirement should apply across the Gngangara and Jandakot Mounds, with implementation in sensitive areas being a priority.

Given the likely influence of climatic variability and also the predicted significant adverse effect of the pine plantations on groundwater levels, it will be important for water allocation regimes to provide for and reflect the changing availability of water. The EPA believes that the current total allocation limits and licenced allocation levels on the Gngangara Mound are too high. As a consequence, the EPA considers that more relevant sustainable allocation limits need to urgently be established for the Gngangara and Jandakot Mounds, with clear variation provisions (rules), to provide for appropriate water use consistent with the protection of significant environmental values.

5. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes this report on compliance by the Water and Rivers Commission with environmental conditions and proponent commitments set out in Statements 438 and 496.
2. That the Minister notes that the EPA has found that the Water and Rivers Commission has not complied with a number of environmental conditions and proponent commitments set out in Statements 438 and 496
3. That the Minister considers the recommendations of the EPA in Table 4 of this report on those matters of non-compliance.
4. That the WRC submit a detailed timetable for the section 46 review addressing non-compliance and that this timetable be agreed with the Minister as soon as possible, noting that the EPA considers this review to be urgent.
5. That the Minister requires that the sustainable limits for all groundwater abstraction from the Gngangara Mound and Jandakot Mound are reviewed and revised by the WRC as a high priority.

Appendix 1

**Ministerial Statement No.438
Gnangara Mound Groundwater Resources**

**Ministerial Statement No.496
Groundwater Resource Allocation, East Gnangara, Shire of Swan**

Environmental Conditions Compliance Tables

NOTE Text in shading represents Auditor's comments relating to non-compliance
 Text in italics represents Auditor's comments relating to recommended action.

A. MINISTERIAL CONDITIONS

NOTE Text in shading represents Auditor's comments relating to non-compliance
Text in italics represents Auditor's comments relating to recommended action.

A. MINISTERIAL CONDITIONS for STATEMENT NO. 438 (APPLICABLE FROM 1997).

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
438: M-1	Fulfil the commitments published in EPA Bulletin 817 (Appendix 3) as revised in November 1996 and attached to the Minister's statement 438.	Compliance detailed in the following table of commitments.	Of the total number of 29 environmental water level criteria published in Statement 438- 22, 22, and 16 have been fulfilled in years 2000-01, 2001-02, and 2002-03 respectively. This has been achieved in a climate different to that which was considered when originally setting these criteria levels. Of major significance is that rainfall for the period 2000- 03 is significantly below long- term average rainfall. Climate is the dominant causal factor in non-compliance of water level criteria as public water supply abstraction from the shallow aquifer has declined by 6.5 Gigalitres from a high in 1993- 94 for the Wanneroo and Pinjar wellfields while private allocation has only increased by 0.5 Gigalitres in the Wanneroo Groundwater Area for the period 2000- 2003.	In printing this table it is preferable that is run continuously, as here, rather than alternately, as in the Gngara Triennial Report. There have been 7, 7 and 13 non-compliances with water level criteria in 2000/01, 01/02, and 02/03 respectively. In addition several other conditions and commitments have not been complied with. The reporting of compliance is appropriate. The assertions about cause are better addressed in the text of the report, with evidence to support them. They are open to question (see comments on text).
438: M-2 M2-1	The implementation of the proposal shall conform in substance to that set out in any designs, specifications, plans or other technical material submitted by the proponent to the EPA.	Condition met for Pinjar stage 2 part 1. Other components are not developed yet, however the Conditions will be met at the appropriate time. Ongoing condition.	As for 2000-01 and 2001-02.	OK
M2-2	Seek approval for modifications to the proposal.	No modifications have been made. Ongoing condition.	Yarragadee 15 GL - the EPA decided not to subject this project to the formal environmental impact assessment and the subsequent setting of formal conditions by the Minister for Environment and Heritage. Two appeals against this level of assessment were dismissed. West Mirrabooka Scheme – was not referred to the EPA because the Water Corporation met the EWR's and the allocation for the	Satisfactory compliance. This condition is no longer required. The condition could be deleted as part of the s46 review.

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
			Mirrabooka well field was not increased.	
438: M3-1	The allocation of water to public and private users and the operation of Pinjar Stages 1,2,3, Wanneroo and Mirrabooka groundwater schemes shall comply with EWPs.	<p>Environmental performance criteria have been set for nine wetlands within the Gngangara groundwater abstraction scheme.</p> <ul style="list-style-type: none"> Preferred minimum peak water level (2 in 6 year criteria) was breached in Coogee Springs in 2001/02 due to insufficient supplementation and water leaking from the lake. Absolute minimum peak water level criteria was breached in Lake Nowergup due to artificial maintenance pumping and electrical problems. Problems with the pumping systems have been remedied during 2000/01, and should ensure that minimum peak criteria are achieved in 2001/02. Breaching of preferred minimum peak water levels has also occurred in Lake Mariginiup during the review period, and for the sixth consecutive year, thereby breaking the 2 in 6 criteria. Breaches of absolute minimum surface water levels occurred in Lexia 186 wetland and Edgecombe seep during 2001-02. The water levels in Nowergup Lake, Lexia 94 and Melaleuca Park Wetlands had acceptable water levels this year, but have previously been below the preferred minimum criteria for several years in succession, thereby breaking the 2 in 6 year criteria. <p>The absolute minimum groundwater levels in JB5, MM59B and WM1 breached during 2001/02.</p>	<p>The majority of water levels were compliant with EWP criteria levels during the reporting period. During 2000/01 there were 9 non-compliances, 8 in 2001/02 and 16 in 2002/03. Water levels have continued to decline in the northern part of the Mound around PM6, PM7, PM9 (Pinjar), WM1 and WM2 (Wanneroo). Criteria were also non-compliant at Lakes Gngangara, Jandabup, Joondalup, Mariginiup, Nowergup, Coogee Springs and Wilgarup.</p> <p>Loch McNess was non-compliant for the first time in 2002/03 probably due to water being used in a trial to supplement the Yanchep Cave water levels and threatened stygofauna communities. This practice has now ceased.</p> <p>Non-compliances with criteria have become more widespread since 1998, correlating with six years of drought from 1997 to 2002.</p> <p>There was no significant change in the health or species composition of wetland vegetation at most sites, with the exception of the collapse of vegetation at Lakes Wilgarup and Nowergup following record low water levels in autumn 2002. In response the Commission continued the artificial maintenance program into the autumn period, rather than switching it off at the end of spring.</p> <p>For further details see tables B and C¹</p>	<p>The condition requires that the allocation of water to public and private users and the operation of the schemes comply with EWPs. The response addresses non-compliance with EWPs but makes no mention of allocation. It is not adequate to argue as M-1, that climate is the cause of the non-compliance and hence that the allocations and operation of the schemes would, given average rainfall, have complied with the EWPs.</p> <p>This condition has clearly not been complied with.</p>
438: M4-1	The integrity of all groundwater dependent	The Commission ensures the protection of groundwater-dependent ecosystems	The Commission ensures the protection of groundwater-dependent ecosystems through compliance with EWPs, which is audited through	The acronym "GDEs" is used later in the report. It presumably refers to groundwater

¹ Tables 6 and 7 – Gngangara 2002 annual report

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
	ecosystems, located on the Gngangara Mound, which are likely to be impacted by groundwater abstraction, shall be protected.	through compliance with EWPs, which is audited through this reporting mechanism. Research is also conducted by and on behalf of the Commission to monitor groundwater-dependent ecosystems on the Mound. The results of this monitoring and research is documented in annual and triennial reports to the EPA.	<p>this reporting mechanism While there have been some local impacts on groundwater dependant ecosystems (eg. weed invasion), partly attributable to groundwater abstraction, the integrity of the ecosystem as a whole has not been compromised (see below).</p> <p>Some of the Yanchep cave fauna are on the CALM's critically endangered list and are in need of protection. Declining water levels in caves primarily due to reduced recharge and possibly pines. Previous supplementation of water levels did not permit sufficient aeration of water leading to significant loss of fauna so higher levels of flow recommended. (Knott and Story, 2002)². The report suggests that, under favourable conditions, the invertebrate community may re-colonise.</p> <p>A 20-day trial in December 2002 was successful in raising water levels to 15cm below the cave floor. In July 2003, construction for a larger trial commenced to provide greater confidence that a the full-scale recharge scheme would be successful.</p> <p>The MoU on pine management with CALM (now Forest Products Commission) outlines the framework for thinning of pines to limit declines in water levels.</p> <p>A frog monitoring programme was carried out in 6 wetlands in the East Lexia area in 2001. Frogs are a sensitive indicator of wetland health and have considerable conservation status in their own right. Overall, the range of species recorded presented an acceptable representation of frogs typically found in the lower Swan Valley area (Aplin et al 2001).</p>	<p>dependent ecosystems. If so, it should be introduced here at the first use of the term.</p> <p>Key findings of the 2003 S46 Progress Report given at 438:P3 (below) of.</p> <ul style="list-style-type: none"> • moderate decline in mean vegetation health at Lake Joondalup, Lake Yonderup, Lexia 94, Lake Jandabup; • significant decline at Lake Mariginiup and Lexia 186; and • severe decline at Lake Nowergup; <p>as well as</p> <ul style="list-style-type: none"> • the "serious threat to cave fauna in the coming summer" (p25 Triennial Report) suggest that "the integrity of all groundwater dependent ecosystems" has not been protected as required. Probable non-compliance.
438: M5-1	The basis of decisions regarding the management of the water resources of the Gngangara Mound and maintenance of ecological systems shall be based on the concept of sustainable yield of resources <u>and maintenance of ecological systems</u> in accordance with	Water resources are managed to ensure sustainable development. The Commission sets limits on the water available for consumptive use to ensure that EWPs are met. EWPs have been set in consultation with DEP. Essentially these EWPs specify the management objectives and water levels that must be maintained in designated monitoring wells and wetlands across the Mound.	<p>Public Supply-</p> <p>The WRC reaches an agreement with the Water Corporation in November each year on the amount of groundwater that can be taken from the Gngangara mound that year without breaching the EWPs. The agreement specifies the amount that can be taken from each well.</p> <p>Private Supply-</p> <p>There is no State Water Conservation Strategy (SWCS). A draft was</p>	The text of the condition in column 2 has a typographical error. The condition actually refers to <i>A State Conservation Strategy for Western Australia – A sense of direction</i> , Bulletin 270, January 270, Dept of Conservation and Environment. This Strategy was prepared as a State response to the <i>World Conservation Strategy: Living Resource Conservation for Sustainable Development</i> (1980) of the International Union for the

² Knott, B and Storey A W 2002, Environmental Monitoring and Investigations – Gngangara Mound: Yanchep Cave Stream Invertebrate Monitoring. Department of Zoology, University of Western Australia. Report to the Water and Rivers Commission.

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
	<p>the objectives of the State Water Conservation Strategy.</p> <p><i>Underlined words are not in the original condition and appear to be a typographical error in the table.</i></p>		<p>released for public comment in July 2002 but was not released in final form. However, key components of the SWCS were included in the State Water Strategy released in February 2003, a decision made at senior government level The Water and Rivers Commission manages water resources on the Gngangara Mound by the sustainable yield concept which recognises maintenance of ecological systems. Each year the condition of the shallow aquifer is assessed in regards to the extent of winter recharge and production quotas for public wellfield abstraction adjusted accordingly. During the reporting period 2000-03, groundwater allocation for wellfield abstraction has declined (Appendix 2) reflecting reduced recharge from below average rainfall.</p> <p>During the reporting period 2000-03, groundwater allocation for private abstraction has increased only marginally (Appendix 2) in environmentally sensitive areas (eg Wanneroo Groundwater Area) as the area has or is close to reaching the sustainable subarea allocation limit.</p>	<p>Conservation of Nature and Natural Resources, and A <i>National Conservation Strategy for Australia</i> (1984) AGPS, Canberra.</p> <p>The thrust of these documents is the application of the principles of sustainable development, as they express them, to natural resources management.</p> <p><i>The response needs to be amended to address the State Conservation Strategy. Since WRC and Water Corp have, in recent years agreed quantities for abstraction at a time when non-compliance for the past year is known and for the coming year predicted it cannot be claimed that the agreed amount can be taken "without breaching the EWPs" so there appears to be non-compliance.</i></p> <p><i>The condition requires that decisions be "based on the concept of sustainable yield of resources <u>and</u> maintenance of ecological systems.." but the response provided refers to management "by the sustainable yield concept <u>which recognises</u> maintenance of ecological systems". These are not the same.</i></p>
438: M5-2	The basis for management decisions and the criteria specified for conservation of the environment and of the groundwater resource of the Gngangara Mound shall be subject to regular review.	Abstraction limits for public schemes are set on an annual basis to reflect environmental and production constraints and these take winter recharge into consideration. The quotas are reviewed on a monthly basis to ascertain compliance with EWPs. If EWPs are predicted to breach then the quotas are reduced in order to prevent the breach occurring. A review of criteria and environmental conditions set on this proposal is currently occurring under Section 46 of the Environmental Protection Act.	<p>Following submission of the Gngangara Mound Triennial 1997-00 report, the Water and Rivers Commission requested a review of the existing Ministerial conditions for the Gngangara Mound. In September 2001, the EPA endorsed a two-stage approach to a review of Ministerial conditions from the Minister for Environments request to the EPA to "inquire into and advise on changes to the existing Ministerial conditions" under Section 46 of the <i>Environmental Protection Act 1986</i>.</p> <p>The process being taken by the Section 46 review is documented in the Section 46 Review of Environmental Conditions on Management of the Gngangara and Jandakot Mounds, Progress report 2003 (refer to attached Introduction of this report).</p>	The condition calls for "regular review". The response refers to a single review, taking five years, over the 18 year life of the project. This is clearly not "regular review". The condition did not contemplate that the mechanism of review should be the s46 process. There should be other internal, but transparent, mechanisms for reviewing the basis of management decisions (and other matters that are to be "regularly reviewed"). The condition has not been complied with.
438: M6-1	Continue the current approach of widely	Allocation limits are published in annual and triennial reports. These reports are	The current approach as detailed in summary for years 2000-02 is on-going. In addition, community representatives on the Wanneroo	"Current" in the context means the approach that was current when the conditions were

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
	publishing the limits on groundwater availability for the Gnangara Mound.	available free of charge on the Internet and in the Commission's library. The Commission liaises regularly with Shire Councils and updates them on allocation limits. Licence holders are made aware of allocation limits during licence compliance surveys. Limits are also always available from the Commission on request for any interested party.	Groundwater Advisory Committee are updated on groundwater availability figures at committee meetings. This information is also available on request to any person.	<i>first set. The EPA recommendation on which this condition was based was preceded by an observation that "It is important that the community in general, and existing and potential users in particular, are aware of changes in groundwater levels. In that way, understanding of the need for management would increase, and future proposals could be consistent with increased understanding of the groundwater systems and improved acceptance of constraints on water use." Publication by annual reports and tabling at committee meetings is not achieving the intent of the condition.</i>
438: M6-2	Update the Figures published according to the requirements of 6-1		Groundwater availability figures are updated as necessary, eg. tabled at the Wanneroo Groundwater Area Advisory Committee meetings. Agendas available on request.	<i>Publication by tabling at committee meetings is not achieving the intent of the condition. The intent is to inform the public so attitudes are changed.</i>
438: M7-1	Actively encourage further reduction in public water demand through its Water Conservation Strategy.	Both the Commission and the Water Corporation undertake demand reduction programs aimed at reducing scheme and private abstraction. <ul style="list-style-type: none"> • Daytime sprinkler restrictions now apply to <u>both</u> scheme water and private garden bores. • Sprinkler restrictions limiting watering for 2 days per week have reduced water consumption by 15% over 2001/02. • Numerous education campaigns aimed at reducing water consumption in households, and the horticultural and industrial sectors have been carried out by the Commission, and the Water Corporation during the review period. • The Commission has conducted a number of Community Water Forums to educate and actively involve the public in water resource management. The Forum recommendations were discussed at the recent Parliamentary 	A State Water Conservation Strategy does not exist. A Draft strategy was released for public comment in July 2002 but was not released in final form. Components of the Conservation Strategy were included in the State Water Strategy released in February 2003. A decision was made at senior government level that the Conservation Strategy would not be released because of the possible confusion with the State Water Strategy. The State Water Strategy contains many actions relating to reducing public water demand that are principally the responsibility of the Water Corporation. The Strategy contains 84 governmental tasks of which the DoE is lead agency for 29 tasks and has a key supporting role for a further 26 tasks. A number of these tasks support the reduction in public water demand (Appendix 1 Attachment 438-M7-1 Tasks 4.1.3, 4.3.5, 4.10.1, 4.1.2, 4.3.6, 4.3.7, 5.1.3, and 6.3.1). Agencies report on progress in implementing these recommendations monthly to a Water Taskforce, which ultimately reports to the Premier. As an example, Stage 4 restrictions imposed on all customers of the Integrated Water Supply Scheme (supplied by Gnangara Mound groundwater) by the Water Corporation saved 51GL of water.	In 1987, when the EPA made its report on the original proposal to the Minister, the then Water Authority was "currently preparing a water conservation strategy for Perth". This is the document to which the condition refers. The State Water Strategy could be reasonably seen as the successor to that Strategy. The State Water Strategy has the objective of ensuring "a sustainable water future for all Western Australians" by, among other things, <ul style="list-style-type: none"> • "improving water use efficiency in all sectors" and • "achieving significant advances in water reuse" both of which would encourage further reduction in public water demand. Phase 1 of compliance with the condition can be said to have been complied with. Phase 2 (implementation of the strategy) is ongoing.

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
		<p>Water Symposium.</p> <ul style="list-style-type: none"> The Water Symposium enabled water resource management issues to be addressed at Parliamentary level, in a whole of Government approach. The outcomes of the Symposium will be implemented in future water resource planning and management initiatives. <p>The Commission has begun a joint program with the Agricultural Department to actively involve farmers and growers in improving water use efficiency in horticulture and farming.</p>	<p>groundwater) by the Water Corporation saved 51GL of water.</p>	
438: M8-1	<p>Refer proposals to allocate water for subsequent public supply schemes on the Gngangara Mound to the EPA (eg, Yeal, Barragoon, Muchea Schemes).</p>	<ul style="list-style-type: none"> Neerabup scheme was referred for environmental impact assessment in 1996 and was given the status of 'Informal Review with Public Advice' as the proposal was considered to have minimal impact on wetlands. The Neerabup scheme became operational in 1997. <p>Lexia approvals were obtained (see East Gngangara groundwater resources proposal). A proposed increase in abstraction from the Lexia wellfield to 8GL was referred to EPA and the Minister for the Environment and Heritage.</p>	<p>Yarragadee 15 GL - this proposal was referred to the EPA on DATE who decided not to subject this project to the formal environmental impact assessment and the subsequent setting of formal conditions by the Minister for Environment and Heritage. Two appeals against this level of assessment were dismissed.</p> <p>West Mirrabooka Scheme – was not referred to the EPA because the Water Corporation met the EWR's and the allocation from the Mirrabooka well field was not increased. This is in accordance with the WRC's Statewide Policy No.5. Environmental Water provisions Policy for Western Australia, 2000.</p>	OK
438: M9-1 (also refer to P21, P39)	<p>Undertake the following areas of specific research and monitoring: 1) Clarify the relationship between groundwater level and wetland water quality, 2) improve the understanding of the conservation value of wetlands on the Gngangara Mound, especially for those for which information on their value is limited.</p>	<p>The WRC has employed consultants to undertake annual vegetation, water quality and macroinvertebrate monitoring on the 11 wetlands on the Gngangara Mound since 1996. The results are incorporated in the annual reports on the Gngangara Mound, and are used to reassess EWP's during the S.46 Review. These studies aim to monitor the health of the wetlands as well as to gain a greater understanding of the conservation value of the wetlands. The Commission is also the State's custodian of its wetland mapping, classification and evaluation data set, which is continually updated to reflect improved understanding of wetland</p>	<p>The WRC monitors Gngangara Mound wetland vegetation, macroinvertebrates, water quality and frogs annually and measures water levels monthly at wetlands at which EWPs have been set (see also P22 to P39). WRC commissioned a study by Rockwater on 'Groundwater and wetland water level relationships' in March 2003. A final draft has been submitted to the WRC for review and comment. The scope of this study was:</p> <p>Task 1: review the relevant groundwater and wetland monitoring data from within the subject areas and identify and describe relationships as specifically as possible, where they exist, and note where relationships appear anomalous.</p> <p>Task 2. Identify anomalous relationships Where relationships appear anomalous, propose reasons for the anomalies and identify those</p>	<p>The scope of the studies initiated appears to cover the requirements of the condition. Once the studies are complete, this condition should be able to be cleared.</p>

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
		conservation values.	<p>wetlands where their water levels have a very poor or no relationship with nearby groundwater levels.</p> <p>Task 3. Identification of alternative monitoring locations Where the selected groundwater monitoring well (criteria well) has an anomalous relationship with the wetland surface water levels, where possible, identify an alternative monitoring point with a good relationship with the wetland and describe that relationship.</p> <p>Task 4. Proposal for investigations Make recommendations for work required to be carried out to confirm the outcomes of Task 2, including cost estimates and proposed prioritisation of work.</p> <p>Task 5. Future criteria setting Based on learnings from the study, provide documented advice on the matters to be considered when setting and monitoring future wetland water level criteria from the viewpoint of monitoring efficacy.</p> <p>The WRC also commissioned a study in March 2003 to review the ecological water requirements of Gngangara and Jandakot Mound wetlands. This study is being conducted by Dr Ray Froend at Edith Cowan University, and the part of the scope relevant to condition M 9-1 is:</p> <p>Identification and re-evaluation of ecological values</p> <p>Task 1a This task involves:</p> <ul style="list-style-type: none"> • Desktop review of ecological values identified in the 1995 Section 46 Review (Gngangara), 1997 East Gngangara Environmental Water Provisions Plan, and 1991 Public Environmental Review and 1992 Environmental Management Programme (Jandakot); • Restatement of the 1995, 1997 and 1991/92 values where applicable and reassessment and redefinition of these values where they have changed; • Identification of the ecological values of GDEs in the wider study area that were not considered in 1995, 1997 and 1991/92 but are now appropriate to define (desktop identification and field truthing). <p>Task 1b This task involves consideration of how values may change under a</p>	

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			<p>dry climate scenario or other land use changes:</p> <ul style="list-style-type: none"> • Utilising predictions based on probable continuation of current water level trends, as well as likely climate scenarios provided by the WRC, propose how the values as defined in task 1a may alter under a declining water level scenario; • Identification of the significance of altered values and areas where there is a high level of degradation risk. Consideration should be given to interim management approaches to manage this risk until the progression of the hierarchical management framework proposed in Task 4; • Where appropriate (for example in areas proposed for urban development under the MRS, or where other land use changes are likely to cause increases in water levels over the longer term) define how the values identified in 1a may alter under a rising water level scenario; <p>Task 1c</p> <ul style="list-style-type: none"> • Propose management objectives for the values identified in tasks 1a and 1b. Proposed objectives should also utilise information on biological and ecological parameters collected in Task 3. <p>A progress report has been received by the WRC on the results of Task 1. This can be made available on request.</p>	
438: M10-1	Submit a brief annual report and more detailed triennial reports on the environmental monitoring and management of the Ghangara Mound.	Condition met by this report and previous reports.	<ul style="list-style-type: none"> • Annual report for 2000-01 was submitted on the 28th of November 2001 • Annual report for 2001-02 was submitted on the 3rd December 2002 <p>Triennial report for 2000-03 has been submitted on 15 March 2003 (i.e. this report) following approval of date for extension</p>	OK
438: M11-1	Seek approval for transfer of ownership, control or management of this project.	Not applicable	Not applicable at this time.	OK
438: M12-1	Submit reports detailing performance and compliance with the conditions set in the Ministerial statement and attachments.	Condition met by this report.	<ul style="list-style-type: none"> • 8/10/99 No longer relevant- duplicated by M10.1 (comment from DEP Environmental Audit Branch audit table) 	OK

B. PROPONENT COMMITMENTS for STATEMENT NO. 438

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
438: P1	Request the Water Corporation to establish further monitoring bores for monthly monitoring and more frequently if required within a 200m radius of production bores located in phreatophytic vegetation.	The Water Corporation has established monitoring bores within a 200m radius of production bores for the Mirrabooka, Wanneroo and Pinjar schemes. These bores are monitored monthly and results are supplied to the Commission.	28/10/97 Condition cleared by DEP Environmental Audit Branch.	OK
438: P2	Establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation.	Additional bores were installed in 1995. Commitment cleared.	28/10/97 Condition cleared by DEP Environmental Audit Branch.	OK
438: P3	Select a range of indicator species at transects to determine an acceptable rate of change in vegetation composition. Also calculate similarity indices when monitoring.	<p>The Commission sponsors surveys of wetland vegetation on the Gngangara Mound on a yearly basis, and terrestrial vegetation on a triennial basis. These surveys are conducted by independent consultants, and analyse the mix of species present in transects across the Mound.</p> <p>The effect of the groundwater abstraction on native vegetation on the northern Swan Coastal Plain was been studied by Mattiske Consulting, (2000). This work is a continuation of research commenced in 1966.</p> <p>Froend <i>et al.</i> (1999) have compiled a detailed report on the interaction between groundwater levels and vegetation condition. An 'acceptable' rate of change in vegetation composition has not been established, however this commitment will be reviewed under the Section 46 review currently underway.</p>	<p>The Commission sponsors surveys of wetland vegetation on the Gngangara Mound on a yearly basis, and terrestrial vegetation on a triennial basis. These surveys are conducted by independent consultants, and analyse the mix of species present in transects across the mound. The results of monitoring are compared with results of previous rounds to give an indication of trends. The results of these are presented and discussed in previous annual reports and the 2003 Section 46 Progress report.</p> <p>The key findings are:</p> <ul style="list-style-type: none"> • Insignificant decline in mean vegetation health at Loch McNess, Coogee Springs, Egerton Spring, MM53, MM55B, MM59B, JB5, PM6, WM1 and WM6. • Moderate decline at Lake Joondalup, Lake Yonderup, Lexia 94, Lake Jandabup. • Significant decline at Lake Mariginiup and Lexia 186. • Severe decline at Lake Nowergup. <p>The key areas of concern relate to lakes Nowergup and Wilgarup and the Yanchep Caves.</p> <p>Note: Lake Wilgarup and the Yanchep Caves are not subject to water level criteria conditions.</p>	<p><i>It is not clear from the response that the condition has been complied with. It appears that, instead of selecting a range of indicator species, monitoring focuses on all trees and the larger understorey species. It also appears that similarity indices have not been calculated as required.</i></p>

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			Froend <i>et al.</i> (1999) have compiled a detailed report on the interaction between groundwater levels and vegetation condition. This report identified a range of potential indicator species such as <i>Banksia littoralis</i> , <i>B. ilicifolia</i> , <i>Melaleuca raphiophylla</i> , <i>Astartea fascicularis</i> and <i>Pericalymma ellipticum</i> . An 'acceptable' rate of change in vegetation composition has not been established, however this commitment will be reviewed under the Section 46 review currently under way.	
438: P4	Require the Water Corporation to prepare an environmental operations plan to provide specific detail on environmental management of groundwater schemes in the study area. To include detailed management prescriptions for wellfield operators and water resource managers.	The operation plan has been finalised. Commitment met and cleared.	24/10/00 Condition cleared by DEP Environmental Audit Branch.	Noted. However, given the changes with new projects and a lack of success of past practices in avoiding breaches of water level minima, it would be advisable to consider a review of the environmental operations plan.
438: P5	Prepare a water resources allocation and management plan for the Yeal area to identify groundwater allocations (before development of Yeal scheme).	Not yet required.	There are no immediate plans to develop the Yeal Scheme. However, groundwater allocation limits for this area will be covered in the Sub-regional Groundwater Management Plan for the Gngangara Mound (Perth to Gingin) currently in preparation by the Water Allocation Branch of the Commission.	OK
438: P6	Prepare a Water Resources Allocation and Management Plan for the Lexia area (East Gngangara area) to identify groundwater allocations prior to the development of the Lexia Scheme To include detailed groundwater modelling to optimise groundwater availability while minimising environmental impacts.	Commitment met through the East Gngangara Environmental Water Provisions Plan (1997) which identified the allocation limits for public and private use.	28/02/00 Condition completed as now assessed under Statement 496 (comment from DEP Evaluation Audit Branch audit table)	OK
438: P7	Develop a Memorandum	The MOU between the Commission and	18/01/00 Condition cleared by DEP Environmental Audit Branch	Agree the MoU has been developed as

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	of Understanding on pine management regimes with CALM	CALM (now FPC) was developed and signed in 1999. MoU is currently being implemented. Some modifications have been made to accommodate the State Agreement for the LVL plant, as this legislation over rides the WRC Act. Any changes to the plan must be approved by WRC, DEP, and CALM before being implemented. Directors' meetings to discuss the progress and amendment of the thinning strategies are currently held bi-monthly.	(incorrectly identified as condition 438: N4)	required, however, it is not presently being implemented and that must be addressed (see recommendations in text).
438: P8	Manage all groundwater allocation and use with the aim of meeting the objectives in EPA Bulletin 817, tables 15 and 16.	Objectives have been met, except for breaches in wetland water level criteria (refer to M3-1).	18/10/99 No longer relevant as covered by 438: M3.1 (DEP Environmental Audit Branch audit table comment)	OK
438: P9	Facilitate and undertake strategic research to minimise the impacts of groundwater abstraction	<p>Ongoing. The Commission is undertaking research in the following areas:</p> <ol style="list-style-type: none"> 1. Acidification of Lake Jandabup. Two research projects have been undertaken, an Honours and a Masters study. The findings indicate that the soil and condition that produces acidity are variably distributed across the lake and the proposed management initiatives have facilitated the recovery of the Lake. 2. Condition in the Yanchep Caves – see Commitment P11. 3. Terrestrial vegetation on the Gngangara Mound – see Commitment P3. 4. Macroinvertebrates/water quality and vegetation monitoring in wetlands on the Gngangara Mound – see Condition M9-1. 5. Groundwater modelling – the Commission and the Water Corporation are currently updating the groundwater model used to calculate predicted groundwater level changes due to abstraction on the Gngangara 	<p>Of the studies outlined in the adjacent columns (2000 to 2002), the Masters study on Lake Jandabup has continued into a PhD study and has been expanded to cover other lakes on the Gngangara Mound. Joint studies have been conducted by the WRC, CALM and the Water Corporation in 2002 and 2003 to develop a proposal for a permanent artificial maintenance scheme for the Yanchep Caves. A funding proposal now rests with Treasury for the infrastructure and running costs of the pumps. The 3 year vegetation mapping project being conducted by Mattiske Consulting has now been completed and a report is available (see P14). The statistical analysis of hydrographs has been completed (C. Yesertener) and a report is available.</p> <p>The WRC initiated four key studies in early 2003 to further the research into the impacts of groundwater abstraction on GDEs. They were:</p> <ol style="list-style-type: none"> 1. Groundwater-wetland water level relationships review (Rockwater). Scope as outlined in M9-1. Final draft received for review and comment 2. Groundwater monitoring network review (Aquaterra). The scope included a review of the current groundwater level monitoring network and recommendations for a preferred network that would provide information to the WRC on the effects of groundwater abstractions, climate, land use and management measures, on the groundwater resource. A final draft has been received for Commission review and comment 	<p>The studies reported seem mainly focussed on understanding the impacts of groundwater abstraction rather than minimising those impacts.</p> <p><i>Consideration should be given to studies that more directly address the commitment.</i></p>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
		<p>Mound. The updated model will predict the effects of confined aquifer pumping more accurately.</p> <p>6. The Commission is undertaking a 3-year project to map the vegetation communities on the Gngangara Mound.</p> <p>7. A statistical analysis of hydrographs and rainfall, land use and abstraction data on the Gngangara and Jandakot Mounds is being undertaken to gain a better understanding of the effects of these influences on groundwater levels.</p> <p>Further strategic research will be initiated as part of the Section 46 of environmental conditions currently underway.</p>	<p>3. Wetland sedimentology study (Syrinx Environmental). The study was a scoping study to examine the potential for wetland sedimentologic studies to provide information on past water level regimes and corresponding ecological condition. The study has been completed and a final report has been produced.</p> <p>4. Ecological water requirements review (Edith Cowan University). Task 1 of the scope is outlined in M9-1. Subsequent tasks are to propose revised ecological water requirements for the identified GDEs, to identify parameters that can be used to reflect the ecological values, environmental condition and health of the GDEs and that have a defined relationship with water levels, to recommend a hierarchical response-based management framework and model Ministerial conditions, and finally to recommend a revised biological monitoring program.</p> <p>A progress report outlining the results of Task 1 has been submitted to the WRC.</p>	
438: P10	Continue to provide advice to City of Wanneroo, Ministry of Planning, CALM and other relevant agencies on the impact of landuse on groundwater resources.	As part of its function the Commission regularly provides advice to State Government Departments, Local Government and community groups on statutory and strategic planning proposals. This liaison will be increased as part of drought response and the Section 46 review.	<p>Gngangara Consultative Committee, TOR, membership</p> <p>1. Advice is provided to State Government Departments, Local Government, Stakeholders and Community groups through the Gngangara Community Consultative Committee (GCCC) (Members List attached)</p> <p>The objective of the Commission's program of community consultation on the Section 46 process is to gain community ownership and understanding of the water resource problems that are currently being faced on the Gngangara and Jandakot Mounds.</p> <p>The Gngangara Community Consultative Committee is the main medium for community involvement for the Gngangara Mound on the Section 46 Review. The Consultative Committee met on 6 occasions from July 2000 to June 2003. At these meetings, detailed presentations are given by a range of government departments on the following subjects:</p> <ul style="list-style-type: none"> • water levels and current status of the Gngangara Mound; • wetland macroinvertebrates and water quality (acidification of wetlands); • wetland vegetation status; • actual and predicted breaches of ministerial conditions; • the status of individual Section 46 reviews (EWRs, sedimentology, wetland-groundwater level relationships and 	<p>The commitment has been complied with. It is not clear from the response whether the proponent provides advice on specific applications for rezoning, subdivision or development approval. If so, this should be mentioned.</p> <p>Given the vital role of the Gngangara mound in providing much of Perth's drinking water, there is an argument for the water resource manager having greater powers to influence land use over the mound.</p>

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			<p>optimisation of the groundwater monitoring network;</p> <ul style="list-style-type: none"> • pines management; • Water Corporation abstraction; • Yanchep Caves; and management of private abstraction. <p>2.The Gngangara Coordinating Committee was first convened in April 2003 and is made up of Directors of several government agencies (AgWA, DPI, WCorp, CALM, WRC, FPC, CSIRO and DPC). The Coordinating Committee meets monthly. Impacts of landuse on Groundwater resources and management options are regularly discussed. The Terms of Reference and members list are attached.</p> <p>Several other inter-agency committees also exist at which the WRC, CALM, the City of Wanneroo and/or the DPI are represented and the impacts of land use on groundwater resources are discussed. These include the Yanchep Caves Recovery Team, the Yanchep Caves Technical Group, the Pines Technical Group, and the East Wanneroo Land Use and Water Management Strategy Community Consultative Committee.</p> <p>A community Water Forum was held in September 2002 at the City of Wanneroo offices and run by the Water and Rivers Commission. Agency representatives and community members attended and the forum involved a full day of discussion centred around groundwater management on Gngangara Mound, and the impacts of land use on GDEs. Outputs of the forum contributed to the Government's Water Symposium held in October 2002. A summary of the forum can be found on the website: http://www.ourwaterfuture.com.au/community/forums_gngangara_mound.asp</p>	
438: P11	Continue to develop catchment strategies to minimise change in hydrological regime within the caves of Yanchep National Park. Monitor water levels and cave fauna.	WRC has supported CALM in developing a Caves Recovery Plan. A trial is currently being conducted to determine the viability of supplementing cave levels with groundwater pumping. Trials have been conducted in 2000/01 with limited success due to the high transmissivity of the cave sands and limestone. Soakwells and similar small-scale forms of artificial maintenance continue to occur in order to retain some habitats for the rare amphipods. Investigation is continuing in an attempt to	Following the 2002 State Agreement with Wesbeam, Cabinet required preparation of a Joint Agency Emergency Response Strategy for the caves. In response, the following actions have been undertaken: <ul style="list-style-type: none"> • investigations of land use management options have been conducted through interagency groups; • small and full-scale artificial maintenance schemes have been constructed and trialed to improve water levels in the Crystal and Cabaret caves; • encouragement of pine thinning upstream of the caves has been pursued as a priority under the pines MOU, however, the potential for this to achieve the desired results has been 	The work reported is consistent with compliance with the commitment. Section 5 of the EP Act was recently amended and now reads "Whenever a provision of this Act or of an approved policy is inconsistent with a provision contained in, or ratified or approved by, any other written law, the provision of this Act or the approved policy, as the case requires, prevails."

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		<p>identify other, more sustainable methods of maintaining the cave streams.</p> <p>Pine thinning upstream of the caves is continuing as a priority under the pines MOU.</p>	<p>compromised by the State Agreement; a joint agency technical group is evaluating alternative pine management options to achieve an optimal outcome for the environment, water supply and pine harvesting.</p>	<p>This means that the requirement of clause 9(d) of the Gngara Mound EPP, requiring the maintenance of the pine plantation at no more than 11 sq.m. basal area per hectare, prevails over the State Agreement Act with Wesbeam in the event of an inconsistency.</p> <p><i>The proponent should seek legal advice on this to ensure that the priority of the EPP is enforced. EPA could recommend that the Minister advise the Minister for Agriculture, Forests and Fisheries of the need for the FPC to comply with the EPP.</i></p>
438: P12	<p>Prepare strategic drainage plans for the study area including options for the management of high water levels in Lake Joondalup, Goollelal, Mariginiup and Jandabup.</p>	<p>Part Commitment met by report "Management of Water Levels in North West Corridor". Preparation of drainage plans has been delayed, however drainage is only an issue in high rainfall periods. The region is presently experiencing an extended period of low rainfall, and consequently research effort has been concentrated on issues associated with current climate trends.</p>	<p>23/09/99 On hold (comment in DEP Environmental Audit Branch audit table)</p>	<p>OK</p>
438: P13	<p>In consultation with other relevant agencies, the Water and Rivers Commission, will within six months of receiving environmental approvals, reconvene and provide ongoing executive support for an inter - agency technical advisory group for water resources planning and management issues on the Gngara Mound. This will be done in the context of recommendations of the Select Committee on Metropolitan Development and</p>	<p>Several interagency and community committees already exist which deal with the issues. These committees are responsible for planning and management of the Gngara Mound land use and water resources. Agreement was obtained from DEP to delay setting up this committee until appropriate.</p>	<p>A number of committees have been developed to deal with water resource planning and management on the Gngara Mound. Since the establishment of the Gngara Coordinating Committee in April 2003 (made up of Directors from all Government agencies) one of the group's roles is to facilitate and coordinate activities of the Technical Groups on the Gngara Mound (see TOR attached). A number of technical committees are described below.</p> <p>A Pines Technical group focus on alternative pine management options to achieve an optimal outcome for the environment, water supply and pine harvesting on the Gngara Mound.</p> <p>The Yanchep Caves Technical group's focus was to trial the feasibility of a full-scale artificial maintenance and prepare for a permanent artificial maintenance scheme to improve water levels in the Yanchep Caves.</p> <p>The aim of the East Wanneroo Land Use and Water Management Strategy Community Consultative Committee is to prepare a strategy</p>	<p>OK</p>

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	Groundwater Supplies.		<p>for sustainable land use and water management in the East Wanneroo area, by way of integrating the land use planning and development processes with groundwater protection and allocation objectives, the protection of productive agricultural land, tourism opportunities, basic raw materials, environmental values and landscape features for the benefit of the whole community.</p> <p>A number of technical groups are involved with the CSIRO Healthy Country Program which aims to apply a systems approach to investigating and modelling the Gnamangara Mound, and to develop the incorporation of water reuse technologies and strategies to increase sustainability.</p>	
438: P14	Continue to chair and provide support for the Consultative Committee as an ongoing forum for information exchange and advice.	<ul style="list-style-type: none"> A combined committee for Gnamangara/East Gnamangara has been reformed and the committee met twice in 2002. <p>Amendment of the <i>Rights in Water and Irrigation Act 1914</i> will enable the use of groundwater advisory committees as a forum for EWP issues, and it is envisaged that members of these committees will be invited to attend that forum.</p>	<p>In April 2003, the Gnamangara Coordinating Committee was established comprising Directors from DoE, FPC, WADA, DPI, DCLM, Department of Premier and Cabinet, Water Corporation and CSIRO. The committee meets monthly and aims to provide an integrated, whole of government approach to management on the Gnamangara Mound and to better coordinate multiple land and water resource use activities.</p> <p>Meeting agendas available on request.</p> <p>Refer to 496: P7.</p>	OK Good response – brief and full of information directly relevant to the fulfillment of the commitment.
438: P15	The Water and Rivers Commission will continue to report every three years to the Department of Environmental Protection on the management of groundwater within the Study area of the Gnamangara Mound. This will include information on the operation of groundwater schemes and private groundwater use, and environmental impacts. In those years when a triennial report is submitted, the Water and Rivers Commission will report to the Department		<p>Condition is similar to 438: M10-1.</p> <p>The Water and Rivers Commission seeks clearance of this condition 438: P15.</p>	<p>Agree this requirement is similar to M10-1. However P15 has a more detailed specification of the content of the reports that should not be lost.</p> <p><i>The wording of M10-1 could be amended to incorporate the elements of P15 specifying report content. P15 could then be cleared. The condition could be changed as part of the s46 review.</i></p>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	of Environmental Protection on compliance with environmental conditions.			
438: P16	Limit potential for tree deaths around production wells to 100m radius for normal (average) climate conditions and within 200m in extreme conditions. This should be part of Water Corporation licence conditions.	The Commission has developed criteria for monitoring adjacent to production wells, and this has been incorporated into the Water Corporation's operating strategy. The Water Corporation is required to monitor these monthly and actively manage their abstraction regime to limit the impacts.	This requirement is included in the Water Corporation's Operating Strategy for the Metropolitan Groundwater Scheme. Compliance with the Operating Strategy is condition of the Water Corporation's licences. Abstraction from wells M140, M150, M172, M240, M250, P10, P50, P60, and P70 are believed to have some impact on the health of nearby vegetation. To ensure compliance, these wells are normally turned off. In total, more than 40 Water Corporation production wells have been turned off to avoid impact on vegetation and wetland water levels across the Gngangara Mound.	OK
438: P17	Upgrade the artificial maintenance facility for Lake Nowergup to provide more rapid recharge when it becomes necessary to meet EWPs.	Lake Nowergup is subject to an artificial recharge regime, which commenced in 1987. The original pump was upgraded from a capacity of 3.5 k/L per day to 6 kL per day and pump failures had occurred due to electrical failure. It was considered that an additional bore would prevent further breaches in this wetland and so a new bore was installed and commenced operation during December 2000. Supplementation of water levels during 2001/02 achieved the preferred spring peak levels.	Following installation of a higher capacity pump in the artificial maintenance well, a second well was added to the artificial maintenance facility for Lake Nowergup in 2000 to provide higher supplementation rates when required. Some mechanical problems limited the ability of the wells to be pumped at their full capacity initially.	OK
438: P18	Establish an artificial maintenance facility for Coogee Springs when necessary to meet EWPs	The criteria for Coogee Springs is a spring preferred minimum peak of 12 m AHD and a spring absolute minimum peak of 11.25 m AHD. Water levels in the review period were below spring preferred minimum peak during this and previous review periods, which constitutes a breach of the 2 in 6 year criteria. Coogee Springs is subject to artificial recharge from one bore, which commenced in August 1999. As a result of unexpected low pumping rates which subsequently failed to meet the water level criteria, the	An artificial maintenance facility was installed and commissioned in August 1999. This facility was upgraded in 2000/01. This condition is now believed to be cleared.	Agree, this commitment can now be cleared

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		Commission has installed a second bore of greater capacity to ensure criteria are met in the future. This bore is to be commissioned for use in spring 2001/02. The original bore will remain operative as a backup to the newly installed bore. Due to the high transmissivity of the karstic aquifer and the regionally low water levels, pumping enough water to meet water level criteria is likely to continue to be problematic, however this will be addressed during the Section 46 review.		
438: P19	Should EWPs not be met by November 1, artificial supplementation shall be used until the EWP is reached.	Artificial supplementation was required in Lake Nowergup and Coogee Springs during the review period. The criteria were not met in Coogee Springs due to problems with the artificial maintenance scheme, low starting water levels and the high transmissivity of the surrounding limestone.	Artificial supplementation was required in Lake Nowergup and Coogee Springs during the review period. The Coogee Springs facility was operated during 2000/01, but not since. The criteria were not met in Coogee Springs during the review period. The Commission has decided not to continue with artificial supplementation of Coogee Spring due to diminishment of environmental values caused by its usage as summer pasture and surrounding rural activity (factors beyond the control of the Commission). These factors should also be taken into account in determining the value of maintaining wetland water levels. The Lake Nowergup facility was operated each year during the review period. The criteria were not met in Lake Nowergup during 2000/01 and 2002/03.	<i>The proponent is required by the commitment to undertake artificial supplementation if the EWPs are not met by November 1. It is not up to the proponent unilaterally to decide to do something different. If the proposal is to be modified in this way permission should be sought from the Minister by written request under M2-2.</i> <i>What changes are proposed to address the failure of the Lake Nowergup supplementation to achieve the criteria?</i>
438: P20	Only allow drops below the preferred level (table 16, bulletin 817) to occur in low rainfall years to mimic natural regimes (rate of 2/6 years).	Breaches of water level criteria have occurred more than twice in six years within Lakes Joondalup, Gngangara, Mariginiup, Nowergup and Coogee Springs.	Breaches of water level criteria have occurred more than twice in six years within Lakes Joondalup, Gngangara, Mariginiup, Nowergup and Coogee Springs.	Non-compliance with environmental water provisions.
438: P21	A review shall take place of the EWPs (table 16, bulletin 817) at least every six years to allow for adaptive management. It will incorporate public involvement.	EWPs will be reviewed as part of the Section 46 review that is current being undertaken. The current EWPs were set in 1996.	Work to revise the EWRs was initiated during 2002 with completion expected during 2004 as a component of the current Section 46 review of environmental conditions. Once completed, this work will be analysed and used in the review of EWPs (expected during late 2004).	The late start to the review of EWPs constitutes administrative non-compliance. Since some EWPs are not being complied with, this delay in reviewing them is likely to extend that non-compliance.
438: P22	The Water and Rivers Commission will, after receiving environmental		4/09/97 Condition cleared in part as covered by 438: P33 & P 34 (comment in DEP Environmental Audit Branch audit table)	The condition has been "cleared in part", implying that there is a residual ongoing reporting requirement. Without reference to

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	approvals, implement and undertake the following monitoring programme, to the satisfaction of the EPA:			<p>"the following monitoring programme" is not clear what that requirement might be.</p> <p><i>It may be that the condition can be cleared in full.</i></p>
438: P23	Groundwater level monitoring across the established monitoring network, at a frequency of 1 or 3 months, depending on the wells.		All monitoring wells and wetlands that have Environmental Water Provision criteria are monitored on a monthly basis (see hydrographs as evidence). Other wells are either monitored monthly, quarterly or biannually. Aquaterra Consulting has recently completed a review of the Commission's groundwater monitoring network in the Perth region, and a draft report is currently with the Commission for review and comment. A copy of this report can be made available on request.	OK
438: P24	Vegetation transects will be established at all wetlands for which EWPs have been set, except Lake Gngangara, Pipidinny Swamp, and Coogee Springs. A minimum of one transect will be established for each wetland. Monitoring will be undertaken yearly, in November, for the first three years, to be reviewed in the first triennial report.		Permanent transects have been set up from the edge of the wetland to upland 40m at Lakes: Joondalup, Jandabup, Mariginiup, Nowergup, Yonderup, Wilgarup, Goollelal, Lexia 86, Lexia 186, Lexia 94, EPP 173, Dampland 78, Loch McNess. They were sampled annually in September 2000 - 02. As part of the Water Corporation's Lexia wetland mitigation strategy, vegetation transects have been established by the Corporation at wetlands 104, 132, 156, 158 and 164. The vegetation at these wetlands has been visually assessed by Edith Cowan University ecologists monthly, or fortnightly in summer over the 2001-2002 period. The Commission is provided with the results of these assessments. The Water Corporation has obtained agreement from the Commission to alter the monitoring programme in line with the annual programme currently in place for wetlands monitored by the Commission.	OK
438: P25	Wetland vegetation will be mapped every two years from large scale aerial photography for Lakes Jandabup, Mariginiup, Nowergup, and Loch McNess.		Aerial photography was used under the SLICP programme up until 2001. It then ceased due to high costs. There are three reasons it was ceased: under the SLICP programme the WRC did not have to pay for the aerial photo runs as it was considered a priority project. The project then fell off the SLICP programme because other projects were given precedence and the cost of the photography then became too much for the Commission to justify (10s of thousands of dollars). Advice from botanists (Bronwen Keighery from DEP and Libby Mattiske from Mattiske Consulting) was that the aerial photography needed to be of a very large scale to be of any real benefit in mapping. As an alternative, the WRC has access to digital orthophotos on its IntraGIS system (and these are regularly updated), and these are used in place of the traditional runs, plus two additional on-ground assessments by ECU each year since 2001 at these wetlands, which is more cost-effective than biennial mapping using air photos.	<i>The proponent requests that the wording of this commitment be changed to remove the requirement to use aerial photography. This could be achieved by deletion of the words "from large scale aerial photography". The condition could be changed as part of the s46 review.</i>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			The Water and Rivers Commission seeks amendment of Condition 438: P25 to reflect this change in methodology (eg delete aerial photography).	
438: P26	Water quality will be monitored annually in November at all wetlands for which EWP's have been set.		<p>Water Chemistry is monitored annually at Coogee Springs, Lakes Gngangara, Goollelal, Jandabup, Joondalup, Mariginiup, Nowergup, Wilgarup, Yonderup Loch McNess, Pipidinny Swamp, Lexia 186 & 86 and EPP wetland 173.</p> <p>Overall, water quality significantly declined during the 1996 drought but appeared to be slowly recovering. Coogee Springs had water quality problems due to livestock access and lack of fringing vegetation. Lake Mariginiup most at risk of excessive summer drying and wetland acidification. EPP 173 exhibited low pH levels. Lake Jandabup appears to be recovering from an acidification that occurred in 1997. Lake Joondalup and Loch McNess showed symptoms of nutrient enrichment.</p>	<p>The listed wetlands and lakes include all the original Gngangara Mound wetlands for which EWP's were set and three of the seven Lexia wetlands for which "interim" EWP's have been established.</p> <p>In the absence of clarification of the meaning of "interim" it would appear that the failure to monitor water chemistry in the other four Lexia wetlands may constitute non-compliance.</p>
438: P27	Wetland habitats will be mapped along two regional transects in November, using large scale aerial photography, every year for the first three years, then every three years.		<p>See above comment – P25.</p> <p>The Water and Rivers Commission seeks amendment of Condition 438: P27 to reflect this change in methodology (eg delete aerial photography).</p>	<i>The proponent requests that the wording of this commitment be changed to remove the requirement to use aerial photography. This could be achieved by deletion of the words " , using large scale aerial photography". As for P25 (above) the condition could be changed as part of the s46 review.</i>
438: P28	Established terrestrial vegetation transects will continue to be monitored in spring, with at least 6 transects monitored every three years.		<p>Phreatophytic, terrestrial vegetation is monitored triennially. The last survey was conducted in 2001/02.</p> <p>There has been a general shift in vegetation composition from moisture dependent species towards xerophytic species, which are better adapted to drought conditions. If dry conditions continue, the extent of the impact on the lower and mid slopes in the Pinjar area will increase, as these areas are already very stressed. Their long term recovery potential is of concern</p>	OK
438: P29	Indicator species will be monitored at established terrestrial vegetation transects when transects are monitored in spring. Parameters that will be assessed for each indicator species are age (size),		Terrestrial vegetation transects have been established at 13 sites on the Gngangara Mound. Most transects are monitored triennially in spring, some less frequently on occasions as advised by the consultant botanist (Mattiske Consulting Pty Ltd). All tree species are recorded, including details such as diameter at breast height (size), tree condition/health (vigour) and the existence of any seedlings (recruitment). Presence or absence of all understorey species in selected 4mx4m quadrats is noted, and information on density (alive	<i>It is not clear whether these indicator species are the same as those referred to in P3. If so, since those indicator species have not been selected, this commitment cannot have been complied with. Nevertheless there has been monitoring focussed on all trees and the larger understorey species. It also appears that similarity indices have not been</i>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	class distribution, vigour and recruitment.		and dead) and percentage foliage cover is recorded. Results are compared with results from previous monitoring. Monitoring of Gngangara terrestrial transects Bell, Bombing Range, Melaleuca, Neaves, P50, Tangletoe, Whiteman Park, Yanchep and Yeal occurred in 2002.	<i>calculated as required.</i>
438: P30	A Similarity Index for each terrestrial vegetation transect at each monitoring period will be calculated with the aim of summarising spatial and temporal changes in vegetation composition.		See P29.	<i>The response at P29 makes no mention of similarity indices. Rather, reporting is descriptive. This is not compliant with the wording of the commitment. While there must be some subjectivity about the assessment of vegetation health, it is absolutely central to the protection of environmental values on the mound. It is desirable, therefore, not only to quantify the assessments with the use of indices, but also to set target levels for the indices that are not to be breached. This would make these vegetation criteria more comparable with the water level criteria.</i>
438: P31	Continuous water level monitoring in three caves in Yanchep National Park will continue, with further cave monitoring established in suitable caves.		Water levels within 6 cave streams have been monitored since 1993. Loggers have been installed in 3 caves to enable continuous monitoring. CALM artificially maintains water levels in the Tuart root mat habitats located inside the caves. Water levels in lined concrete sumps located in Crystal Cave are also being artificially maintained to protect small populations of rare isopods (Knott and Storey, 2002). Cave stream water levels are generally representative of the surrounding groundwater table. Declining levels are due mainly to low rainfalls, and possibly dense pine plantation upstream, reducing groundwater discharge (Water and Rivers Commission, 1999)	OK
438: P32	Aquatic fauna will be monitored within those cave streams containing root mats once per year in November.		Macroinvertebrate monitoring occurred in Yanchep National park – Boomerang (YN99), Cabaret (YN31), Carpark (YN18), Lot 51 (YN55), Unnamed Cave (YN61) and Orpheua (YN256) in September 2001 and January 2002 with the exception of Twilight cave (unsafe to enter) Monitoring of cave fauna and water quality has occurred in November 1996, December 1998, November 2000, September 2001, January 2002 and September 2002 (Note, not all caves were sampled for water quality and cave fauna on each of the dates above). The paucity of species, low abundance of animals, and the unhealthy appearance of the root mats found in September 2001 prompted a	<i>The proponent requests that the wording of this commitment be changed to make the requirement to monitor in November more flexible. This could be achieved by replacing the words "in November" with "during Spring or early Summer". As for P25 (above) the condition could be changed as part of the s46 review.</i>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>second sampling in January 2002. Four new caves were sampled in September 2002, these were Cave YN61, Jackhammer Cave (YN438), Cave on Lot 51 (YN555) and Orpheus Cave (YN256).</p> <p>The caves sampled in September 2002 were Boomerang Cave (YN99), Cabaret Cave (YN31), Carpark Cave (YN18), Water Cave (YN11), Cave YN61, Jackhammer Cave (YN438), Cave on Lot 51 (YN555) and Orpheus Cave (YN256). Twilight Cave (YN194) should have been sampled but it was unsafe to enter and Gilgie Cave (YN27) was dry so it was not sampled (water cave was sampled instead). This sampling regime was also followed for the September 2003 monitoring.</p> <p>One of the recommendations stated in the 2002 monitoring report is that annual monitoring of the fauna be undertaken in September/October when habitat area is likely to be greatest to assess recovery of the fauna, should any occur. The report also recommended that permanent flows be restored to the cave streams and maintained at levels where by the majority of the root mats are submerged. In addition to the ecologists recommended that active management be initiated to develop and then maintain extensive root mats in the cave streams to provide suitable habitat to support fauna should it recolonise from inaccessible refuges.</p> <p>The results continue to indicate that species diversity and abundance has been reduced, mainly due to the decline in water from cave streams. Root mats are now being exposed to the air when previously they were submerged. Sampling difficult due to the dry conditions and it is not appropriate to sample the root mats to complete destruction.</p> <p>Cabaret Cave continues to be of major concern, in January 2002. The stream dried out completely and was still dry in September 2002 and there has been no detectable recovery of fauna. The four caves added in the September 2002 monitoring were of interest but did not contain extensive root mats or associated communities that would classify as new occurrences of the Threatened Ecological Community. However, aquatic fauna was collected from cave YN61 and Orpheus, were different from adjacent, routinely sampled caves and cave on lot YN51 was of some scientific interest. This highlights the diversity and zoological significance of the cave fauna of the area.</p> <p>The results indicate the importance of establishing a more robust and</p>	

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>reliable method of supplementation, which will restore or mimic flowing water to cave streams and through root mats.</p> <p>The actual month of cave monitoring may vary from year to year ranging from September to December. To some extent this is dependent on consultant availability. Having this flexibility is desirable. The Water and Rivers Commission seeks amendment to this condition 438: P32 by the deletion of the date of "November" and inclusion of the word "spring to early summer".</p>	
438: P33	Water levels in wells for which EWPs have been established will be monitored every month.		<p>Water levels at these sites are monitored monthly.</p> <p>These results are available upon request.</p>	OK
438: 34	Water levels in piezometer transects in the Yanchep area will be monitored every month.		<p>Water levels at these sites are monitored monthly.</p> <p>These results are available upon request.</p>	OK
438: P35	The impact of confined aquifer abstraction on unconfined aquifer water levels will be monitored. If significant impacts are observed the Water and Rivers Commission will discuss the observed impacts with the EPA.		<p>The Water Corporation currently has approval to abstract up to 15 GL from the Yarragadee confined aquifer. The Corporation has been requested to provide monitoring data relating to this abstraction to the Commission.</p> <p>Superficial monitoring bores that were identified in the 'cumulative deviation from the mean' (CDFM) hydrograph analysis studies as showing impacts from pumping the confined aquifers continue to be monitored eg PM1, PM4, PM6, and GC12. The impact of confined aquifer abstraction on the Superficial aquifer is being quantified using Perth Regional Modelling System (PRAMS) for the S46- Stage 2 and the Gnangara Allocation Plan (completion Dec. 2005).</p>	There was no reporting against this commitment in 2000-01 or 2001-02. The date on which the Corporation was asked to provide monitoring data to the Commission is not given. However, the Commission has adequate powers to require the Corporation to provide the data. Since the data are not provided, it is the Commission that is in non-compliance with the requirement.
438: P36	Water levels will continue to be monitored once per month in 28 wetlands within the study area.		<p>Water levels at these sites are monitored monthly.</p> <p>These results are available upon request.</p>	OK
438: P37	Water level monitoring in 13 wetlands for which EWPs have been set will occur more frequently than once per month, when necessary, to determine compliance with set levels.		<p>Water levels at these sites are monitored monthly.</p> <p>These results are available upon request.</p>	OK

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
438: P38	Aquatic fauna will be monitored at the 13 wetlands for which EWPs have been set twice per year (but only when open water is present), in November and March.		Macroinvertebrate monitoring occurs in Lakes Jandabup, Joondalup, Mariginiup, Nowergup, Yonderup, Wilgarup, Goollelal, Loch McNess, Gngangara, Coogee Springs, Pipidinny Springs, Lexia 86 & 186, EPP 173 and Egerton/Edgecombe seepages biannually at times of low and high water levels (September and January). If no water is present in the wetland during the summer sampling round, then no monitoring occurs. These results are available upon request.	The months during which monitoring has occurred (September and January) are different from those required under the commitment (November and March). At present this amounts to a minor non-compliance. As the intent of the commitment is still being achieved, this inconsistency could be rectified as part of the s46 review.
438: P39	The Water and Rivers Commission will, on receiving environmental approvals, prepare monitoring protocols for aquatic invertebrate monitoring within the wetlands, to the satisfaction of the EPA.	Monitoring of wetland macroinvertebrates is currently carried out. Suggestions from the improvement of monitoring methodology are given in the monitoring reports (Centre of Ecosystem Management, 2000).	Macroinvertebrate monitoring protocols were established between researchers to maintain consistency with monitoring on both the Jandakot and Gngangara Mounds. Attached are the macroinvertebrate methodologies employed. Approval for these is sought from the EPA.	Clearly this commitment has been in non-compliance for some time, since the protocols were to be prepared to EPA's satisfaction "on receiving environmental approvals" in 1997 and approval is only now being sought. An independent expert assessment of the monitoring protocols should be sought before the commitment is cleared.

C. WETLAND MANAGEMENT OBJECTIVES for STATEMENT 438.

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
438: Lake Jandabup	<ul style="list-style-type: none"> No expansion in the area of sedge vegetation, but maintenance of existing areas. Maintenance of the current extent of wading bird habitat. Maintenance, and if possible, expansion of the <i>M raphiophylla</i> and <i>E rudis</i> fringing woodlands. Removal of mosquito fish from the Lake. Maintenance of the high species richness of aquatic 	The existing extent of sedge and wading habitats within the Lake will be maintained (within +/- 10%), and should not change by more than 5% in any 2 year monitoring period.	In order to determine whether the values of the GDEs on the Gngangara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9. Preliminary results of this study indicate that values have been retained for this lake. <i>Mattiske Pty Ltd (2001)</i> reported Vegetation within lakes changed substantially, with extension of sedge species and decrease in condition of tree species on fringes.	<i>Given the major difference between the findings of ECU (preliminary, 2003) and Mattiske (2001) the final results of the ECU study should be awaited and scrutinised before compliance can be assessed.</i>

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
	macroinvertebrates and macrophytes.		<p>Water quality has improved in the lake following a 1997 acidification event. Alteration of the artificial maintenance regime to prevent excessive drying of the lake appears to have played a part in lake recovery.</p> <p>Despite long-term declines in surface water levels, artificial maintenance has lead to an increase of 0.21m in peak levels and an increase of 0.08m in minimums since 1998. Continuation of artificial maintenance and the trend in increasing water levels over the next five years should support the ecological values of Lake Jandabup related to diverse sedge and macrophytes and waterbirds and see further improvements in water quality.</p> <p>The EWRs of Lake Jandabup are currently under review.</p>	
438: Lake Gngangara	<ul style="list-style-type: none"> To improve water quality through increased water levels, as a means of enhancing both environmental and social values of the Lake. 	The pH of the Lake should increase. The extent of any expected increase is unknown.	<p>In order to determine whether the values of the GDEs on the Gngangara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9.</p> <p>Despite increasing water levels, this has not resulted in a general improvement in water quality. pH is low and the lowest recorded was in Spring 2003 (3.68 – 3.73).</p> <p>Quote from J. Clark and P.Horwitz January 2004: “Lower water levels at this wetland in recent years, has resulted in reduced inundation of littoral and fringing vegetation and therefore lower wetland habitat complexity. Habitat complexity is important to aquatic macroinvertebrate richness i.e. the more diverse the habitat complexity the more diverse the macroinvertebrate community composition of a wetland (Balla and Davis, 1993). The family richness of Lake Gngangara remains consistently low in comparison to most other wetlands studied as part of the study of wetlands following the Gngangara ERMP. This is due to the poor water quality of Lake Gngangara and in particular the low water pH. Dense mats of (red coloured) filamentous algae were apparent throughout</p>	<p>The initial paragraph need not be repeated, it clearly applies to the whole table and could be provided once in a general row at the head of the table.</p> <p><i>While the water levels have increased, the performance indicator of increased pH has not been achieved. In addition there are high levels of nitrogen and symptoms of eutrophication. The response does not mention any additional, specific, proposed management action to address these problems.</i></p>

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
			the wetland in Round 14 (with associated high chlorophyll <i>a</i> and turbidity). Nitrogen concentrations at Lake Gngara are consistently (and often significantly) higher than any other wetlands studied following the Gngara ERMP. These observations and results show that as well as being acidic, and having declining water levels, symptoms of eutrophication are evident."	
438: Lake Mariginiup	<ul style="list-style-type: none"> • To maintain the current area of sedge vegetation to within +/- 10%. • To maintain the current area of wading bird habitat. • To maintain invertebrate diversity through some lake- bed drying in summer. • To maintain, and if possible, enhance, fringing woodland vegetation. 	The existing sedge area to be maintained to within +/- 10%, and should not change by more than 5% in any 2 year monitoring period.	<p>In order to determine whether the values of the GDEs on the Gngara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9.</p> <p>The lake is not actively managed in terms of surrounding land used weed and fire control etc (factors beyond the control of the Commission) and these factors should also be taken into account in determining the value of maintaining wetland water levels.</p> <p>The area around Lake Mariginiup was burnt in 1997 that has resulted in loss of cover of <i>Baumea articulata</i>. Although there was extensive resprouting in 2000, in 2001 <i>B. articulata</i> was isolated to shaded areas under trees.</p> <p>In 2002 it was reported that <i>Baumea articulata</i> and <i>Typha orientalis</i> were encroaching further into the wetland as areas become progressively dry. The lake burnt again early summer 2003, and <i>B. articulata</i> and <i>Typha orientalis</i> is widespread and encroaching into the wetland basin. A firebreak was bulldozed through vegetation in the permanent monitoring transect leaving little to assess. By the end of winter Within the transect, exotic taxa dominated the understorey showing greater species richness than in recent years. Mean tree health declined significantly. Peak surface water levels at Lake Mariginiup have declined since the late 1960s. Although there has only been a decrease of 0.085m since 1998, a decrease of 0.23m occurred the previous year. The lake has also dried every autumn since 1995. A continuation of this declining water level trend over the next five years could have serious impacts on the ecological values of Lake</p>	<i>It is not possible from the information provided to determine whether or not the objectives and performance indicators have been achieved or not. The information needs to be briefer and to directly address the criteria/indicators.</i>

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
			<p>Mariginiup as water quality declines further. Lakes Mariginiup and Jandabup share similar characteristics including soil types, bathymetry, hydrology and surrounding land-use patterns. Prior to the 1997 collapse, the lakes also shared similar macroinvertebrate family composition. PH levels at Lake Mariginiup have declined since 2000 and are now approaching those recorded at Lake Jandabup immediately before the collapse in 1997. It is envisaged that another drying event over summer 2003/04 may cause the acidification of Lake Mariginiup and the loss of existing macroinvertebrate composition. This in turn may impact on the value of the lake as waterbird habitat thereby seriously affecting the ecological values of Lake Mariginiup.</p> <p>The EWRs of Lake Mariginiup are currently under review as part of the Section 46 Review process.</p>	
438: Lake Joondalup	<ul style="list-style-type: none"> • To conserve existing wetland vegetation, including sedge beds, fringing woodlands, and aquatic macrophytes. • To maintain and if possible enhance the aquatic fauna of the Lake. • To support the full range of habitats for avian fauna found at Lake Joondalup to help ensure its continued value as a major water-bird habitat within the Regions. This includes areas of deep and shallow water, and exposed banks in late summer. • To ensure the landscape amenity value of the Lake is maintained, except under low rainfall climatic conditions. 	(none)	<p>In order to determine whether the values of the GDEs on the Gngangara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9. Preliminary results indicate that Lake Joondalup is at moderate risk of impact and has retained the following ecological values</p> <p>Retained</p> <ul style="list-style-type: none"> • Waterbird habitat. • Diverse range of macrophytes. • Supports aquatic macroinvertebrates and vertebrates. <p>New</p> <ul style="list-style-type: none"> • Vegetation largely intact, provides range of habitat types. • Bushland surrounding wetland supports rare or priority flora. <p>The EWRs of Lake Joondalup are currently under review.</p>	The response does not directly address the objectives, but indicates that they have been achieved during the reporting period, with the possible exception of landscape amenity, which is not mentioned.

A. MINISTERIAL CONDITIONS for STATEMENT NO. 496 (APPLICABLE FROM 1999).

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: M1.1	Fulfil the commitments published in EPA Bulletin 904 (Appendix 2) as attached to the Ministers statement 496.	Condition met and ongoing.	Of the total number of 12 environmental water level criteria published in Statement 496- 10, 11, and 9 have been fulfilled in years 2000-01, 2001-02, and 2002-03 respectively. This has been achieved in a climate different to that which was considered when originally setting these criteria levels. Of major significance is that rainfall for the period 2000- 03 is significantly below long- term average rainfall. Climate is the dominant causal factor in non-compliance of water level criteria as public water supply abstraction from the shallow aquifer has declined by 5.5 Gigalitres from a high in 1990 for the Mirrabooka wellfield while private allocation has only increased by 1.4 Gigalitres in the Mirrabooka and Swan Groundwater Areas for the period 2000- 2003.	There have been 2, 1 and 3 non-compliances with water level criteria in 2000/01, 01/02, and 02/03 respectively. In addition several other conditions and commitments have not been complied with. The assertions about cause are better addressed in the text of the report, with evidence to support them.
496: M1.2	Changes to any aspects of the proposal as documented in schedule 1 of the statement that the Minister determines is substantial, shall be referred to the EPA.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 45C into the Act provides a mechanism for the Minister to approve non-substantial changes. The condition could be deleted as part of the s46 review.</i>
496: M1.3	Changes to any aspects of the proposal as documented in schedule 1 of the statement that the Minister determines is non-substantial, can be effected.	Not relevant at this time	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 45C into the Act provides a mechanism for the Minister to approve non-substantial changes. The condition could be deleted as part of the s46 review..</i>
496: M2.1	Implement the consolidated environmental management commitments documented in schedule 2 of the Minister's statement.	These commitments are being met as part of the ongoing management of the area.	<ul style="list-style-type: none"> • Condition is met by Condition 496: M1.1 • The Water and Rivers Commission requests that Condition 496: M2.1 be merged with Condition 496: M1.1. 	<i>Agree this condition appears to duplicate condition M1.1. They could be consolidated. The EPA could recommend to the Minister that this be done.</i>
496: M2.2	Implement the subsequent environmental management commitments which are made as part of the fulfilment of conditions and procedures in the	Commitments made to fulfil the conditions and procedures in the Ministers statement are implemented as part of the operating strategy of the Water Corporation.	As for 2000-01 and 2001-02.	<i>As implementation proceeds in response to matters arising, for example, in annual and triennial compliance reports, additional management commitments will be made. Some of these may relate to things the Corporation must do, in which case the response provided would apply. However,</i>

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	Minister's statement.			<i>others would relate to actions the Commission must take – at the very least ensuring that the operating strategy is updated and implemented. It is necessary to report on compliance with all these additional commitments for full accountability. They should therefore be added to the list of the proponent's commitments and reported annually until cleared.</i>
496: M3.1	The proponent nominated by the Minister for the Environment under section 38(6) or (7) is responsible for implementation of the proposal until such time as the nomination for that proponent is revoked under section 38(7) of the EPA Act and another person is nominated in respect of that proposal.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M3.2	Any request for change in proponent shall be accompanied by a copy of the Minister's Statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M3.3	Notify the DEP of any change of proponent, contact name and address within 30 days of such change.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M4.1	Provide evidence to the Minister before 17	This document provides this evidence.	Evidence that the proposal has substantially commenced is given in annual and triennial reports previously submitted to the EPA and the	Agree, this condition can be cleared.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	February 2004 that the proposal has been substantially commenced.		Minister. The Water and Rivers Commission seeks clearance of this condition 496: M4.1.	
496: M4.2	If the proposal has not been substantially commenced before 17 February 2004, the approval to implement the proposal as granted in this statement shall lapse and be void.	Not relevant.	Condition 496: M4.1 has been met. The Water and Rivers Commission seeks clearance of this condition 496: M4.2.	Agree, this condition can be cleared.
496: M4.3	Make an application to the Min for Environment for any extension of approval for the substantial commencement of the proposal beyond 17 February 2004 at least 6 months before 17 February 2004.	Not relevant.	Condition 496: M4.1 has been met. The Water and Rivers Commission seeks clearance of this condition 496: M4.3.	Agree, this condition can be cleared.
496: M4.4	If it demonstrated that the parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding 5 years for the substantial commencement of the proposal.	Not relevant.	Condition 496: M4.1 has been met. The Water and Rivers Commission seeks clearance of this condition 496: M4.4.	Agree, this condition can be cleared.
496: M5.1	Submit periodic Performance and Compliance Reports, in accordance with an audit program.	Ongoing. East Gngangara reporting will be incorporated into Gngangara annual reporting as stated in the proponent commitments. Therefore dates set in audit table are irrelevant as Gngangara reports are due prior to these dates.	Submitted jointly with Statement 438. Refer to Condition 438: M10-1.	OK
496: M5.2	Unless otherwise specified, the DEP is responsible for assessing compliance with the conditions, procedures and	Acknowledged. Changes to this arrangement are now necessary due to the merger between WRC and the DEP.	Condition needs to be amended to reflect the EPA is now responsible for assessing compliance with conditions, procedures and commitments.	<i>Agree the reference to DEP is no longer appropriate. The text "DEP" should be replaced with "EPA". The condition could be changed as part of the s46 review.</i>

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	commitments contained in this Statement and for issuing formal clearances.			
496: M5.3	The Minister will determine the matter where compliance with any condition, procedure or commitment is in dispute.	Acknowledged.	Acknowledged.	OK

B. PROPONENT COMMITMENTS for STATEMENT 496.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P1.1	Manage public and private groundwater abstraction to meet objectives and Environmental Water Provisions (EWPs) as summarised in Table A and B which appear in the attachment to Statement 496.	Of the 12 criteria there was one breach of absolute minimum in the 2001/02 reporting period at wetland Lexia 186. Abstraction from the Lexia GWS commenced in the 2000/01 summer under an interim licence, though only 2.5 GL of the 4 GL quota was abstracted. The Water Corporation negotiating an increase for more, subject to the approval of the wetland mitigation strategy. The Corporation have approval to take 7.75GL from Lexia in 2001/02.	<p>East Gngara Mound Bores (NR11C, MM12, L30C, L110C, L220C) Water levels were all compliant with interim absolute minimum end of summer levels.</p> <p>WM8, NR6C, WM2 and MM49B. Water levels were all compliant with minimum water levels.</p> <p>East Lexia Wetlands and Seepages (GNM13, GNM14, GNM15, GNM16, GNM17A, B10, B25) There were non-compliances with the absolute summer minimum at GNM15 (Lexia 186) in 2000 – 03. Water Corporation have shut down the four closest production bores so impacts likely to be primarily caused by reduced recharge. Non-compliance with the absolute minimum (>2 in 6 years) of GNM17A (Lexia 94).</p> <p>There was a non-compliance for the first time at Egerton Seep (B25) in 2003. However macroinvertebrate species richness and abundance was good and there had been no significant change in species richness since monitoring began. The next round of monitoring in Spring 2004 will help assess this further.</p>	Three non-compliances. Despite near average winter rains in 2003 and the shut down of four adjacent bores Lexia 186 was again non-compliant. The claim that this was caused by reduced recharge is weakened by the rains and (temporarily) raised water levels. The response makes no mention of private abstraction

³ Table 8 – Gngangara 2002 annual report

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			Near average rains in winter 2003 produced groundwater levels higher, on average than the previous years. The Lexia wetlands were 30cm higher and Egerton Seep 34 cm higher than at the same time the previous year. For more details see Table A ³	
496: P1.2	Review interim EWRs in the first triennial report to the EPA and update as appropriate.	Interim EWRs are currently being reviewed as part of the Section 46 review of environmental conditions currently occurring for Gngangara and Jandakot Groundwater Resources.	Work to revise the EWRs was initiated during 2002 with completion expected during 2004 as a component of the current Section 46 review of environmental conditions.	OK
496: P2	Submit annual and triennial reports on the management and monitoring of the East Gngangara Mound.	This Commitment has been met to date and is ongoing.	9/05/01 Condition no longer relevant as superseded by 496: M5.1 (comment in DEP Environmental Audit Branch audit table)	Agree this commitment is addressed by M5.1, and could be deleted. The EPA could recommend to the Minister to do this under s46A.
496: P3.1	Investigate stratigraphy and water regimes in the Lexia wetlands, EPP wetland 173 in Melaleuca Park and Melaleuca Park dampland 78.	Currently occurring as part of the Section 46 review (see P1.2). Preliminary analysis suggests the wetlands are not perched.	Rockwater reported on groundwater wetland relationships on the Gngangara and Jandakot Mounds in July and September 2003 (outside the period of this report), including the Lexia wetlands, EPP wetland 173 in Melaleuca Park and Melaleuca Park dampland 78 to determine possibility of perching. Perching of EPP wetland 173 and dampland 78 is indicated, with possible perching of Lexia 94 swamp.	OK
496: P3.2	Determine EWPs following the investigation undertaken in P3.1	Currently occurring as part of the Section 46 review (see P1.2).	To be undertaken following work to revise the EWRs expected for completion during 2004 as a component of the current Section 46 review of environmental conditions. (expected during late 2004).	OK
496: P4	Provide support to research projects and conduct research and investigations into the EWRs of wetlands, vegetation and seepage areas as defined in Section 16.5 of the PER.	Research into developing EWRs for wetlands, phreatophytic vegetation and other GDEs is occurring as part of the Section 46 review of environmental conditions on Gngangara and Jandakot Mounds. This includes sediment studies, development of monitoring protocols, methodologies for development of interim EWRs etc.	See responses to M9-1 and P9 of Ministerial Statement 438 (Gngangara Groundwater Resources).	OK
496: P5	Review and update EWPs and water allocation if necessary by feedback from the monitoring program.	Monitoring is conducted on an ongoing basis with data reviewed on an annual basis. A review of EWPs under Section 46 of the Environmental Protection Act and is currently being conducted.	Monitoring has been conducted on an ongoing basis during the review period, with annual reviews of the data. Work to revise the EWRs was initiated during 2002 with completion expected during 2004 as a component of the current Section 46 review of environmental conditions. This will incorporate consideration of the monitoring data to date. Once completed, this work will be analysed and used in the review of EWPs (expected during late 2004).	The commitment states that the proponent should update (i.e. change) the EWPs in response to monitoring. The EWPs are binding and set by the Minister, and can only be changed by her. However, there is nothing to prevent the proponent, in response to monitoring, adopting more stringent criteria. Indeed, such rapid response may well be needed, given the long time

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
				frame for formal amendment through s46.
496: P6	Undertake a monitoring program.	<p>Monitoring is conducted on an ongoing basis.</p> <ul style="list-style-type: none"> • Water levels at criteria sites are monitored monthly • biological monitoring wetland vegetation, invertebrates and frogs occurs annually. • water chemistry is analysed annually • terrestrial vegetation is monitored triennially. 	<p>A monitoring program was conducted during the reporting period.</p> <ul style="list-style-type: none"> • water levels- refer to Attachment 5 (hydrographs) • vegetation- refer to 496: P15.1 • invertebrates- refer to 438: M9-1 • frogs- refer to 438: M4-1 <p>Results are available upon request.</p>	OK
496: P7	Develop a MOU with CALM which includes pine harvesting in State forest 65 (SF65) over 20 years and the Gngangara Park establishment.	<p>MOU has been developed and signed in December 1999. MOU is currently being implemented and has recently been amended to accommodate the State Agreement for the LVL plant. Directors' meetings to discuss thinning strategies etc, are currently held bi-monthly.</p>	<p>18/01/00 Condition cleared by DEP Environmental Audit Branch (refer to 438: P7)</p> <p>Update- The MoU has not been effectively upheld since it was signed by WRC and CALM (now FPC) in 1999. Commitment between agencies has been compromised by the signing of the State Agreement to the WESBEAM LVL plant operations in mid 2002. Unfortunately, no provisions for compliance with the requirements of the Pines MoU were included in the State Agreement with Wesbeam negotiated by FPC and the Office of Major Projects, however, some pine thinning and clearfelling has been accommodated within the constraints of the State agreement for the LVL plant.</p> <p>In recognition of the importance for sustainable management of water resources and pine plantations on the Gngangara Mound, a number of new approaches are being considered and progressed to better achieve the purpose of the MoU. This includes the establishment of the Gngangara Coordinating Committee in April 2003 that comprises Directors from DoE, FPC, WADA, DPI, DCLM, Department of Premier and Cabinet, Water Corporation and CSIRO. The committee meets monthly and aims to provide an integrated, whole of government approach to management on the Gngangara Mound and to better coordinate multiple land and water resource use activities. Under the coordination of the Gngangara Coordinating Committee, the Pines Technical Group, a joint agency group (including members from DoE, DCLM, FPC and Water Corporation) was established to evaluate alternative pine management options to achieve an optimal outcome for the environment, water supply and pine harvesting.</p>	<p>OK.</p> <p>Re "Update" see comment on 438 P11 recommending the proponent seek legal advice re- the primacy of the EPP over the Agreement Act.</p>

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P8	Provide advice on impacts of landuse on groundwater resources to relevant agencies.	The Commission, as the peak body for water resource management, participates as an active member in a large number of committees and groups. It also provides advice, as required to State and Local Government agencies, on statutory and strategic planning.	<p>Advice is provided to State Government Departments, Local Government, Stakeholders and Community groups through the Gngangara Community Consultative Committee (GCCC) (Members List attached)</p> <p>The objective of the Commission's program of community consultation on the Section 46 process is to gain community ownership and understanding of the water resource problems that are currently being faced on the Gngangara and Jandakot Mounds.</p> <p>The Gngangara Community Consultative Committee is the main medium for community involvement for the Gngangara Mound on the Section 46 Review. The Consultative Committee met on 6 occasions from July 2000 to June 2003 (July 2001, November 2001, March 2002, April 2002, July 2002, and March 2003- agendas available on request). At these meetings, detailed presentations are given by a range of government departments on the following subjects:</p> <ul style="list-style-type: none"> • water levels and current status of the Gngangara Mound; • wetland macroinvertebrates and water quality (acidification of wetlands); • wetland vegetation status; • actual and predicted breaches of ministerial conditions; • the status of individual Section 46 reviews (EWRs, sedimentology, wetland-groundwater level relationships and optimisation of the groundwater monitoring network; • pines management; • Water Corporation abstraction; • Yanchep Caves; and management of private abstraction. <p>2. The Gngangara Coordinating Committee was first convened in April 2003 and is made up of Directors of several government agencies (AgWA, DPI, WCorp, CALM, WRC, FPC, CSIRO and DPC). The Coordinating Committee meets monthly. Impacts of landuse on Groundwater resources and management options are regularly discussed. The Terms of Reference and members list are attached.</p> <p>Several other inter-agency committees also exist at which the WRC, CALM, the City of Wanneroo and/or the DPI are represented and the impacts of land use on groundwater resources are discussed. These include the Yanchep Caves Recovery Team, the Yanchep Caves Technical Group, the Pines Technical Group, and the East Wanneroo Land Use and Water Management Strategy Community Consultative Committee.</p>	<p>The commitment has been complied with.</p> <p>The comments on community consultation are not relevant to this commitment, which relates to the provision of advice to agencies. It is not clear from the response whether the proponent provides advice on specific applications for rezoning, subdivision or development approval. If so, this should be mentioned.</p>

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<ul style="list-style-type: none"> A community Water Forum was held in September 2002 at the City of Wanneroo offices and run by the Water and Rivers Commission. Agency representatives and community members attended and the forum involved a full day of discussion centred around groundwater management on Gnangara Mound, and the impacts of land use on GDEs. Outputs of the forum contributed to the Government's Water Symposium held in October 2002. A summary of the forum can be found on the website: http://www.ourwaterfuture.com.au/community/forums_gnangara_mound.asp 	
496: P9	Determine EWRs for new appropriately located bores in the vegetation corridor.	The Commission is currently developing new EWRs, and they are scheduled for completion in 2003/04.	All EWRs and EWRs on the Gnangara Mound are under review as agreed to by the Minister and the EPA in 2001. As part of this review under Section 46 of the Environmental Protection Act, Edith Cowan University has been contracted to review the ecological values and ecological water requirements for GDEs on the Gnangara Mound (more information on the scope of this study is contained in the responses to M9-1 and P9 of Statement 438 (Gnangara Mound Groundwater Resources). This includes the vegetation corridor near the Lexia borefield. This review is due to be completed by the end of 2004.	OK
496: P10	Chair and provide support for a Consultative Committee as a forum for information exchange.	A combined committee for Gnangara/East Gnangara has been formed.	A combined committee for Gnangara/East Gnangara has been formed (The Gnangara Community Consultative Committee) meets in April and October each year (see Ministerial Statement 438 (Gnangara Groundwater Resources) P-10 for aims and details) Attached is the committee members list.	OK
496: P11	Require the Water Corporation to Phase in production bores closest to phreatophytic vegetation.	Phasing in of bores will form part of the licence conditions on Water Corporation.	<p>The Water Corporation is required by the operating strategy to phase in bores L12, L420, L430, L510, L620 and L710. The operating strategy forms part of the licence.</p> <p>The Water and Rivers Commission seeks clearance of this condition 496: P11.</p>	The condition could be cleared once the phase-in is complete. The response does not make it clear that this is the case.
496: P12.1	Require the Water Corporation to develop a wetlands mitigation strategy for any loss of value in wetlands 132, 156, 158, 164 and 104. The mitigation strategy will; identify actions to minimize loss of values, prior to development; monitor wetlands to determine whether loss of values has	The Water Corporation provided the draft wetland mitigation strategy to the Commission for comments in 2001. The Commission is currently working with the Water Corporation to reach an agreement on the final strategy.	16/02/01 Condition cleared in part with issue of interim licence to the Water Corporation to commence production subject to conditions (comment from DEP Evaluation Audit Branch audit table) requiring the Corporation to develop a wetlands mitigation strategy.	OK

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	occurred, on an ongoing basis; and compensate for any loss of values in the event of adverse impacts becoming apparent.			
496: P12.2	Require the Water Corporation to implement the mitigation strategy required of P12.1.	The Commission will require the Corporation to implement the mitigation strategy as a condition of holding a licence to take water.	Implementation of the wetland mitigation strategy required by Water Corporation's licence conditions (refer Condition 7). The strategy is due for review on 2004.	For full accountability the Corporation should be required to report to the Commission (and thence to the EPA) on compliance with the wetland mitigation strategy.
496: P13.1	Require the Water Corporation to prepare an operations plan (with environmental commitments to meet EWPs) for the Lexia and East Mirrabooka groundwater scheme.	The operation plan has been finalised.	Operation plan due for review in 2004. 10/02/00 Condition cleared by DEP Environmental Audit Branch.	OK
496: 13.2	Require the Water Corporation to submit yearly production plans as part of the operating strategy.	The requirement for yearly production plans forms part of the operating strategy.	Yearly production plans are submitted by the Water Corporation during negotiations in November each year to determine the amount that can be abstracted from the Gnangara Mound without breaching EWPs.	Given the ongoing breaches of EWPs this system is inadequate. The Corporation should be required to address past and predicted compliance with the "environmental commitments" referred to in 496 P13.1 (above), and the Commission should incorporate that information into this compliance report.
496: P14	Map vegetation communities on the Gnangara Mound.	Stage 1 of the mapping project has commenced. The project is expected to be completed by mid-2004.	The three-year vegetation mapping project has recently been completed. The study was conducted by Mattiske Consulting and a final report and ArcView information has been submitted to the WRC, DEP, CALM and the Water Corporation.	OK. It is not clear from the response whether the completed project is "Stage 1" referred to in the earlier response, or whether there is a Stage 2 still to come.
496: P15.1	Monitor water levels and establish a vegetation transect in wetland 132. - Pre-Operation	A water level monitoring bore has been installed and a vegetation transect has been established in this wetland.	As part of the Water Corporation's Lexia wetland mitigation strategy, vegetation transects have been established by the Corporation at wetlands 104, 132, 156, 158 and 164. The vegetation at these wetlands has been visually assessed by Edith Cowan University ecologists monthly, or fortnightly in summer over the 2001-2003 period. Water level monitoring has been conducted at the same time as the visual assessments. The Commission is provided with the results of these assessments at regular intervals (generally monthly). The Water Corporation has obtained preliminary agreement from the Commission to alter the monitoring programme in line with the annual programme currently in place for wetlands monitored by the Commission. Water levels will continue to be monitored monthly.	OK This commitment relates to the "Pre-Operation" that is now complete. It could be cleared.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P15.2	Monitor water levels and establish a vegetation transect in wetland 132. - Operation		As for P15.1	This is the ongoing commitment to continue monitoring during operations.
496: P16	Liaise with the Swan Valley Nyungah Community regarding the proposal.	Liaison with the Swan Valley Nyungah Community has been undertaken. A representative of the Community sits on the Gnangara/East Gnangara Community Consultative Committee.	Mr Iva Hayward-Jackson, a representative of the Swan Valley Nyungah Community, has been a member of the Gnangara Community Consultative Committee since late 2000. Mr Hayward-Jackson has generally declined to attend meetings in person, however, the WRC has sent Mr Hayward-Jackson copies of the meeting agendas and minutes. The Commission has also met with Mr Hayward-Jackson at the Swan Valley Nyungah premises and again at the Yanchep Caves in 2001. Since the Swan Valley Nyungah Community was closed down in 2003, the Commission has attempted to contact Mr Hayward-Jackson but so far has been unsuccessful.	OK <i>Given the representative's attendance record, and present unknown whereabouts his effectiveness must be questioned. A new representative should be sought.</i>
496: P17.1	Undertake a dieback survey.	A dieback survey was conducted in 1996 and again in 2000.	A dieback survey was conducted in September 2003. A survey is conducted every 3 years (commitment made in East Gnangara Water Provisions Plan (WRC, 1997). The 2003 report has recommending that sections of the survey be done each year rather than all at one time.	OK
496: P17.2	Prepare dieback management procedures. - Pre-Operation	Completed.	Water and Rivers Commission monitoring personnel have a standard policy of keeping vehicles clean between trips. Dieback quarantine areas are managed by CALM and have unique levels of restrictions associated with it. Due to sandy nature of the Gnangara Mound in general, the transmission of dieback from soil adhering to vehicle tyres and shoes of people walking through dieback areas is of lower risk than in clayey areas such as in the Darling Range. The Water and Rivers Commission is not aware of special requirements for the Gnangara Mound area.	<i>The commitment requires that procedures (however simple) be prepared. It appears that the proponent has decided to adopt the Commissions general procedures, but it is not clear that these have been submitted in clearance of this commitment.</i>
496: P17.3	Implement the dieback management procedures as required in P17.2 – Operation	Ongoing.	<ul style="list-style-type: none"> Refer to 496: P17.2 	OK

Appendix 2

References

Environmental Protection Authority (1999). Revised Draft Environmental Protection (Gnangara Mound Crown Land) Policy 1999. Report to the Minister for the Environment as required under Section 28 of the Environmental Protection Act, 1986

Malcolm J (2004). Audit of Compliance Report - Environmental Management of Groundwater Abstraction from the Gnangara Groundwater Mound July 2000-June 2003

Water and Rivers Commission (2000). Environmental Water Provisions Policy for Western Australia, Statewide Policy No. 5

Water and Rivers Commission (2003). Progress Report 2003 – Section 46 Review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds

Water and Rivers Commission (2004). Environmental Management of Groundwater Abstraction from the Gnangara Groundwater Mound July 2000-June 2003 - Triennial Report to the Environmental Protection Authority

Appendix 3

**Malcolm J (2004). Audit of Compliance Report - Environmental Management of
Groundwater Abstraction from the Jandakot Groundwater Mound**

1 April 2004

Audit of Compliance Report

**Environmental Management of
Groundwater Abstraction from the
Gnangara Groundwater Mound
July 2000 – June 2003**

Water and Rivers Commission

JIM MALCOLM
Environmental Consultant



Audit of Triennial Compliance Report for 2000-03

Environmental Management of Groundwater Abstraction from the Gngangara Groundwater Mound

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Audit of Triennial Compliance Report for 2000-03

Environmental Management of Groundwater Abstraction from the Gnangara Groundwater Mound

Summary

The taking of groundwater from the Gnangara Groundwater Mound, in the northern suburbs of Perth is subject to two Ministerial approvals under Part IV of the *Environmental Protection Act 1986* (the Act). Those approvals are subject to a number of environmental management conditions. The purpose of those conditions is to ensure that the environment is protected as implementation of the proposal proceeds.

The Department of Environment¹ submitted to the Environmental Protection Authority in March 2004 its report for the 2000-03 triennium on compliance with the conditions (the Report), and this document presents an audit of that compliance report, including an assessment of the significance of instances of non-compliance.

The Report acknowledges that there has been non-compliance with the environmental water provision where minimum water levels in lakes and monitoring bores have been breached on 9 occasions in 2000/01, 8 occasions in 2001/02 and 16 times in 2002/03. In addition, this Audit has identified 25 other instances on non-compliance or possible non-compliance of a more administrative nature.

There are a number of deficiencies in the management of water abstraction from the Gnangara water mound. The prime concerns relate to the superficial aquifer. It has the greatest complexity, being most closely linked to the health of wetlands and vegetation on the mound, and having significant competing uses for the water (e.g. domestic bores, irrigated horticulture, pines and scheme water abstraction).

Not enough is known at present about the relationship between rainfall, recharge, abstraction and water levels or their effect on environmental health. Nevertheless, water levels are being used as the primary monitoring and reporting criterion, and viewed as a surrogate for the health status of the vegetation on the mound. The implied assumption is that if water levels drop “too low” from an environmental health point of view, this can be reversed by reducing groundwater abstraction.

What level is “too low” is not known. There are instances where the set minimum water levels have been breached while the health status of the vegetation remained unaffected. Historically low rainfall has had a significant impact on declining water levels so it is by no means certain that reducing water abstraction will reverse the trend. If the reduction is confined to the public scheme abstraction, leaving private well-owners with fixed or increasing allocations, the likelihood is that the trend will not be reversed.

Faced with such concerns the management response has not been swift, appropriate or effective, partly because of a lack of clear understanding of responsibilities and partly because of a lack of appropriate tools to respond quickly to the identified problems. As a result there has been recurring non-compliance with the minimum water level requirements as well as observed declines in vegetation health, serious threats to some cave fauna and extreme concern over the possible acidification of some wetlands.

During the triennial period the reporting responsibilities for the environmental conditions have changed, with the move to amalgamate the Water and Rivers Commission (the proponent) with the Department of Environmental Protection (the agency with the responsibility for monitoring compliance with the conditions of environmental approval).

To address the perceived conflict of interest that this creates, the responsibility for monitoring compliance with the environmental approval for this project has been delegated to the independent EPA. However, this does not remove all concerns over conflict of interest, as noted below.

¹ The nominated proponent is the Water and Rivers Commission, which is currently being incorporated into a new Department of Environment.



It appears from the Triennial report that the WRC has seen as part of its role as proponent, where a minimum level is breached, to negotiate with the Water Corporation for a reduction in water abstraction that balances the economic costs of such a reduction with the environmental concerns, so as to minimise the severity of the breach.

While the conditions remain unchanged, it is imperative that they be strictly complied with because the ongoing breaches would be likely to constitute offences under the Act.

There is good reason to believe that the failure to comply with the existing water level criteria and wetland management objectives is contributing to unacceptable environmental impacts. By the same token, complying with the criteria and objectives would undoubtedly have significant economic and social implications. WRC has commenced a section 46 review process under which these can be re-evaluated, but the timeline for this process is lengthy and the question of on-going non-compliance in the interim has not been adequately addressed.

A possible approach to expedite change would be for the EPA to split the s46 into two parts, the first of which recommends to the Minister, as quickly as possible, interim conditions that, with appropriate corrective action by the proponent, will address the non-compliance while the full s46 review is finalised.

The longer-term solution to the sustainable management of the Gnangara Mound is likely to require a whole-of-government approach.

This Audit included a detailed assessment of compliance with all the conditions and commitments applying to the environmental management of the groundwater mound. Table 1 summarises the issues identified and recommended actions. Note that not all recommended actions relate to actual non-compliances.

Table 1 – Issues identified in the audit and recommended actions

No.	Issue	Recommended action
1	Ongoing failure to comply with wetland management objectives and environmental water provisions (EWPs).	A new, expedited s46 to set interim criteria that can protect the environment in the short term and can be feasibly complied with in dry years. The present, more detailed s46 review to be completed and new, long-term sustainable management criteria set and complied with.
2	Relationship between areas of increased abstraction and incidence of non-compliance not clear.	Ask proponent to present in a simple map form the changes in abstraction and the sites of non-compliance.
3	No measurement or estimation of private abstraction provided, only licensed amount.	Ask proponent why all licensed bores should not be metered, with a licence requirement to report actual water use.
4	Rules used for the management of private water abstraction are different from those applying to public water abstraction and do not give priority to environmental water provisions.	Ask proponent to develop rules for the management of private abstractions that give priority to environmental water provisions over any new allocations and include a strategy for progressively applying a similar priority to existing allocations, including the take back of unused allocations.
5	The 18 management initiatives are insufficiently proactive and insufficiently resourced to have the necessary impact in reducing private water abstractions.	Proponent develop interim new, more effective management options for influencing private abstraction, to be used in the 2004/05 summer when there is a predicted breach of water levels, to ensure no subsequent non-compliance.



No.	Issue	Recommended action
6	No rainfall records for Wanneroo for most of the early and mid 1990s (rainfall a major influence on g/w levels).	Proponent ensure that the problem with reliability of rainfall data in the early and mid 1990s has been rectified.
7	FPC management of pine plantation may be in contravention of EPP (which overrides Agreement Act – s5 of EP Act).	Proponent seek legal advice, EPA recommend that Minister write to Minister for Agriculture, Forests and Fisheries.
8	Several conditions no longer required due to amendments to the EP Act.	Delete those conditions as part of the s46 review.
9	Possible failure to protect the integrity of groundwater dependent ecosystems.	Ask proponent to demonstrate to EPA's satisfaction that integrity has been protected.
10	Possible failure to ensure the maintenance of ecological systems.	Ask proponent to demonstrate to EPA's satisfaction that ecological systems have been maintained.
11	Failure to regularly review the basis of management decisions and criteria.	Commence more frequent, internal, transparent review procedures.
12	"Wide publication" of the limits on groundwater availability by tabling at committee meetings and in annual reports is inadequate.	Publish more widely in the general community so attitudes to water use may be changed.
13	Indicator species not selected, similarity indices not calculated.	Ask proponent to comply or demonstrate to the EPA that the present form of vegetation monitoring is adequate.
14	Research studies have not addressed minimising the impacts of groundwater abstraction.	Initiate studies to address minimisation of impacts.
15	Several conditions and commitments address similar matters and could be amalgamated with minor re-wording	Consolidate the conditions as part of the s46 review.
16	Artificial supplementation at Coogee Springs not commenced as required.	Ask proponent to comply or demonstrate to the EPA that the commitment should be changed.
17	Review of EWP's not commenced within 6 years as required.	Section 46 review process must be expedited. Interim measures are needed to address ongoing non-compliance in the meantime.
18	Failure to use aerial photography for wetland vegetation mapping.	Recommend that Minister remove the requirement to use aerial photography.
19	Possible failure to monitor water quality in some Lexia wetlands.	Ask proponent to demonstrate compliance or amend monitoring programme to comply.
20	Several commitments require monitoring in specified months but it has been done in other months.	Ask proponent to comply or demonstrate to the EPA that the commitment should be changed.
21	No evidence that impact of confined aquifer abstraction was monitored.	Proponent should use its powers to require Water Corporation to monitor impact.
22	Macro-invertebrate monitoring protocols submitted for EPA approval.	Seek independent expert review before approving.
23	The requirements of a number of conditions and commitments have been met.	These conditions and commitments could be cleared.
24	For some commitments the response provided is inadequate to determine compliance.	Require proponent to provide additional information.
25	Non-attendance and unknown whereabouts of Nyungah representative on Community Consultative Committee.	Proponent to seek a new representative.
26	There are no quantitative criteria set for monitoring vegetation, macroinvertebrates or water quality.	Quantitative criteria for vegetation, macroinvertebrates and water quality should be developed as part of the s46 review.

Audit of Triennial Compliance Report for 2000-03
Environmental Management of Groundwater Abstraction from the
Gngangara Groundwater Mound – Department of Environment

No.	Issue	Recommended action
27	Significant differences in the approach of these environmental approvals for Gngangara and those for Jandakot and between the two Gngangara approvals.	The s46 review should be used to harmonise the approach and, if appropriate, bring the reporting together.

Shading indicates actual or possible non-compliance.

1. Water Allocation and Water Use

Figure 1 shows the public and private quotas, allocations and licences since 2000/01. The Report did not provide figures for earlier years nor any assessment of the amount used by private licence holders.

Figure 1 – Quotas, allocations and licences for abstraction from the Gnangara Groundwater Mound

Public Scheme abstraction

Private abstraction

Total abstraction (Assuming private use = licensed amount)

1.1 Public abstraction

According to the Compliance Report production quotas for each bore are set each year, agreed between the Water and Rivers Commission and the Water Corporation, based on, among other things, “the likely impact of the predicted groundwater declines on water level criteria and the groundwater dependent ecosystems”. These quotas are submitted to the EPA for review by 1 December each year.

It seems certain that the expectation in setting these quotas has been that there will be some level of non-compliance with the water level criteria and that it is appropriate for the Commission to seek to minimise the non-compliance. It is not clear whether this implication of on-going, predicted non-compliance was made clear to the EPA when its approval of the quotas was sought or whether EPA approved them on that basis.

In explaining the method of setting allocation limits adopted by the Commission, the Report states “This process involves balancing environmental and resource management requirements with Perth’s social and economic needs to ensure that water quality and important ecosystems are protected.”

This reveals a misunderstanding of the way the environmental approval process works. Once the EPA has assessed a proposal, conditions are set by the Minister in consultation with and with the agreement of her Ministerial colleagues. That consultation involves the balancing of environmental, social and economic considerations and the conditions and commitments attached to the environmental approval reflect that balance.

The conditions are binding and are not open to further trade-off. If they are inappropriate or unworkable, there is a mechanism for changing them that is equivalent in scrutiny and consultation to the process that produced the original conditions. Until the conditions are changed by that process, they need to be complied with and failure to comply is an offence.

WRC has commenced a section 46 review process, but the timeline for this process is lengthy and the question of on-going non-compliance in the interim has not been adequately addressed.

With the recent amendments to the Environmental Protection Act 1986, section 46A provides a mechanism whereby the Minister may set interim conditions while the section 46 review is proceeding. That power is constrained, in that the interim conditions may not increase the effect of the proposal on the environment. That constraint is likely to limit the applicability of the new provision in this case.

It is recommended that an expedited s46 review be initiated, based on existing knowledge, to set interim criteria that can protect the environment in the short term (while the more detailed s46 review is completed) and can be feasibly complied with in dry years.



The present, more detailed s46 review should be completed as quickly as possible and new, long-term sustainable management criteria set and complied with.

This Audit recommends that a number of conditions could be deleted or changed. Those changes could be part of the expedited s46 review.

The public abstraction from the superficial aquifer in 2002/03 was 63Gigalitres, a 20% increase on the 52Gigalitres abstracted in 2000/01. The extra 11Gigalitres came from the Mirrabooka, Lexia, Whitfords and Quinns wellfields. The presentation of the report does not make it easy to relate these increased abstractions to the incidence of non-compliance with water levels or wetland management criteria. It is possible that the increased abstraction from Mirrabooka and Lexia has contributed to non-compliances in the Lexia wetlands

It is recommended that the EPA ask the proponent to present in a simple map form the changes in abstraction and the sites of non-compliance.

1.2 Private abstraction

The Ministerial conditions do not require that the amount of water abstracted for private use be measured. Rather, condition 438:M3.1 requires the allocation of water for public and private use to comply with the environmental water provisions.

Since licensed private abstraction accounts for more than two thirds of total abstraction, not counting domestic bores, which are exempt from licensing, this level of monitoring and reporting seems inadequate.

This is particularly so for the Wanneroo area, where private abstraction is thought to be the main cause of non-compliance in Lakes Jandabup, Mariginiup and Joondalup that has persisted, in one case for the last seven years.

Private water users (other than domestic and other small users) are licensed, but there is no general requirement for water use to be measured, so the actual quantity of water used by licence holders is not known. This is despite the fact that they account for 65% of total abstractions, and that measurement is required for the other 35% used by the public scheme.

It is recommended that the EPA ask the proponent why all licensed bores (both public and private) should not be metered, with a licence requirement to report actual water use.

1.3 Management of abstraction

From the Report it appears that the licensed amount for abstraction from public bores may be increased or decreased in any given year in response to, among other things, actual or predicted non-compliance with environmental water provisions or wetland management objectives. The fact that there has still been non-compliance shows that this management response has not been adequate, but it has given a level of priority to environmental water provisions.

With regard to private water abstractions different rules are applied. The rules outlined in the Report are:

- new domestic bores and increased domestic abstraction unconstrained (unlicensed);
- small licences (500 – 1500kl) will be issued where mains water supplies are not available, regardless of whether or not the subarea is already fully allocated;
- the issuing of new or increased allocations for larger licences may be refused if the subarea is already fully allocated (e.g. parts of Wanneroo); and
- where private abstractions may be significantly impacting on water level criteria licensees were invited, in 2001, to voluntarily forfeit the unused portion of their allocations.

The net effect of these different rules is that it is easier to increase, and almost impossible to decrease private abstractions, when compared with the public scheme. It is not clear that these rules for private abstraction have any status other than being management strategies adopted by the proponent. Since



they are inequitable (different rules for public and private schemes) and give private abstraction priority ahead of environmental water provisions, the appropriateness of these rules must be questioned.

Also of relevance is the meaning of the allocation limit applying to private licences in an area. In Mirrabooka, for example, where three monitoring bores were non-compliant, current licences are just 55% of the allocation limit. It is likely that if there were abstraction up to the full allocation limit, this level of non-compliance would be greatly increased. Even for Wanneroo, with the history of non-compliance in lakes due to private abstraction, licences are still only 91.5% of the allocation limit. This may be explained by differences between subareas, but it has not been made clear. Nor is it clear that the allocation limits are subject to frequent review based on predicted non-compliances.

The rules for private abstraction licences should be changed to give priority to environmental water provisions and compliance with them. This would mean that

- subarea allocations are cut back where there is predicted non-compliance;
- where a subarea is fully allocated, no new licences (small or large) or increased allocations are issued;
- where private abstractions are already significantly impacting on water level criteria, no new licences or increased allocations are issued (whether or not the subarea is fully allocated); and
- where private abstractions are already significantly impacting on water level criteria, unused portions of allocations are taken back until the environmental water provisions can be met.

This latter point is addressed by the State Water Strategy² under the heading of “Providing water for the environment” with a proposal to

“Establish a strategy to manage instances where EWPs have been set and are unable to be met in the short term due to historical decisions and allocations to existing users.

Of direct relevance is Principle 4 of the National Principles for the Provision of Water for Ecosystems³

“In systems where there are existing users, provision of water for ecosystems should go as far as possible to meet the water regime necessary to sustain the ecological values of aquatic ecosystems whilst recognising the existing rights of other water users.”

From these it is clear that the process of “taking back” unused allocations must be consultative and, possibly involve compensation, but it does not have to be limited to voluntary forfeiture.

It is recommended that the EPA ask the proponent to develop a set of rules for the management of private abstractions that give priority to environmental water provisions over any new allocations and include a strategy for progressively applying a similar priority to existing allocations, including the take back of unused allocations.

Figure 2 – Abstraction and water-level non-compliance

From Figure 2 it is clear that the number of non-compliances, while already unacceptably high in 2000/01, was much higher by 2002/03, the third year of the triennium. Over the same period the total quota has trended down slightly, due to a cut in public scheme licences. However, assuming private use roughly equated to the private licensed allocation, total (public and private) use has slightly increased, while the number of non-compliances almost doubled.

The management approach for private users adopted by the proponent was to develop a commitment to 18 water resource management initiatives which were put forward in the 2001 Section 46 Stage 1

² Government of Western Australia, *Securing Our Water Future - A State Water Strategy for Western Australia*, February 2003, p50

³ ANZECC/ARMCANZ 1996, *National Principles for the Provision of Water for Ecosystems*, Sustainable Land and Water Resource Management Committee, Subcommittee on Water Resources, Occasional Paper SWR No. 3, July 1996



Report. The Compliance Report refers the reader to the 2003 Progress Report of the s46 Review⁴ provides a progress report on the implementation of these commitments.

There has been no action on at least seven of these initiatives, in some cases due to “lack of resources”. The most significant action has been the use of regulations to ban daytime domestic sprinklers and the progress in finalising an improved computer model of the mound to review “sustainable private allocation limits”.

There have been ongoing breaches of the environmental criteria, as noted in the next section. From these ongoing problems of non-compliance it is clear that the present system for managing abstraction (the 18 initiatives and limiting scheme abstraction) has not been effective in responding to changed circumstances so as to maintain the set environmental criteria. Despite this, the Report does not propose any changes, appearing to wait for the new PRAMS model, the completion of the s46 Review and “more resources”.

The Stage 2 section 46 Review is due for completion by late 2004/early 2005. This would mean that any implementation of its management initiatives would be delayed until the 2005/06 summer. Some interim management options need to be identified for the 2004/05 summer.

It is recommended that the proponent develop interim new, more effective management options for influencing private abstraction, to be used in the 2004/05 summer when there is a predicted breach of water levels, to ensure no subsequent non-compliance.

⁴ Strategen 2003, *Section 46 Progress Report – Review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds*, Report prepared for the Water and Rivers Commission, December 2003.



2. Compliance with the environmental criteria

2.1 Non-compliances

The Report advises that “During 2000/01 there were nine non-compliances with EWP criteria, with eight non-compliances in 2001/02 and 16 non-compliances in 2002/03”. It further advises that most of the non-compliances in 2001/02 were predicted. While this may be an indicator of the accuracy of the predictions it is also an indicator of the inadequacy of the management responses. The primary value of being able to predict non-compliances is to put in place effective strategies to ensure the non-compliances are avoided. This has not been achieved.

The response has included significant constraints on public water abstraction. The Report mentions the turning off of nine superficial aquifer bores in the Pinjar borefield, 11 in the East Mirrabooka area, and three in the Wanneroo area, as well as an unspecified number near Lake Jandabup and bore JB5 that have not been pumped for ten years. The cut-back amounts to 20% of installed capacity.

Nevertheless, for the Mound as a whole, there was a high level of non-compliance, as Figure 3 shows. It presents the non-compliances in bar graph form, with the individual wetlands or bores identified to show where the non-compliance has been on-going, in some cases, for six or seven years.

Figure 3. Reported breaches of preferred and absolute minimum water levels

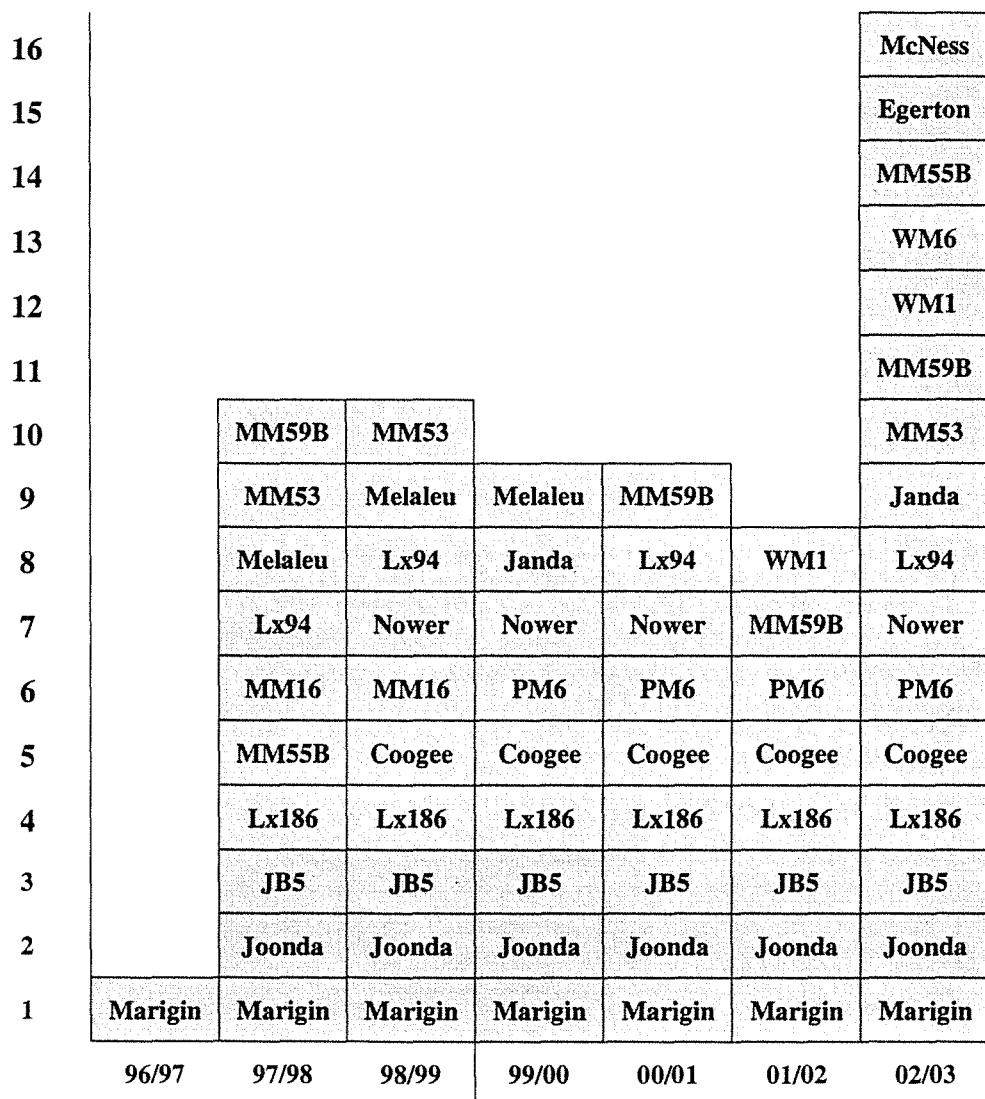


Table 2 Water level non-compliances and management responses

Location of non-compliance and WRC suggested cause	Management Response (summary)	Auditor's comments
<u>Pinjar borefield</u> – bore PM6 Reduced rainfall and public abstraction from confined and superficial aquifers.	Superficial abstraction cut from 5GL in 2000/01 to ~2 in 02/03. Super/Leederville/Yarragadee abst cut from 13.5GL 98/99 to 11.3GL 02/03	Response has achieved slower rate of decline of water levels, but insufficient to stop non-compliance.
<u>Mirrabooka borefield</u> – bores MM53, 55B & 59B Public abstraction. Water levels respond strongly to rainfall.	Super. public abst. to be cut from 14.9GL in 02/03 to 13.6GL in 03/04. Private allocations 6GL (55% of limit).	MM59B non-compliant in 00/01 and 01/02, when public abstraction was just over 10GL, so proposed cut unlikely to stop non-compliance. Private alloc. limit seems meaningless if there is non-compliance at only 55%.
<u>Lexia 94 & Lexia 186</u> Climate the major driver – breaches before start-up and no major decline since.	Super. public abst. cut from planned 11GL to max of 7GL in 02/03 and 4GL in ¼, to be in areas far from wetlands.	Too early to tell if reductions will stop non-compliance, but climatic influence makes it doubtful.
<u>Bores WM1 & WM6</u> Wanneroo and Pinjar abstraction exacerbating effect of drying climate	Wanneroo Super. public abstr. cut from 11GL in 00/01 to 9GL in 02/03.	Response insufficient to stop non-compliance.
<u>Lake Jandabup and bore JB5</u> Rainfall and private abstraction in Wanneroo.	Artificial maintenance of Lake Jandabup since 1997. Wanneroo private abst. Initiative (see below)	Artificial maintenance should be a short-term last resort. It was insufficient to stop non-compliance.
<u>Lakes Mariginiup, Wilgarup and Joondalup</u> Reduced recharge and private abstraction in Wanneroo	Private alloc 35GL (92% of limit). Relocation of abst. a long term strategy. Other options being investigated include <ul style="list-style-type: none"> • Beenyup treated wastewater • WaterWise on the Farm • Flowmeters for some • Little interest in voluntary forfeit of unused alloc. • 18 management initiatives 	Action to cut private abstraction has been ineffective. Non-compliance has grown worse. Mariginiup has been non-compliant every year since 96/97, Joondalup since 97/97 and Jandabup in 02/03.
<u>Lake Nowergup</u> Private abstraction	Artificial maintenance for last six years. Increasingly difficult to achieve levels with declining regional water table. May be cause to set a lower level and/or phase out artif. maintenance.	See above comment. Proposal to set a lower minimum water level or phase out artificial maintenance should be addressed in s46 review.
<u>Loch McNess</u> Pumping to supplement water in Yanchep caves (lowered by climate and pines)	Options of restoring groundwater levels near caves by cutting abstraction, removal of pines exhausted. Pumping from Loch McNess to supplement only feasible option in next 10 years.	Pines management appears to be contrary to EPP, which is binding on FPC and overrides Agreement Act in the event of conflict. Action recommended (see below).
<u>Coogee Springs</u> No causes suggested	Artif. maintenance from 1998-2002 (now ceased). Used as summer pasture, ecological values degraded	Artif. maintenance required under 438:P18. Cessation is non-compliance. No evidence that EPA was consulted/advised. S46 review should address.
<u>Egerton Seepage</u> Rainfall	Levels rose in 2003 following average rainfall.	OK

Section 2.2.2 of the Report outlines the instances of non-compliance and the management responses initiated. These are summarised in Table 2 (above), with comments.

2.2 Observations

2.2.1 Inadequate rainfall data

In the Report, the discussion of the influence of climate on groundwater levels includes references to rainfall. It acknowledges that the rainfall data for Wanneroo (the nearest relevant recording station) are incomplete. Figure 3 of the Report has no data beyond 1997, though the text refers to a declining trend in the reporting period, so this may be an oversight. Given the major role that rainfall is believed to play in the variations in water levels on the Mound, it would be advisable for the proponent to ensure that the unreliability of rainfall data in the early and mid 1990s has been rectified.

It is recommended that the proponent ensure that the problem with reliability of rainfall data in the early and mid 1990s has been rectified.

2.2.2 FPC non-compliance with the EPP

The Report makes it clear that a significant factor in some non-compliance, and especially the impacts on cave fauna at Yanchep, is the fact that undertakings about the management of State pine plantations have not been fulfilled.

The EPP⁵ specifies that

“the achievement and maintenance of the environmental quality objectives ... and the protection generally of groundwater, native vegetation and wetlands in the policy area are to be effected by [among other things] management of the pine plantation being carried out in such a manner as to ensure that use of groundwater by the pine plantation is no greater than the use of groundwater by native vegetation (this means that the basal area of the pine plantation should not exceed an average of 11 square metres per hectare)”

Under 438:P7 a Memorandum of Understanding was developed between WRC and the then Department of Conservation and Land Management, consistent with the EPP, for the management of the pine plantation.

However, since then, under an Agreement Act⁶, the State has made contractual arrangements that affect the way in which the pine plantation might be managed. The Report suggests that the pine plantation is now being managed so as to comply with the Agreement Act but not in compliance with the MoU or the EPP.

Under section 5 of the EP Act, the Act (including the EPP) prevails over all other Acts in the event of an inconsistency. This would appear to require that while the State has obligations under the Agreement Act, these must be fulfilled in a way that is consistent with the EPP. This is affirmed in the preamble to the agreement which states that

“The State wishes the progressive harvesting of its softwood plantations on and adjacent to the Gnangara Mound to continue as part of its plans to protect the Gnangara Mound water resource.”

It is recommended that the proponent seek legal advice on this matter, and that the EPA recommend that the Minister write to the Minister for Agriculture, Forests and Fisheries advising of FPC's failure to comply with obligations under the EPP.

⁵ *Environmental Protection (Groundwater Mound Crown Land) Policy 1992* clause 9(d)

⁶ *Wood Processing (Wesbeam) Agreement Act 2002*



3. Meeting the environmental conditions and commitments

The purpose of the Compliance Report is to demonstrate publicly that the proponent has complied with the environmental conditions and commitments. The key part of the Report that does this is the Compliance Audit Table, a detailed table listing all the conditions and commitments and briefly stating how they have been complied with.

Appendix 1 presents the proponent's Compliance Audit Table (from Appendix 1 of the Compliance Report), with some comments on the adequacy of the responses and the degree of compliance. A summary of those items with non-compliance, inadequate information or other queries or recommended actions is provided in Table 3. Some of the key items are highlighted in the text following the table.

**Table 3 - Compliance Audit Table- Gngangara Groundwater Mound
Environmental Approvals – Auditors Action Items**

NOTE: Text in *italics* represents Auditor's comments relating to non-compliance or recommended action.

A. MINISTERIAL CONDITIONS for STATEMENT NO. 438 (APPLICABLE FROM 1997).

Code	Abbreviated Description	Auditor's comments
438: M-1	Fulfil commitments	<i>Non-compliances with water level criteria and several other conditions and commitments have not been complied with.</i>
438: M2-2	Seek approval for modifications to the proposal.	<i>With changes to the EP Act, this condition is no longer required.</i>
438: M3-1	Allocation of water to public and private users and operation of the groundwater schemes shall comply with EWPs.	<i>The response makes no mention of allocation. There has been non-compliance with EWPs.</i>
438: M4-1	The integrity of all groundwater dependent ecosystems, located on the Gngangara Mound, which are likely to be impacted by groundwater abstraction, shall be protected.	<i>With</i> <ul style="list-style-type: none"> • moderate decline in mean vegetation health at Lake Joondalup, Lake Yonderup, Lexia 94, Lake Jandebup; • significant decline at Lake Mariginiup and Lexia 186; and • severe decline at Lake Nowergup; <i>as well as</i> <ul style="list-style-type: none"> • the "serious threat to cave fauna in the coming summer" (p25 Triennial Report) <i>"the integrity of all groundwater dependent ecosystems" has not been protected as required. Probable non-compliance.</i>
438: M5-1	Basis of decisions re- management of water resources of Gngangara Mound & maintenance of ecological systems shall be based on the concept of sustainable yield of resources..	<i>Since WRC and Water Corp have, in recent years agreed quantities for abstraction at a time when non-compliance for the past year is known and for the coming year predicted it cannot be claimed that the agreed amount can be taken "without breaching the EWPs" . Probable non-compliance.</i>

Code	Abbreviated Description	Auditor's comments
438: M5-2	The basis for management decisions and the criteria specified for conservation of the environment and of the groundwater resource of the Gngangara Mound shall be subject to regular review.	<i>The response refers to a single review, taking five years, over the 18 year life of the project. This is clearly not "regular review". The condition did not contemplate that the mechanism of review should be the s46 process. There should be other internal, but transparent, mechanisms for reviewing the basis of management decisions (and other matters that are to be "regularly reviewed"). There has been non-compliance with this condition.</i>
438: M6-1	Continue the current approach of widely publishing the limits on groundwater availability for the Gngangara Mound.	<i>Publication by annual reports and tabling at committee meetings is not achieving the intent of the condition.</i>
438: M6-2	Update the Figures published according to the requirements of 6-1	<i>Publication by tabling at committee meetings is not achieving the intent of the condition. The intent is to inform the public so attitudes are changed.</i>

B. PROPONENT COMMITMENTS for STATEMENT NO. 438

Code	Description	Auditor's comments
438: P3	Select a range of indicator species at transects to determine an acceptable rate of change in vegetation composition. Also calculate similarity indices when monitoring.	<i>It is not clear from the response that the condition has been complied with. It appears that, instead of selecting a range of indicator species, monitoring focuses on all trees and the larger understorey species. It also appears that similarity indices have not been calculated as required. There has been non-compliance with this commitment.</i>
438: P9	Facilitate and undertake strategic research to minimise the impacts of groundwater abstraction	<i>Studies focussed on <u>understanding</u> the impacts not <u>minimising</u> impacts. The response does not demonstrate full compliance with the commitment.</i>
438: P11	Continue to develop catchment strategies to minimise change in hydrological regime within the caves.	<i>See recommendations re- FPC compliance with EPP.</i>
438: P15	The WRC will continue to report every three years to the DEP on the management of groundwater within the Study area.	<i>The wording of M10-1 could be amended as part of the s46 review to incorporate the elements of P15 specifying report content. P15 could then be cleared.</i>
438: P19	Should EWP's not be met by November 1, artificial supplementation shall be used until the EWP is reached.	<i>Unilateral decision to cease artificial supplementation is non-compliance. Permission for the change should be sought from the Minister by written request under M2-2.</i>
438: P20	Only allow drops below the preferred level to occur in low rainfall years to mimic natural regimes (2/6 years).	<i>Non-compliance with environmental water provisions.</i>
438: P21	Review the EWP's at least every six years to allow for adaptive management.	<i>The late start to the review of EWP's constitutes administrative non-compliance. Since some EWP's are not being complied with, this delay in reviewing them is likely to extend that non-compliance.</i>
438: P22	The WRC will undertake the following monitoring programme.	<i>As the reporting of most of the monitoring is addressed in other commitments and conditions, this condition can be cleared in full.</i>

Code	Description	Auditor's comments
438: P25	Wetland vegetation will be mapped every two years from large scale aerial photography for Lakes Jandabup, Marginiup, Nowergup, and Loch McNess.	<i>Unilateral decision to cease use of aerial photography is non-compliance.. Change has now been requested. The EPA could recommend that the Minister make the change using her powers under s46A.</i>
438: P26	Water quality will be monitored annually in November at all wetlands for which EWPs have been set.	<i>Not clear that water quality was monitored at Lexia 94, Melaleuca Park, Edgecombe and Egerton. Possible non-compliance.</i>
438: P27	Wetland habitats will be mapped along two regional transects in November, using large scale aerial photography, every year for the first three years, then every three years.	<i>Unilateral decision to cease use of aerial photography is non-compliance.. Change has now been requested. The condition could be changed as part of the s46 review.</i>
438: P29	Indicator species will be monitored at established terrestrial vegetation transects when transects are monitored in spring.	<i>No evidence that indicator species were selected and monitored. Possible non-compliance</i>
438: P30	A Similarity Index for each terrestrial vegetation transect at each monitoring period will be calculated with the aim of summarising spatial and temporal changes in vegetation composition.	<i>No evidence that similarity indices were calculated. Possible non-compliance.</i>
438: P32	Aquatic fauna will be monitored within those cave streams containing root mats once per year in November.	<i>The proponent requests replacing the words "in November" with "during Spring or early Summer". As for P25 (above) the condition could be changed as part of the s46 review.</i>
438: P35	The impact of confined aquifer abstraction on unconfined aquifer water levels will be monitored. If significant impacts are observed the Water and Rivers Commission will discuss the observed impacts with the EPA.	<i>There was no reporting against this commitment in 2000-01 or 2001-02. The date on which the Corporation was asked to provide monitoring data to the Commission is not given. However, the Commission has adequate powers to require the Corporation to provide the data. Since the data are not provided, it is the Commission that is in non-compliance with the requirement.</i>
438: P38	Aquatic fauna will be monitored at the 13 wetlands for which EWPs have been set twice per year (but only when open water is present), in November and March.	<i>The monitoring months (September and January) are different from those required (November and March). At present this amounts to a minor non-compliance. As the intent of the commitment is still being achieved, this inconsistency could be rectified as part of the s46 review.</i>
438: P39	The Water and Rivers Commission will, on receiving environmental approvals, prepare monitoring protocols for aquatic invertebrate monitoring within the wetlands, to the satisfaction of the EPA.	<i>Clearly this commitment has been in non-compliance for some time, since the protocols were to be prepared to EPA's satisfaction "on receiving environmental approvals" in 1997 and approval is only now being sought. An independent expert assessment of the monitoring protocols should be sought before the commitment is cleared.</i>



C. WETLAND MANAGEMENT OBJECTIVES for STATEMENT 438.

Wetland	Water Regime Management Objectives	Auditor's comments (These Objectives are part of the EWP and must be complied with)
438: Lake Jandabup	<ul style="list-style-type: none"> • No expansion in the area of sedge vegetation, but maintenance of existing areas. • Maintenance of the current extent of wading bird habitat. • Maintenance, and if possible, expansion of the <i>M raphiophylla</i> and <i>E rudis</i> fringing woodlands. • Removal of mosquito-fish from the Lake. • Maintenance of the high species richness of aquatic macroinvertebrates and macrophytes. 	<p><i>Mattiske (2001) found vegetation within lakes changed substantially, with extension of sedge spp. ECU (preliminary 2003) found values had been retained.</i></p> <p><i>Given the major difference between the findings of ECU (preliminary, 2003) and Mattiske (2001) the final results of the ECU study should be awaited and scrutinised before compliance can be assessed.</i></p>
438: Lake Gngara	<ul style="list-style-type: none"> • To improve water quality through increased water levels, as a means of enhancing both environmental and social values of the Lake. 	<p><i>While the water levels have increased, the performance indicator of increased pH has not been achieved. There has been non-compliance with this management objective In addition there are high levels of nitrogen and symptoms of eutrophication. The response does not mention any additional, specific, proposed management action to address these problems.</i></p>
438: Lake Mariginiup	<ul style="list-style-type: none"> • To maintain the current area of sedge vegetation to within +/- 10%. • To maintain the current area of wading bird habitat. • To maintain invertebrate diversity through some lake- bed drying in summer. • To maintain, and if possible, enhance, fringing woodland vegetation. 	<p><i>It is not possible from the information provided to determine whether or not the objectives and performance indicators have been achieved or not. The information needs to be briefer and to directly address the criteria/indicators.</i></p>

D. MINISTERIAL CONDITIONS for STATEMENT NO. 496 (APPLICABLE FROM 1999).

Code	Description	Auditor's comments
496: M1.1	Fulfil the commitments published in EPA Bulletin 904 (Appendix 2) as attached to the Ministers statement 496.	<i>There have been 2, 1 and 3 non-compliances with water level criteria in 2000/01, 01/02, and 02/03 respectively. In addition several other conditions and commitments have not been complied with.</i>
496: M1.2	Changes to any aspects of the proposal as documented in schedule 1 of the statement that the Minister determines is substantial, shall be referred to the EPA.	<i>This condition is no longer required. The insertion of section 45C into the Act provides a mechanism for the Minister to approve non-substantial changes. The condition could be deleted as part of the s46 review.</i>

Code	Description	Auditor's comments
496: M1.3	Changes to any aspects of the proposal as documented in schedule 1 of the statement that the Minister determines is non-substantial, can be effected.	<i>This condition is no longer required. The insertion of section 45C into the Act provides a mechanism for the Minister to approve non-substantial changes. The condition could be deleted as part of the s46 review.</i>
496: M2.1	Implement the consolidated environmental management commitments documented in schedule 2 of the Minister's statement.	<i>Agree this condition appears to duplicate condition M1.1. They could be consolidated. The conditions could be changed as part of the s46 review.</i>
496: M2.2	Implement the subsequent environmental management commitments which are made as part of the fulfilment of conditions and procedures in the Minister's statement.	<i>As implementation proceeds in response to matters arising, for example, in annual and triennial compliance reports, additional management commitments will be made. Some of these may relate to things the Corporation must do, in which case the response provided would apply. However, others would relate to actions the Commission must take – at the very least ensuring that the operating strategy is updated and implemented. It is necessary to report on compliance with all these additional commitments for full accountability. They should therefore be added to the list of the proponent's commitments and reported annually until cleared. Possible non-compliance.</i>
496: M3.1	The proponent nominated by the Minister for the Environment under section 38(6) or (7) is responsible for implementation of the proposal until such time as the nomination for that proponent is revoked under section 38(7) of the EPA Act and another person is nominated in respect of that proposal.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M3.2	Any request for change in proponent shall be accompanied by a copy of the Minister's Statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M3.3	Notify the DEP of any change of proponent, contact name and address within 30 days of such change.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M4.1	Provide evidence to the Minister before 17 Feb. 2004 that the proposal has been substantially commenced.	<i>Agree, this condition can be cleared.</i>
496: M4.2	If the proposal has not been substantially commenced before 17 Feb. 2004, the approval to implement the proposal as granted in this statement shall lapse and be void.	<i>Agree, this condition can be cleared.</i>

Code	Description	Auditor's comments
496: M4.3	Make an application to the Min for Environment for any extension of approval for the substantial commencement of the proposal beyond 17 Feb. 2004 at least 6 months before 17 Feb. 2004.	<i>Agree, this condition can be cleared.</i>
496: M4.4	If it is demonstrated that the parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding 5 years for the substantial commencement of the proposal.	<i>Agree, this condition can be cleared.</i>
496: M5.2	Unless otherwise specified, the DEP is responsible for assessing compliance with the conditions, procedures and commitments contained in this Statement and for issuing formal clearances.	<i>Agree the reference to DEP is no longer appropriate. The initials "DEP" should be replaced with "EPA". The condition could be changed as part of the s46 review.</i>

E. PROPONENT COMMITMENTS for STATEMENT 496.

Code	Description	Auditor's comments
496: P1.1	Manage public and private groundwater abstraction to meet objectives and EWPs as summarised in Table A and B which appear in the attachment to Statement 496.	<i>Three non-compliances. Despite near average winter rains in 2003 and the shut down of four adjacent bores Lexia 186 was again non-compliant. The claim that this was caused by reduced recharge is weakened by the rains and (temporarily) raised water levels. The response makes no mention of private abstraction. Management of abstractions has not met the objectives and EWPs, so there is non-compliance.</i>
496: P2	Submit annual and triennial reports on the management and monitoring of the East Gnangara Mound.	<i>Agree this commitment is addressed by M5.1, and could be deleted. The condition could be deleted as part of the s46 review.</i>
496: P5	Review and update EWPs and water allocation if necessary by feedback from the monitoring program.	<i>The commitment states that the proponent should update (i.e. change) the EWPs in response to monitoring. The EWPs are binding and set by the Minister, and can only be changed by her. However, there is nothing to prevent the proponent, in response to monitoring, adopting more stringent criteria. Indeed, such rapid response may well be needed, given the long time frame for formal amendment through s46. Response does not clearly demonstrate compliance.</i>
496: P12.2	Require the Water Corporation to implement the mitigation strategy required of P12.1.	<i>For full accountability the Corporation should be required to report to the Commission (and thence to the EPA) on compliance with the wetland mitigation strategy.</i>
496: 13.2	Require the Water Corporation to submit yearly production plans as part of the operating strategy.	<i>Given the ongoing breaches of EWPs this system is inadequate. The Corporation should be required to address past and predicted compliance with the "environmental commitments" referred to in 496 P13.1 (above), and the Commission should incorporate that information into this compliance report.</i>

Code	Description	Auditor's comments
496: P16	Liaise with the Swan Valley Nyungah Community regarding the proposal.	<i>OK Given the representative's attendance record, and present unknown whereabouts his effectiveness must be questioned. A new representative should be sought.</i>
496: P17.2	Prepare dieback management procedures. - Pre-Operation	<i>The commitment requires that procedures (however simple) be prepared. It appears that the proponent has decided to adopt the Commission's general procedures, but it is not clear that these have been submitted in clearance of this commitment. Possible minor non-compliance.</i>

3.1 Non-compliance on the evidence presented

The audit of the tables identified 15 instances of non-compliance with the requirements of the relevant condition or commitment⁷, 10 of probable or possible non-compliance, 7 where there was insufficient or inadequate information or where action by the proponent is recommended, and 20 where the condition is recommended to be cleared or amended. These assessments are based on the information presented in the Report.

3.1.1 Non-compliance with water levels and wetland objectives

These are addressed elsewhere, and are not commented on further here.

3.1.2 Other non-compliance

Condition 438:M5.2 requires the basis for management decisions to be subject to regular review. Over the 18-year life of the project there has only one review, the present s46 review.

Commitment 438:P21 requires that the environmental water provisions be reviewed at least every six years to allow for adaptive management. The reference to adaptive management implies that the review might lead to a need to change the EWPs. If the need is to make them less stringent, this can only be achieved by a s46 review. If, however, they should be made more protective of the environment, the change could be made less formally. It is not necessary, therefore, to link these six-yearly reviews to a s46 review process.

Commitment 496:P5 refers to reviewing and updating EWPs and water allocation if necessary by feedback from the monitoring program. This is clearly a commitment to an ongoing review of EWPs, not a protracted formalised review process once a decade.

It is recommended that the proponent develop regular, transparent and accountable forms of review other than, and less formal than s46 review to comply with these conditions and commitments.

3.1.3 Probable or possible non-compliance

In several instances, as Table 3 indicates, the information in the Compliance Report was sufficient to suggest non-compliance, in the absence of further information to the contrary. The proponent should be invited to demonstrate that these conditions or commitments have actually been complied with.

It is recommended that the EPA ask the proponent to demonstrate that the conditions or commitments marked "possible non-compliance" or "probable non-compliance" have in fact been complied with.

⁷ Actually the conditions are subdivided into "auditable elements". For example, condition 438:M5 has two auditable elements. One was probably non-compliant and the other was non-compliant. The numbers 438 and 496 refer to the statement numbers of the environmental approvals. M refers to a Ministerial condition and P to a commitment by the proponent.

3.1.4 *Pre-emptive non-compliance*

In four instances the proponent, finding the requirements of the condition or commitment impractical, expensive or inconvenient has decided, unilaterally, to do something different, broadly consistent with the intent of the requirement.

The process of putting the conditions and commitments in place involves agreement between the Minister for the Environment and her Ministerial colleagues. They are legally binding and cannot be changed unilaterally by the proponent.

Only one of these actions, the cessation of artificial supplementation of Coogee Springs, had any direct environmental impact. Such a change to a condition or commitment can only be made as part of the s46 review. The others related to more administrative matters - changing the month of monitoring or using mapping alternatives to aerial photography. The changing of these conditions is addressed at 3.3.3 (below).

3.1.5 *Not achieving the intent of the condition*

Condition M6 relates to publishing widely the limits on groundwater availability for the Gnangara Mound. It requires a continuation of "the current approach". "Current" in this context means current at the time the condition was first set, in 1987.

The EPA recommendation on which this condition was based was preceded by an observation that "It is important that the community in general, and existing and potential users in particular, are aware of changes in groundwater levels. In that way, understanding of the need for management would increase, and future proposals could be consistent with increased understanding of the groundwater systems and improved acceptance of constraints on water use."⁸

The present practice is to publish the information in annual and triennial reports (available free of charge on the Internet and at the Commission's library), provide information on limits on request and update the Wanneroo Groundwater Advisory Committee. This is not adequate to achieve the intent of the condition, which is to make the information so widely available that it changes people's attitudes to constraints on their water use.

It is recommended that the proponent be required to publish information about groundwater availability constraints more widely in the community so that attitudes to water use may be changed, consistent with the original intent of Condition 438:M6.

3.2 Incomplete or inadequate responses or action required

The audit of the tables identified 7 responses that were incomplete or inadequate. In at least four cases this meant that it was not possible to determine whether or not the requirement had been complied with.

For 438:P9, the wetland management objectives for Lakes Jandabup and Mariginiup and 496:P12.2 more information is required.

Actions required include the EPA seeking independent expert advice on the monitoring protocols submitted under 438:P39, and the proponent seeking a new Nyungah representative for the Gnangara Community Consultative Committee.

It is recommended that these deficiencies be rectified and actions taken.

⁸ Environmental Protection Authority, 1987, *Gnangara Mound Groundwater Resources: Water Authority of Western Australia --Report and Recommendations of the Environmental Protection Authority*, Bulletin 295, August 1987, p24



3.3 Conditions to be cleared, amended or deleted

3.3.1 Conditions to be cleared

There are several conditions that have now been fully complied with and under which no further action is required. These commitments should be cleared.

It is recommended that the EPA advise the proponent that conditions 496:M4.1, 4.2, 4.3 and 4.4 are cleared.

3.3.2 Conditions that may be deleted

Several conditions were included in the statements because of deficiencies with the EP Act that have now been rectified. These include

- provisions for the Minister to approve minor changes to the proposal and
- provisions for change of proponent.

As a result of the first provisions conditions 438:M2.2 and 496:M1.2 and 1.3 may be deleted.

While it may be possible to achieve this under s46A, this is not recommended because it is likely to cause confusion. It is better that these deletions are made as part of the s46 review process.

It is recommended that conditions 438:M2.2 and 496:M1.2 and 1.3 be deleted as part of the s46 review process.

3.3.3 Conditions that may be amended

Several conditions should be amended as part of the s46 review process. These include

- if 438:M10.1 is amended to include some elements of 438:P15, the latter could be cleared;
- in 438:P32 and P38, references to months when monitoring is to be undertaken need adjusting;
- conditions 496:M1.1 and M2.1 could be amalgamated; and
- in 496:M5.2 the reference to DEP should read EPA.

It is recommended that conditions 438:M10.1, 496:M1.1, M2.1 and M5.2, and commitments 438:P15, P32 and P38 be amended as outlined above as part of the s46 review process.



4. Significance of the compliance results

Compliance with the Ministerial conditions is a statutory requirement and failure to comply is a Tier 1 offence under the Environmental Protection Act 1986. Consequently, a failure to comply with any of the conditions is a significant matter. However, the purpose of the conditions is to protect the environment. How significant are the identified non-compliances in their effect on the environment?

In general, the environmental water provisions are expressed as minimum water levels that are not to be breached, or breached no more than two years in six. This in itself does not amount to an environmental impact except in the sense of visual amenity, when a lake dries. To determine the environmental impact of the lowered water levels the status of vegetation, fauna and water quality is monitored.

The Report provides a review of the vegetation status of the wetlands for which EWP have been set and the monitoring wells where EWPs have been breached as well as information on macroinvertebrates and water quality. Table 4 presents a brief summary. It would be helpful if the proponent provided such a summary.

There is also an assessment of the status of upland vegetation, analysing the mix of species present in transects across the Mound. The information provided relates to a 2001/02 survey. It concluded that “There is no doubt that lower annual rainfalls have affected the vegetation on the Gngangara Mound”, with “a general shift from moisture-dependent species towards xerophytic species”. It reports a decline in the number and condition of overstorey species

Table 4 Summary of environmental monitoring of EWP wetlands, lakes and bores

Ident.	Vegetation status	Macroinvertebrates	Water quality
Lake Gngangara	Not monitored	Spring - increased family spp richness Summer – dry at sampling	Drought-induced acidification an extreme concern. Nitrogen levels signif above other wetlands
Loch McNess	Good condition. Algae on lake edge – water quality may be an issue	Spring –increased family spp richness, Nth & Sth Summer – Sth above ave spp richness, Nth - dry at sampling.	Symptoms of nutrient enrichment.
Lake Joondalup	South – fire impact, decline in mean tree health North – decrease in species richness, increased exotics, decline in meant tree health	Spring - increased family spp richness Summer – below ave spp richness	Symptoms of nutrient enrichment.
Lake Goollelal	Poor health of overstorey spp exotics abundant	Spring - increased family spp richness Summer – above ave spp richness	Sampled but not reported
Lake Nowergup	East cleared for agriculture, signif veg decline in 2002, water stress in trees, exotics dominate understorey	Spring - increased family spp richness Summer – below ave spp richness	pH increased, nutrients, chlorophyll <i>a</i> declined probably due to fresh water supplementation.
Lake Yonderup	Exotics dominate understorey. Tree health mixed.	Spring - increased family spp richness Summer – above ave spp richness	Sampled but not reported
Lake Jandabup	Mean tree health decline, high spp richness, few exotics	Spring - increased family spp richness Summer – above ave spp richness	Declining quality – high conductivity and concentrations of all nutrients and sulphate

Ident.	Vegetation status	Macroinvertebrates	Water quality
Lake Mariginiup	Fire in 2003 caused mean tree health decline, now recovering	Spring - increased family spp richness Summer – dry at sampling Increased susceptibility to fire an extreme concern	Low pH, high sulphate mean drought-induced acidification an extreme concern
Coogee Springs	Exotic pasture spp dominate, fire damage to mature trees, grazing limits recruitment	Dry at time of sampling. Increased susceptibility to fire an extreme concern	Artif supplementation & stock access changed water qual'y
Lake Wilgarup (not EWP but high cons. value)	Wetland veg. and tree health has continued to decline, peat layer has further dried. Introduced spp recruiting across wetland.	Dry at time of sampling. Increased susceptibility to fire an extreme concern	Sampled but not reported.
Egerton Spr	Some fire deaths	Abundant and diverse	Good qual fresh water
Lexia 94	Tree health unchanged, exotics low, thicket shrubs in poor condition, many deaths, but germination of seedlings	Not sampled	Drought-induced acidification an extreme concern
Lexia 186	Exotics low, canopy improved, mean tree health declining with distance from wetland.	Dry at time of sampling. Increased susceptibility to fire an extreme concern	Sampled but not reported. Drought-induced acidification an extreme concern
Lexia 86	Baumea articulata reduced density and condition, tree health poor, declining	Dry at time of sampling. Increased susceptibility to fire an extreme concern	Sampled but not reported. Drought-induced acidification an extreme concern
Melaleuca Park EPP 173	Not reported	Spring - family spp richness lower. Summer – below ave family spp richness. Increased susceptibility to fire an extreme concern	Considerable decline in water quality, lower pH, higher chloro a, nitrogen. Drought-induced acidification an extreme concern
Pipidiny Swamp	Not reported	Spring – unchanged family spp richness Summer – above ave family spp richness	Sampled but not reported.
PM6	Some tree deaths indicate recent water stress	Not relevant.	Not sampled or reported.
WM1	Some tree deaths indicate recent water stress	Not relevant.	Not sampled or reported.
WM6	Trees showing stress, understorey relatively intact	Not relevant.	Not sampled or reported.
MM53 (in Whiteman Park)	Some dead Banksias and dead stems in healthy trees, epicormic growth may water stress or recovery from fire.	Not relevant.	Not sampled or reported.
MM55B	Understorey thinned but dominated by native spp. No clear evidence of stress.	Not relevant.	Not sampled or reported.
MM59B	Recent Banksia deaths, but many saplings, other spp stressed (water?)	Not relevant.	Not sampled or reported.
JB5	Overstorey spp good condition, some evidence of previous stress.	Not relevant.	Not sampled or reported.

There are no set quantitative criteria for the required minimum status of vegetation, macroinvertebrates or water quality, but it is clear from the information in Table 4 that the Gnangara Mound environment has been subject to water stress for some time. There is evidence of a general decline due probably to a mix of reduced rainfall and ongoing water abstraction. While the vegetation status does not indicate cause for extreme concern, there is extreme concern over acidification and fire risk in some wetlands and signs of nutrient enrichment or eutrophication in others.

Since the purpose of the water level criteria is to protect environmental values it seems inappropriate that there are no established quantitative criteria for the required status of vegetation, macroinvertebrates and water quality. While these environmental parameters remain ill-defined there is a danger that they will be placed at a disadvantage when weighed up against other considerations that may be better defined.

It is recommended that quantitative criteria for the required status of vegetation, macroinvertebrates and water quality be developed as part of the s46 review.

In addition to the information summarised in Table 4, there was sampling of water quality and macroinvertebrates at Edgcombe Spring and a frog monitoring program in the East Lexia wetlands. Edgcombe Spring dried in 1999 and a firebreak was placed through it in 2000, severely affecting fauna. The frog study found an acceptable representation of frogs of the lower Swan Valley area.

There was also a special study of water quality and root-mat fauna in the Yanchep caves. Water quality remains good, but there has been a significant decline in the number of fauna species and a reduction in population sizes of the remaining species. This is due to reduced water flow through the root-mats with falling water levels. There have been artificial supplementation trials with pumping from Loch McNess, but this does not provide a long-term solution. The water levels are thought to be significantly affected by the management of the nearby pine plantation. Recommendations elsewhere about the management of the pines could focus on areas such as this where compliance with the EPP would have the most significant effect.

Unlike the Jandakot Mound, there is no reported monitoring of water birds.

Indeed, there are a number of differences of approach between the conditions applying to the Jandakot and Gnangara Mound, such as the use of an environmental management plan for Jandakot but not for Gnangara.

It is recommended that the s46 review should be used to harmonise the approach for the two Mounds and, if appropriate, bring the reporting together.



Appendix 1 – Compliance Audit Table - with Auditor's Comments



Appendix 1 – Compliance Table with Auditor’s Comments

NOTE Text in shading identifies Conditions that the Water and Rivers Commission is in non-compliance.
Text in italic represents Auditor’s comments relating to non-compliance or recommended action.

A. MINISTERIAL CONDITIONS for STATEMENT NO. 438 (APPLICABLE FROM 1997).

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor’s comments
438: M-1	Fulfil the commitments published in EPA Bulletin 817 (Appendix 3) as revised in November 1996 and attached to the Minister’s statement 438.	Compliance detailed in the following table of commitments.	Of the total number of 29 environmental water level criteria published in Statement 438- 22, 22, and 16 have been fulfilled in years 2000-01, 2001-02, and 2002-03 respectively. This has been achieved in a climate different to that which was considered when originally setting these criteria levels. Of major significance is that rainfall for the period 2000- 03 is significantly below long- term average rainfall. Climate is the dominant causal factor in non-compliance of water level criteria as public water supply abstraction from the shallow aquifer has declined by 6.5 Gigalitres from a high in 1993- 94 for the Wanneroo and Pinjar wellfields while private allocation has only increased by 0.5 Gigalitres in the Wanneroo Groundwater Area for the period 2000- 2003.	In printing this table it is preferable that is run continuously, as here, rather than alternately, as in the Gngangara Triennial Report. <i>There have been 7, 7 and 13 non-compliances with water level criteria in 2000/01, 01/02, and 02/03 respectively. In addition several other conditions and commitments have not been complied with.</i> The reporting of compliance is appropriate. The assertions about cause are better addressed in the text of the report, with evidence to support them. They are open to question (see comments on text).
438: M-2 M2-1	The implementation of the proposal shall conform in substance to that set out in any designs, specifications, plans or other technical material submitted by the proponent to the EPA.	Condition met for Pinjar stage 2 part 1. Other components are not developed yet, however the Conditions will be met at the appropriate time. Ongoing condition.	As for 2000-01 and 2001-02.	OK
M2-2	Seek approval for modifications to the proposal.	No modifications have been made. Ongoing condition.	Yarragadee 15 GL - the EPA decided not to subject this project to the formal environmental impact assessment	Satisfactory compliance.

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
			and the subsequent setting of formal conditions by the Minister for Environment and Heritage. Two appeals against this level of assessment were dismissed.	<i>This condition is no longer required. The condition could be deleted as part of the s46 review.</i>
438: M3-1	The allocation of water to public and private users and the operation of Pinjar Stages 1,2,3, Wanneroo and Mirrabooka groundwater schemes shall comply with EWPs.	<p>Environmental performance criteria have been set for nine wetlands within the Gnangara groundwater abstraction scheme.</p> <ul style="list-style-type: none"> • Preferred minimum peak water level (2 in 6 year criteria) was breached in Coogee Springs in 2001/02 due to insufficient supplementation and water leaking from the lake. Absolute minimum peak water level criteria was breached in Lake Nowergup due to artificial maintenance pumping and electrical problems. Problems with the pumping systems have been remedied during 2000/01, and should ensure that minimum peak criteria are achieved in 2001/02. • Breaching of preferred 	The majority of water levels were compliant with EWP criteria levels during the reporting period. During 2000/01 there were 9 non-compliances, 8 in 2001/02 and 16 in 2002/03. Water levels have continued to decline in the northern part of the Mound around PM6, PM7, PM9 (Pinjar), WM1 and WM2 (Wanneroo). Criteria were also non-compliant at Lakes Gnangara, Jandabup, Joondalup, Mariginiup, Nowergup, Coogee Springs and Wilgarup.	<p><i>The condition requires that the allocation of water to public and private users and the operation of the schemes comply with EWPs. The response addresses non-compliance with EWPs but makes no mention of allocation. It is not adequate to argue as M-1, that climate is the cause of the non-compliance and hence that the allocations and operation of the schemes would, given average rainfall, have complied with the EWPs. This condition has clearly not been complied with.</i></p>

⁹ Tables 6 and 7 – Gnangara 2002 annual report



Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
		<p>minimum peak water levels has also occurred in Lake Mariginiup during the review period, and for the sixth consecutive year, thereby breaking the 2 in 6 criteria.</p> <ul style="list-style-type: none"> • Breaches of absolute minimum surface water levels occurred in Lexia 186 wetland and Edgecombe seep during 2001-02. • The water levels in Nowergup Lake, Lexia 94 and Melaleuca Park Wetlands had acceptable water levels this year, but have previously been below the preferred minimum criteria for several years in succession, thereby breaking the 2 in 6 year criteria. • The absolute minimum groundwater levels in JB5, MM59B and WM1 breached during 2001/02. 	<p>levels in autumn 2002. In response the Commission continued the artificial maintenance program into the autumn period, rather than switching it off at the end of spring.</p> <p>For further details see tables B and C⁹</p>	
438: M4-1	The integrity of all groundwater dependent ecosystems, located on the Gnangara Mound, which are likely to be impacted by	The Commission ensures the protection of groundwater-dependent ecosystems through compliance with EWPs, which is audited through this reporting	The Commission ensures the protection of groundwater-dependent ecosystems through compliance with EWPs, which is audited through this reporting mechanism While there have been some local impacts on groundwater dependant ecosystems (eg. weed invasion),	The acronym "GDEs" is used later in the report. It presumably refers to groundwater dependent ecosystems. If so, it should be introduced here at the first use of the term.

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
	groundwater abstraction, shall be protected.	mechanism. Research is also conducted by and on behalf of the Commission to monitor groundwater-dependent ecosystems on the Mound. The results of this monitoring and research is documented in annual and triennial reports to the EPA.	<p>partly attributable to groundwater abstraction, the integrity of the ecosystem as a whole has not been compromised (see below).</p> <p>Some of the Yanchep cave fauna are on the CALM's critically endangered list and are in need of protection. Declining water levels in caves primarily due to reduced recharge and possibly pines. Previous supplementation of water levels did not permit sufficient aeration of water leading to significant loss of fauna so higher levels of flow recommended. (Knott and Story, 2002)¹⁰. The report suggests that, under favourable conditions, the invertebrate community may re-colonise.</p> <p>A 20-day trial in December 2002 was successful in raising water levels to 15cm below the cave floor. In July 2003, construction for a larger trial commenced to provide greater confidence that a the full-scale recharge scheme would be successful.</p> <p>The MoU on pine management with CALM (now Forest Products Commission) outlines the framework for thinning of pines to limit declines in water levels.</p> <p>A frog monitoring programme was carried out in 6 wetlands in the East Lexia area in 2001. Frogs are a sensitive indicator of wetland health and have considerable conservation status in their own right. Overall, the range of species recorded presented an acceptable representation of frogs typically found in the</p>	<p><i>Key findings of the 2003 S46 Progress Report given at 438:P3 (below) of.</i></p> <ul style="list-style-type: none"> • moderate decline in mean vegetation health at Lake Joondalup, Lake Yonderup, Lexia 94, Lake Jandabup; • significant decline at Lake Mariginiup and Lexia 186; and • severe decline at Lake Nowergup; <p><i>as well as</i></p> <ul style="list-style-type: none"> • the "serious threat to cave fauna in the coming summer" (p25 Triennial Report) suggest that "the integrity of all groundwater dependent ecosystems" has not been protected as required. Probable non-compliance.

¹⁰ Knott, B and Storey A W 2002, Environmental Monitoring and Investigations – Gnangara Mound: Yanchep Cave Stream Invertebrate Monitoring. Department of Zoology, University of Western Australia. Report to the Water and Rivers Commission.

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
438: M5-1	<p>The basis of decisions regarding the management of the water resources of the Gngangara Mound and maintenance of ecological systems shall be based on the concept of sustainable yield of resources <u>and maintenance of ecological systems</u> in accordance with the objectives of the State Water Conservation Strategy.</p> <p><i>Underlined words are not in the original condition and appear to be a typographical error in the table.</i></p>	<p>Water resources are managed to ensure sustainable development. The Commission sets limits on the water available for consumptive use to ensure that EWPs are met. EWPs have been set in consultation with DEP. Essentially these EWPs specify the management objectives and water levels that must be maintained in designated monitoring wells and wetlands across the Mound.</p>	<p>lower Swan Valley area (Aplin et al 2001).</p> <p>Public Supply-</p> <p>The WRC reaches an agreement with the Water Corporation in November each year on the amount of groundwater that can be taken from the Gngangara mound that year without breaching the EWPs. The agreement specifies the amount that can be taken from each well.</p> <p>Private Supply-</p> <p>There is no State Water Conservation Strategy (SWCS). A draft was released for public comment in July 2002 but was not released in final form. However, key components of the SWCS were included in the State Water Strategy released in February 2003, a decision made at senior government level The Water and Rivers Commission manages water resources on the Gngangara Mound by the sustainable yield concept which recognises maintenance of ecological systems. Each year the condition of the shallow aquifer is assessed in regards to the extent of winter recharge and production quotas for public wellfield abstraction adjusted accordingly. During the reporting period 2000-03, groundwater allocation for wellfield abstraction has declined (Appendix 2) reflecting reduced recharge from below average rainfall.</p> <p>During the reporting period 2000-03, groundwater allocation for private abstraction has increased only marginally (Appendix 2) in environmentally sensitive areas (eg Wanneroo Groundwater Area) as the area has or is close to reaching the sustainable subarea allocation</p>	<p>The text of the condition in column 2 has a typographical error. The condition actually refers to <i>A State Conservation Strategy for Western Australia – A sense of direction</i>, Bulletin 270, January 270, Dept of Conservation and Environment. This Strategy was prepared as a State response to the <i>World Conservation Strategy: Living Resource Conservation for Sustainable Development</i> (1980) of the International Union for the Conservation of Nature and Natural Resources, and <i>A National Conservation Strategy for Australia</i> (1984) AGPS, Canberra.</p> <p>The thrust of these documents is the application of the principles of sustainable development, as they express them, to natural resources management.</p> <p><i>The response needs to be amended to address the State Conservation Strategy. Since WRC and Water Corp have, in recent years agreed quantities for abstraction at a time when non-compliance for the past year is known and for the coming year predicted it cannot be claimed that the agreed amount can be taken "without breaching the EWPs" so there appears to be non-compliance. The condition requires that decisions be "based on the concept of sustainable yield of resources and maintenance of ecological</i></p>

Code	Description	Compliance Assessment Reported 2001- 02	Compliance Assessment (2000- 03)	Auditor's comments
			limit.	<i>systems..” but the response provided refers to management “by the sustainable yield concept which recognises maintenance of ecological systems”. These are not the same.</i>
438: M5-2	The basis for management decisions and the criteria specified for conservation of the environment and of the groundwater resource of the Gngangara Mound shall be subject to regular review.	Abstraction limits for public schemes are set on an annual basis to reflect environmental and production constraints and these take winter recharge into consideration. The quotas are reviewed on a monthly basis to ascertain compliance with EWPs. If EWPs are predicted to breach then the quotas are reduced in order to prevent the breach occurring. A review of criteria and environmental conditions set on this proposal is currently occurring under Section 46 of the Environmental Protection Act.	Following submission of the Gngangara Mound Triennial 1997-00 report, the Water and Rivers Commission requested a review of the existing Ministerial conditions for the Gngangara Mound. In September 2001, the EPA endorsed a two-stage approach to a review of Ministerial conditions from the Minister for Environments request to the EPA to “inquire into and advise on changes to the existing Ministerial conditions” under Section 46 of the <i>Environmental Protection Act 1986</i> . The process being taken by the Section 46 review is documented in the Section 46 Review of Environmental Conditions on Management of the Gngangara and Jandakot Mounds, Progress report 2003 (refer to attached Introduction of this report).	<i>The condition calls for “regular review”. The response refers to a single review, taking five years, over the 18 year life of the project. This is clearly not “regular review”. The condition did not contemplate that the mechanism of review should be the s46 process. There should be other internal, but transparent, mechanisms for reviewing the basis of management decisions (and other matters that are to be “regularly reviewed”). The condition has not been complied with.</i>
438: M6-1	Continue the current approach of widely publishing the limits on groundwater availability for the Gngangara Mound.	Allocation limits are published in annual and triennial reports. These reports are available free of charge on the Internet and in the Commission's library. The Commission liaises regularly with Shire Councils and updates them on allocation limits. Licence holders are made aware of allocation limits during licence compliance surveys. Limits are also always available from the Commission on request	The current approach as detailed in summary for years 2000-02 is on- going. In addition, community representatives on the Wanneroo Groundwater Advisory Committee are updated on groundwater availability figures at committee meetings. This information is also available on request to any person.	<i>“Current” in the context means the approach that was current when the conditions were first set. The EPA recommendation on which this condition was based was preceded by an observation that “It is important that the community in general, and existing and potential users in particular, are aware of changes in groundwater levels. In that way, understanding of the need for management would increase, and future proposals could be consistent with increased understanding of the groundwater systems and improved acceptance of constraints on water use.”</i>

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		for any interested party.		<i>Publication by annual reports and tabling at committee meetings is not achieving the intent of the condition.</i>
438: M6-2	Update the Figures published according to the requirements of 6-1		Groundwater availability figures are updated as necessary, eg. tabled at the Wanneroo Groundwater Area Advisory Committee meetings. Agendas available on request.	<i>Publication by tabling at committee meetings is not achieving the intent of the condition. The intent is to inform the public so attitudes are changed.</i>
438: M7-1	Actively encourage further reduction in public water demand through its Water Conservation Strategy.	Both the Commission and the Water Corporation undertake demand reduction programs aimed at reducing scheme and private abstraction. <ul style="list-style-type: none"> • Daytime sprinkler restrictions now apply to <u>both</u> scheme water and private garden bores. • Sprinkler restrictions limiting watering for 2 days per week have reduced water consumption by 15% over 2001/02. • Numerous education campaigns aimed at reducing water consumption in households, and the horticultural and industrial sectors have been carried out by the Commission, and the Water Corporation during the review period. • The Commission has conducted a number of 	A State Water Conservation Strategy does not exist. A Draft strategy was released for public comment in July 2002 but was not released in final form. Components of the Conservation Strategy were included in the State Water Strategy released in February 2003. A decision was made at senior government level that the Conservation Strategy would not be released because of the possible confusion with the State Water Strategy. The State Water Strategy contains many actions relating to reducing public water demand that are principally the responsibility of the Water Corporation. The Strategy contains 84 governmental tasks of which the DoE is lead agency for 29 tasks and has a key supporting role for a further 26 tasks. A number of these tasks support the reduction in public water demand (Appendix 1 Attachment 438-M7-1 Tasks 4.1.3, 4.3.5, 4.10.1, 4.1.2, 4.3.6, 4.3.7, 5.1.3, and 6.3.1). Agencies report on progress in implementing these recommendations monthly to a Water Taskforce, which ultimately reports to the Premier. As an example, Stage 4 restrictions imposed on all customers of the Integrated Water Supply Scheme (supplied by Gnangara Mound groundwater) by the	In 1987, when the EPA made its report on the original proposal to the Minister, the then Water Authority was "currently preparing a water conservation strategy for Perth". This is the document to which the condition refers. The State Water Strategy could be reasonably seen as the successor to that Strategy. The State Water Strategy has the objective of ensuring "a sustainable water future for all Western Australians" by, among other things, <ul style="list-style-type: none"> • "improving water use efficiency in all sectors" and • "achieving significant advances in water reuse" both of which would encourage further reduction in public water demand. Phase 1 of compliance with the condition can be said to have been complied with. Phase 2 (implementation of the strategy) is ongoing.

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		<p>Community Water Forums to educate and actively involve the public in water resource management. The Forum recommendations were discussed at the recent Parliamentary Water Symposium.</p> <ul style="list-style-type: none"> • The Water Symposium enabled water resource management issues to be addressed at Parliamentary level, in a whole of Government approach. The outcomes of the Symposium will be implemented in future water resource planning and management initiatives. • The Commission has begun a joint program with the Agricultural Department to actively involve farmers and growers in improving water use efficiency in horticulture and farming. 	<p>Water Corporation saved 51GL of water.</p>	
438: M8-1	<p>Refer proposals to allocate water for subsequent public supply schemes on the Gngangara Mound to the EPA (eg, Yeal, Barragoon, Muchea Schemes).</p>	<ul style="list-style-type: none"> • Neerabup scheme was referred for environmental impact assessment in 1996 and was given the status of 'Informal Review with Public Advice' as the proposal was considered to have minimal impact on wetlands. The 	<p>Yarragadee 15 GL - this proposal was referred to the EPA on DATE who decided not to subject this project to the formal environmental impact assessment and the subsequent setting of formal conditions by the Minister for Environment and Heritage. Two appeals against this level of assessment were dismissed.</p> <p>West Mirrabooka Scheme – was not referred to the EPA</p>	OK



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		<p>Neerabup scheme became operational in 1997.</p> <ul style="list-style-type: none"> Lexia approvals were obtained (see East Gnangara groundwater resources proposal). A proposed increase in abstraction from the Lexia wellfield to 8GL was referred to EPA and the Minister for the Environment and Heritage. 	<p>because the Water Corporation met the EWR's and the allocation from the Mirrabooka well field was not increased. This is in accordance with the WRC's Statewide Policy No.5. Environmental Water provisions Policy for Western Australia, 2000.</p>	
<p>438: M9-1 (also refer to P21, P39)</p>	<p>Undertake the following areas of specific research and monitoring: 1) Clarify the relationship between groundwater level and wetland water quality, 2) improve the understanding of the conservation value of wetlands on the Gnangara Mound, especially for those for which information on their value is limited.</p>	<p>The WRC has employed consultants to undertake annual vegetation, water quality and macroinvertebrate monitoring on the 11 wetlands on the Gnangara Mound since 1996. The results are incorporated in the annual reports on the Gnangara Mound, and are used to reassess EWP's during the S.46 Review. These studies aim to monitor the health of the wetlands as well as to gain a greater understanding of the conservation value of the wetlands. The Commission is also the State's custodian of its wetland mapping, classification and evaluation data set, which is continually updated to reflect improved understanding of wetland conservation values.</p>	<p>The WRC monitors Gnangara Mound wetland vegetation, macroinvertebrates, water quality and frogs annually and measures water levels monthly at wetlands at which EWPs have been set (see also P22 to P39). WRC commissioned a study by Rockwater on 'Groundwater and wetland water level relationships' in March 2003. A final draft has been submitted to the WRC for review and comment. The scope of this study was:</p> <p>Task 1: review the relevant groundwater and wetland monitoring data from within the subject areas and identify and describe relationships as specifically as possible, where they exist, and note where relationships appear anomalous.</p> <p>Task 2. Identify anomalous relationships Where relationships appear anomalous, propose reasons for the anomalies and identify those wetlands where their water levels have a very poor or no relationship with nearby groundwater levels.</p> <p>Task 3. Identification of alternative monitoring</p>	<p>The scope of the studies initiated appears to cover the requirements of the condition. Once the studies are complete, this condition should be able to be cleared.</p>

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			<p>Locations Where the selected groundwater monitoring well (criteria well) has an anomalous relationship with the wetland surface water levels, where possible, identify an alternative monitoring point with a good relationship with the wetland and describe that relationship.</p> <p>Task 4. Proposal for investigations Make recommendations for work required to be carried out to confirm the outcomes of Task 2, including cost estimates and proposed prioritisation of work.</p> <p>Task 5. Future criteria setting Based on learnings from the study, provide documented advice on the matters to be considered when setting and monitoring future wetland water level criteria from the viewpoint of monitoring efficacy.</p> <p>The WRC also commissioned a study in March 2003 to review the ecological water requirements of Gnangara and Jandakot Mound wetlands. This study is being conducted by Dr Ray Froend at Edith Cowan University, and the part of the scope relevant to condition M 9-1 is:</p> <p><i>Identification and re-evaluation of ecological values</i></p> <p>Task 1a This task involves:</p> <ul style="list-style-type: none"> • Desktop review of ecological values identified in the 1995 Section 46 Review (Gnangara), 1997 East Gnangara Environmental Water Provisions Plan, and 1991 Public Environmental Review and 1992 Environmental Management Programme (Jandakot); • Restatement of the 1995, 1997 and 1991/92 values where applicable and reassessment and redefinition 	

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			<p>of these values where they have changed;</p> <ul style="list-style-type: none"> • Identification of the ecological values of GDEs in the wider study area that were not considered in 1995, 1997 and 1991/92 but are now appropriate to define (desktop identification and field truthing). <p>Task 1b This task involves consideration of how values may change under a dry climate scenario or other land use changes:</p> <ul style="list-style-type: none"> • Utilising predictions based on probable continuation of current water level trends, as well as likely climate scenarios provided by the WRC, propose how the values as defined in task 1a may alter under a declining water level scenario; • Identification of the significance of altered values and areas where there is a high level of degradation risk. Consideration should be given to interim management approaches to manage this risk until the progression of the hierarchical management framework proposed in Task 4; • Where appropriate (for example in areas proposed for urban development under the MRS, or where other land use changes are likely to cause increases in water levels over the longer term) define how the values identified in 1a may alter under a rising water level scenario; <p>Task 1c</p> <ul style="list-style-type: none"> • Propose management objectives for the values identified in tasks 1a and 1b. Proposed objectives should also utilise information on biological and ecological parameters collected in Task 3. <p>A progress report has been received by the WRC on the</p>	

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			results of Task 1. This can be made available on request.	
438: M10-1	Submit a brief annual report and more detailed triennial reports on the environmental monitoring and management of the Gngangara Mound.	Condition met by this report and previous reports.	<ul style="list-style-type: none"> • Annual report for 2000-01 was submitted on the 28th of November 2001 • Annual report for 2001-02 was submitted on the 3rd December 2002 • Triennial report for 2000-03 has been submitted on 15 March 2003 (ie. this report) following approval of date for extension 	OK
438: M11-1	Seek approval for transfer of ownership, control or management of this project.	Not applicable	Not applicable at this time.	OK
438: M12-1	Submit reports detailing performance and compliance with the conditions set in the Ministerial statement and attachments.	Condition met by this report.	<ul style="list-style-type: none"> • 8/10/99 No longer relevant- duplicated by M10.1 (comment from DEP Environmental Audit Branch audit table) 	OK

B. PROPONENT COMMITMENTS for STATEMENT NO. 438

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
438: P1	Request the Water Corporation to establish further monitoring bores for monthly monitoring and more frequently if required within a 200m radius of production bores located in phreatophytic vegetation.	The Water Corporation has established monitoring bores within a 200m radius of production bores for the Mirrabooka, Wanneroo and Pinjar schemes. These bores are monitored monthly and results are supplied to the Commission.	28/10/97 Condition cleared by DEP Environmental Audit Branch.	OK
438: P2	Establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation.	Additional bores were installed in 1995. Commitment cleared.	28/10/97 Condition cleared by DEP Environmental Audit Branch.	OK
438: P3	Select a range of indicator species at transects to determine an acceptable rate of change in vegetation composition. Also calculate similarity indices when monitoring.	<p>The Commission sponsors surveys of wetland vegetation on the Gnangara Mound on a yearly basis, and terrestrial vegetation on a triennial basis. These surveys are conducted by independent consultants, and analyse the mix of species present in transects across the Mound.</p> <p>The effect of the groundwater abstraction on native vegetation on the northern Swan Coastal Plain was been studied by Matiske Consulting, (2000). This work is a continuation of research commenced in 1966.</p>	<p>The Commission sponsors surveys of wetland vegetation on the Gnangara Mound on a yearly basis, and terrestrial vegetation on a triennial basis. These surveys are conducted by independent consultants, and analyse the mix of species present in transects across the mound. The results of monitoring are compared with results of previous rounds to give an indication of trends. The results of these are presented and discussed in previous annual reports and the 2003 Section 46 Progress report.</p> <p>The key findings are:</p> <ul style="list-style-type: none"> • Insignificant decline in mean vegetation health at Loch McNess, Coogee Springs, Egerton Spring, MM53, MM55B, MM59B, JB5, PM6, WM1 and WM6. • Moderate decline at Lake Joondalup, Lake Yonderup, Lexia 94, Lake Jandabup. 	<i>It is not clear from the response that the condition has been complied with. It appears that, instead of selecting a range of indicator species, monitoring focuses on all trees and the larger understorey species. It also appears that similarity indices have not been calculated as required.</i>

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		<p>Froend <i>et al.</i> (1999) have compiled a detailed report on the interaction between groundwater levels and vegetation condition. An 'acceptable' rate of change in vegetation composition has not been established, however this commitment will be reviewed under the Section 46 review currently underway.</p>	<ul style="list-style-type: none"> • Significant decline at Lake Mariginiup and Lexia 186. • Severe decline at Lake Nowergup. <p>The key areas of concern relate to lakes Nowergup and Wilgarup and the Yanchep Caves.</p> <p>Note: Lake Wilgarup and the Yanchep Caves are not subject to water level criteria conditions.</p> <p>Froend <i>et al.</i> (1999) have compiled a detailed report on the interaction between groundwater levels and vegetation condition. This report identified a range of potential indicator species such as <i>Banksia littoralis</i>, <i>B. ilicifolia</i>, <i>Melaleuca raphiophylla</i>, <i>Astartea fascicularis</i> and <i>Pericalymma ellipticum</i>. An 'acceptable' rate of change in vegetation composition has not been established, however this commitment will be reviewed under the Section 46 review currently under way.</p>	
438: P4	Require the Water Corporation to prepare an environmental operations plan to provide specific detail on environmental management of groundwater schemes in the study area. To include detailed management prescriptions for wellfield operators and water resource managers.	The operation plan has been finalised. Commitment met and cleared.	24/10/00 Condition cleared by DEP Environmental Audit Branch.	Noted. However, given the changes with new projects and a lack of success of past practices in avoiding breaches of water level minima, it would be advisable to consider a review of the environmental operations plan.
438: P5	Prepare a water resources allocation and management plan for the Yeal area to identify groundwater	Not yet required.	There are no immediate plans to develop the Yeal Scheme. However, groundwater allocation limits for this area will be covered in the Sub-regional Groundwater Management Plan for the Gnangara Mound (Perth to	OK



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	allocations (before development of Yeal scheme).		Gingin) currently in preparation by the Water Allocation Branch of the Commission.	
438: P6	Prepare a Water Resources Allocation and Management Plan for the Lexia area (East Gnangara area) to identify groundwater allocations prior to the development of the Lexia Scheme To include detailed groundwater modelling to optimise groundwater availability while minimising environmental impacts.	Commitment met through the East Gnangara Environmental Water Provisions Plan (1997) which identified the allocation limits for public and private use.	28/02/00 Condition completed as now assessed under Statement 496 (comment from DEP Evaluation Audit Branch audit table)	OK
438: P7	Develop a Memorandum of Understanding on pine management regimes with CALM	The MOU between the Commission and CALM (now FPC) was developed and signed in 1999. MoU is currently being implemented. Some modifications have been made to accommodate the State Agreement for the LVL plant, as this legislation over rides the WRC Act. Any changes to the plan must be approved by WRC, DEP, and CALM before being implemented. Directors' meetings to discuss the progress and amendment of the thinning strategies are currently held bi-monthly.	18/01/00 Condition cleared by DEP Environmental Audit Branch (incorrectly identified as condition 438: N4)	Agree the MoU has been developed as required, however, it is not presently being implemented and that must be addressed (see recommendations in text).
438: P8	Manage all groundwater allocation and use with the	Objectives have been met, except for breaches in wetland water	18/10/99 No longer relevant as covered by 438: M3.1 (DEP Environmental Audit Branch audit table comment)	OK

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	aim of meeting the objectives in EPA Bulletin 817, tables 15 and 16.	level criteria (refer to M3-1).		
438: P9	Facilitate and undertake strategic research to minimise the impacts of groundwater abstraction	<p>Ongoing. The Commission is undertaking research in the following areas:</p> <ol style="list-style-type: none"> 1. Acidification of Lake Jandabup. Two research projects have been undertaken, an Honours and a Masters study. The findings indicate that the soil and condition that produces acidity are variably distributed across the lake and the proposed management initiatives have facilitated the recovery of the Lake. 2. Condition in the Yanchep Caves – see Commitment P11. 3. Terrestrial vegetation on the Gngangara Mound – see Commitment P3. 4. Macroinvertebrates/water quality and vegetation monitoring in wetlands on the Gngangara Mound – see Condition M9-1. 5. Groundwater modelling – the Commission and the Water Corporation are currently updating the groundwater 	<p>Of the studies outlined in the adjacent columns (2000 to 2002), the Masters study on Lake Jandabup has continued into a PhD study and has been expanded to cover other lakes on the Gngangara Mound. Joint studies have been conducted by the WRC, CALM and the Water Corporation in 2002 and 2003 to develop a proposal for a permanent artificial maintenance scheme for the Yanchep Caves. A funding proposal now rests with Treasury for the infrastructure and running costs of the pumps. The 3 year vegetation mapping project being conducted by Mattiske Consulting has now been completed and a report is available (see P14). The statistical analysis of hydrographs has been completed (C. Yesertener) and a report is available.</p> <p>The WRC initiated four key studies in early 2003 to further the research into the impacts of groundwater abstraction on GDEs. They were:</p> <ol style="list-style-type: none"> 1. Groundwater-wetland water level relationships review (Rockwater). Scope as outlined in M9-1. Final draft received for review and comment 2. Groundwater monitoring network review (Aquaterra). The scope included a review of the current groundwater level monitoring network and recommendations for a preferred network that would provide information to the WRC on the effects of groundwater abstractions, climate, land use and management measures, on the groundwater resource. A final draft has been received for Commission review and comment 	<p>The studies reported seem mainly focussed on understanding the impacts of groundwater abstraction rather than minimising those impacts. <i>Consideration should be given to studies that more directly address the commitment.</i></p>

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		<p>model used to calculate predicted groundwater level changes due to abstraction on the Gnangara Mound. The updated model will predict the effects of confined aquifer pumping more accurately.</p> <p>6. The Commission is undertaking a 3-year project to map the vegetation communities on the Gnangara Mound.</p> <p>7. A statistical analysis of hydrographs and rainfall, land use and abstraction data on the Gnangara and Jandakot Mounds is being undertaken to gain a better understanding of the effects of these influences on groundwater levels.</p> <p>Further strategic research will be initiated as part of the Section 46 of environmental conditions currently underway.</p>	<p>3. Wetland sedimentology study (Syrinx Environmental). The study was a scoping study to examine the potential for wetland sedimentologic studies to provide information on past water level regimes and corresponding ecological condition. The study has been completed and a final report has been produced.</p> <p>4. Ecological water requirements review (Edith Cowan University). Task 1 of the scope is outlined in M9-1. Subsequent tasks are to propose revised ecological water requirements for the identified GDEs, to identify parameters that can be used to reflect the ecological values, environmental condition and health of the GDEs and that have a defined relationship with water levels, to recommend a hierarchical response-based management framework and model Ministerial conditions, and finally to recommend a revised biological monitoring program.</p> <p>A progress report outlining the results of Task 1 has been submitted to the WRC.</p>	
438: P10	Continue to provide advice to City of Wanneroo, Ministry of Planning, CALM and other relevant agencies on the impact of landuse on groundwater resources.	As part of its function the Commission regularly provides advice to State Government Departments, Local Government and community groups on statutory and strategic planning	Gnangara Consultative Committee, TOR, membership 1. Advice is provided to State Government Departments, Local Government, Stakeholders and Community groups through the Gnangara Community Consultative Committee (GCCC) (Members List attached)	The commitment has been complied with. It is not clear from the response whether the proponent provides advice on specific applications for rezoning, subdivision or development approval. If so, this should be mentioned.

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		<p>proposals. This liaison will be increased as part of drought response and the Section 46 review.</p>	<p>The objective of the Commission's program of community consultation on the Section 46 process is to gain community ownership and understanding of the water resource problems that are currently being faced on the Gngangara and Jandakot Mounds.</p> <p>The Gngangara Community Consultative Committee is the main medium for community involvement for the Gngangara Mound on the Section 46 Review. The Consultative Committee met on 6 occasions from July 2000 to June 2003. At these meetings, detailed presentations are given by a range of government departments on the following subjects:</p> <ul style="list-style-type: none"> • water levels and current status of the Gngangara Mound; • wetland macroinvertebrates and water quality (acidification of wetlands); • wetland vegetation status; • actual and predicted breaches of ministerial conditions; • the status of individual Section 46 reviews (EWRs, sedimentology, wetland-groundwater level relationships and optimisation of the groundwater monitoring network; • pines management; • Water Corporation abstraction; • Yanchep Caves; and management of private abstraction. <p>2.The Gngangara Coordinating Committee was first convened in April 2003 and is made up of Directors of several government agencies (AgWA, DPI, WCorp,</p>	<p>Given the vital role of the Gngangara mound in providing much of Perth's drinking water, there is an argument for the water resource manager having greater powers to influence land use over the mound.</p>



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Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>CALM, WRC, FPC, CSIRO and DPC). The Coordinating Committee meets monthly. Impacts of landuse on Groundwater resources and management options are regularly discussed. The Terms of Reference and members list are attached.</p> <p>Several other inter-agency committees also exist at which the WRC, CALM, the City of Wanneroo and/or the DPI are represented and the impacts of land use on groundwater resources are discussed. These include the Yanchep Caves Recovery Team, the Yanchep Caves Technical Group, the Pines Technical Group, and the East Wanneroo Land Use and Water Management Strategy Community Consultative Committee.</p> <p>A community Water Forum was held in September 2002 at the City of Wanneroo offices and run by the Water and Rivers Commission. Agency representatives and community members attended and the forum involved a full day of discussion centred around groundwater management on Gnangara Mound, and the impacts of land use on GDEs. Outputs of the forum contributed to the Government's Water Symposium held in October 2002. A summary of the forum can be found on the website: http://www.ourwaterfuture.com.au/community/forums_gnangara_mound.asp</p>	
438: P11	Continue to develop catchment strategies to minimise change in hydrological regime within the caves of Yanchep National Park. Monitor water levels and	WRC has supported CALM in developing a Caves Recovery Plan. A trial is currently being conducted to determine the viability of supplementing cave levels with groundwater pumping.	Following the 2002 State Agreement with Wesbeam, Cabinet required preparation of a Joint Agency Emergency Response Strategy for the caves. In response, the following actions have been undertaken: <ul style="list-style-type: none"> • investigations of land use management options have been conducted through interagency groups; 	The work reported is consistent with compliance with the commitment. Section 5 of the EP Act was recently amended and now reads "Whenever a provision of this Act or of an approved policy is inconsistent

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	cave fauna.	<p>Trials have been conducted in 2000/01 with limited success due to the high transmissivity of the cave sands and limestone. Soakwells and similar small-scale forms of artificial maintenance continue to occur in order to retain some habitats for the rare amphipods. Investigation is continuing in an attempt to identify other, more sustainable methods of maintaining the cave streams.</p> <p>Pine thinning upstream of the caves is continuing as a priority under the pines MOU.</p>	<ul style="list-style-type: none"> • small and full-scale artificial maintenance schemes have been constructed and trialed to improve water levels in the Crystal and Cabaret caves; • encouragement of pine thinning upstream of the caves has been pursued as a priority under the pines MOU, however, the potential for this to achieve the desired results has been compromised by the State Agreement; • a joint agency technical group is evaluating alternative pine management options to achieve an optimal outcome for the environment, water supply and pine harvesting. 	<p>with a provision contained in, or ratified or approved by, any other written law, the provision of this Act or the approved policy, as the case requires, prevails.”</p> <p>This means that the requirement of clause 9(d) of the Gnangara Mound EPP, requiring the maintenance of the pine plantation at no more than 11 sq.m. basal area per hectare, prevails over the State Agreement Act with Wesbeam in the event of an inconsistency.</p> <p><i>The proponent should seek legal advice on this to ensure that the priority of the EPP is enforced. EPA could recommend that the Minister advise the Minister for Agriculture, Forests and Fisheries of the need for the FPC to comply with the EPP.</i></p>
438: P12	Prepare strategic drainage plans for the study area including options for the management of high water levels in Lake Joondalup, Goollelal, Mariginiup and Jandabup.	Part Commitment met by report “Management of Water Levels in North West Corridor”. Preparation of drainage plans has been delayed, however drainage is only an issue in high rainfall periods. The region is presently experiencing an extended period of low rainfall, and consequently research effort has been concentrated on issues associated with current climate trends.	23/09/99 On hold (comment in DEP Environmental Audit Branch audit table)	OK
438: P13	In consultation with other relevant agencies, the Water and Rivers Commission, will	Several interagency and community committees already exist which deal with the issues.	A number of committees have been developed to deal with water resource planning and management on the Gnangara Mound. Since the establishment of the	OK

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	<p>within six months of receiving environmental approvals, reconvene and provide ongoing executive support for an inter – agency technical advisory group for water resources planning and management issues on the Gnangara Mound. This will be done in the context of recommendations of the Select Committee on Metropolitan Development and Groundwater Supplies.</p>	<p>These committees are responsible for planning and management of the Gnangara Mound land use and water resources. Agreement was obtained from DEP to delay setting up this committee until appropriate.</p>	<p>Gnangara Coordinating Committee in April 2003 (made up of Directors from all Government agencies) one of the group's roles is to facilitate and coordinate activities of the Technical Groups on the Gnangara Mound (see TOR attached). A number of technical committees are described below.</p> <p>A Pines Technical group focus on alternative pine management options to achieve an optimal outcome for the environment, water supply and pine harvesting on the Gnangara Mound.</p> <p>The Yanchep Caves Technical group's focus was to trial the feasibility of a full-scale artificial maintenance and prepare for a permanent artificial maintenance scheme to improve water levels in the Yanchep Caves.</p> <p>The aim of the East Wanneroo Land Use and Water Management Strategy Community Consultative Committee is to prepare a strategy for sustainable land use and water management in the East Wanneroo area, by way of integrating the land use planning and development processes with groundwater protection and allocation objectives, the protection of productive agricultural land, tourism opportunities, basic raw materials, environmental values and landscape features for the benefit of the whole community.</p> <p>A number of technical groups are involved with the CSIRO Healthy Country Program which aims to apply a systems approach to investigating and modelling the Gnangara Mound, and to develop the incorporation of water reuse technologies and strategies to increase</p>	

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438: P14	Continue to chair and provide support for the Consultative Committee as an ongoing forum for information exchange and advice.	<ul style="list-style-type: none"> • A combined committee for Gngangara/East Gngangara has been re-formed and the committee met twice in 2002. • Amendment of the <i>Rights in Water and Irrigation Act 1914</i> will enable the use of groundwater advisory committees as a forum for EWP issues, and it is envisaged that members of these committees will be invited to attend that forum. 	<p>sustainability.</p> <p>In April 2003, the Gngangara Coordinating Committee was establishment comprising Directors from DoE, FPC, WADA, DPI, DCLM, Department of Premier and Cabinet, Water Corporation and CSIRO. The committee meets monthly and aims to provide an integrated, whole of government approach to management on the Gngangara Mound and to better coordinate multiple land and water resource use activities.</p> <p>Meeting agendas available on request.</p> <p>Refer to 496: P7.</p>	OK Good response – brief and full of information directly relevant to the fulfillment of the commitment.
438: P15	The Water and Rivers Commission will continue to report every three years to the Department of Environmental Protection on the management of groundwater within the Study area of the Gngangara Mound. This will include information on the operation of groundwater schemes and private groundwater use, and environmental impacts. In those years when a triennial report is submitted, the Water and Rivers Commission will report to the Department of Environmental Protection on compliance with		<p>Condition is similar to 438: M10-1.</p> <p>The Water and Rivers Commission seeks clearance of this condition 438: P15.</p>	<p>Agree this requirement is similar to M10-1. However P15 has a more detailed specification of the content of the reports that should not be lost.</p> <p><i>The wording of M10-1 could be amended to incorporate the elements of P15 specifying report content. P15 could then be cleared. The condition could be changed as part of the s46 review.</i></p>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	environmental conditions.			
438: P16	Limit potential for tree deaths around production wells to 100m radius for normal (average) climate conditions and within 200m in extreme conditions. This should be part of Water Corporation licence conditions.	The Commission has developed criteria for monitoring adjacent to production wells, and this has been incorporated into the Water Corporation's operating strategy. The Water Corporation is required to monitor these monthly and actively manage their abstraction regime to limit the impacts.	This requirement is included in the Water Corporation's Operating Strategy for the Metropolitan Groundwater Scheme. Compliance with the Operating Strategy is condition of the Water Corporation's licences. Abstraction from wells M140, M150, M172, M240, M250, P10, P50, P60, and P70 are believed to have some impact on the health of nearby vegetation. To ensure compliance, these wells are normally turned off. In total, more than 40 Water Corporation production wells have been turned off to avoid impact on vegetation and wetland water levels across the Gnangara Mound.	OK
438: P17	Upgrade the artificial maintenance facility for Lake Nowergup to provide more rapid recharge when it becomes necessary to meet EWPs.	Lake Nowergup is subject to an artificial recharge regime, which commenced in 1987. The original pump was upgraded from a capacity of 3.5 k/L per day to 6 kL per day and pump failures had occurred due to electrical failure. It was considered that an additional bore would prevent further breaches in this wetland and so a new bore was installed and commenced operation during December 2000. Supplementation of water levels during 2001/02 achieved the preferred spring peak levels.	Following installation of a higher capacity pump in the artificial maintenance well, a second well was added to the artificial maintenance facility for Lake Nowergup in 2000 to provide higher supplementation rates when required. Some mechanical problems limited the ability of the wells to be pumped at their full capacity initially.	OK
438: P18	Establish an artificial maintenance facility for Coogee Springs when necessary to meet EWPs	The criteria for Coogee Springs is a spring preferred minimum peak of 12 m AHD and a spring absolute minimum peak of 11.25	An artificial maintenance facility was installed and commissioned in August 1999. This facility was upgraded in 2000/01. This condition is now believed to be cleared.	Agree, this commitment can now be cleared



Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
		<p>m AHD. Water levels in the review period were below spring preferred minimum peak during this and previous review periods, which constitutes a breach of the 2 in 6 year criteria.</p> <p>Coogee Springs is subject to artificial recharge from one bore, which commenced in August 1999. As a result of unexpected low pumping rates which subsequently failed to meet the water level criteria, the Commission has installed a second bore of greater capacity to ensure criteria are met in the future. This bore is to be commissioned for use in spring 2001/02. The original bore will remain operative as a backup to the newly installed bore. Due to the high transmissivity of the karstic aquifer and the regionally low water levels, pumping enough water to meet water level criteria is likely to continue to be problematic, however this will be addressed during the Section 46 review.</p>		
438: P19	Should EWPs not be met by November 1, artificial supplementation shall be used	Artificial supplementation was required in Lake Nowergup and Coogee Springs during the review	Artificial supplementation was required in Lake Nowergup and Coogee Springs during the review period. The Coogee Springs facility was operated during	<i>The proponent is required by the commitment to undertake artificial supplementation if the EWPs are not met by November 1. It is not up</i>



Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	until the EWP is reached.	period. The criteria were not met in Coogee Springs due to problems with the artificial maintenance scheme, low starting water levels and the high transmissivity of the surrounding limestone.	2000/01, but not since. The criteria were not met in Coogee Springs during the review period. The Commission has decided not to continue with artificial supplementation of Coogee Spring due to diminishment of environmental values caused by its usage as summer pasture and surrounding rural activity (factors beyond the control of the Commission). These factors should also be taken into account in determining the value of maintaining wetland water levels. The Lake Nowergup facility was operated each year during the review period. The criteria were not met in Lake Nowergup during 2000/01 and 2002/03.	<i>to the proponent unilaterally to decide to do something different. If the proposal is to be modified in this way permission should be sought from the Minister by written request under M2-2.</i> <i>What changes are proposed to address the failure of the Lake Nowergup supplementation to achieve the criteria?</i>
438: P20	Only allow drops below the preferred level (table 16, bulletin 817) to occur in low rainfall years to mimic natural regimes (rate of 2/6 years).	Breaches of water level criteria have occurred more than twice in six years within Lakes Joondalup, Gnangara, Mariginiup, Nowergup and Coogee Springs.	Breaches of water level criteria have occurred more than twice in six years within Lakes Joondalup, Gnangara, Mariginiup, Nowergup and Coogee Springs.	<i>Non-compliance with environmental water provisions.</i>
438: P21	A review shall take place of the EWPs (table 16, bulletin 817) at least every six years to allow for adaptive management. It will incorporate public involvement.	EWPs will be reviewed as part of the Section 46 review that is current being undertaken. The current EWPs were set in 1996.	Work to revise the EWRs was initiated during 2002 with completion expected during 2004 as a component of the current Section 46 review of environmental conditions. Once completed, this work will be analysed and used in the review of EWPs (expected during late 2004).	<i>The late start to the review of EWPs constitutes administrative non-compliance. Since some EWPs are not being complied with, this delay in reviewing them is likely to extend that non-compliance.</i>
438: P22	The Water and Rivers Commission will, after receiving environmental approvals, implement and undertake the following monitoring programme, to the satisfaction of the EPA:		4/09/97 Condition cleared in part as covered by 438: P33 & P 34 (comment in DEP Environmental Audit Branch audit table)	The condition has been "cleared in part", implying that there is a residual ongoing reporting requirement. Without reference to "the following monitoring programme" is not clear what that requirement might be. <i>It may be that the condition can be cleared in full.</i>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
438: P23	Groundwater level monitoring across the established monitoring network, at a frequency of 1 or 3 months, depending on the wells.		All monitoring wells and wetlands that have Environmental Water Provision criteria are monitored on a monthly basis (see hydrographs as evidence). Other wells are either monitored monthly, quarterly or biannually. Aquaterra Consulting has recently completed a review of the Commission's groundwater monitoring network in the Perth region, and a draft report is currently with the Commission for review and comment. A copy of this report can be made available on request.	OK
438: P24	Vegetation transects will be established at all wetlands for which EWPs have been set, except Lake Gnangara, Pipidinny Swamp, and Coogee Springs. A minimum of one transect will be established for each wetland. Monitoring will be undertaken yearly, in November, for the first three years, to be reviewed in the first triennial report.		Permanent transects have been set up from the edge of the wetland to upland 40m at Lakes: Joondalup, Jandabup, Mariginiup, Nowergup, Yonderup, Wilgarup, Goollelal, Lexia 86, Lexia 186, Lexia 94, EPP 173, Dampland 78, Loch McNess. They were sampled annually in September 2000 – 02. As part of the Water Corporation's Lexia wetland mitigation strategy, vegetation transects have been established by the Corporation at wetlands 104, 132, 156, 158 and 164. The vegetation at these wetlands has been visually assessed by Edith Cowan University ecologists monthly, or fortnightly in summer over the 2001-2002 period. The Commission is provided with the results of these assessments. The Water Corporation has obtained agreement from the Commission to alter the monitoring programme in line with the annual programme currently in place for wetlands monitored by the Commission.	OK
438: P25	Wetland vegetation will be mapped every two years from large scale aerial photography for Lakes Jandabup, Mariginiup, Nowergup, and Loch McNess.		Aerial photography was used under the SLICP programme up until 2001. It then ceased due to high costs. There are three reasons it was ceased: under the SLICP programme the WRC did not have to pay for the aerial photo runs as it was considered a priority project. The project then fell off the SLICP programme because other projects were given precedence and the cost of the	<i>The proponent requests that the wording of this commitment be changed to remove the requirement to use aerial photography. This could be achieved by deletion of the words "from large scale aerial photography". The condition could be changed as part of the s46 review.</i>



Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>photography then became too much for the Commission to justify (10s of thousands of dollars). Advice from botanists (Bronwen Keighery from DEP and Libby Mattiske from Mattiske Consulting) was that the aerial photography needed to be of a very large scale to be of any real benefit in mapping. As an alternative, the WRC has access to digital orthophotos on its IntraGIS system (and these are regularly updated), and these are used in place of the traditional runs, plus two additional on-ground assessments by ECU each year since 2001 at these wetlands, which is more cost-effective than biennial mapping using air photos.</p> <p>The Water and Rivers Commission seeks amendment of Condition 438: P25 to reflect this change in methodology (eg delete aerial photography).</p>	
438: P26	Water quality will be monitored annually in November at all wetlands for which EWPs have been set.		<p>Water Chemistry is monitored annually at Coogee Springs, Lakes Gnangara, Goollelal, Jandabup, Joondalup, Mariginiup, Nowergup, Wilgarup, Yonderup Loch McNess, Pipidinny Swamp, Lexia 186 & 86 and EPP wetland 173.</p> <p>Overall, water quality significantly declined during the 1996 drought but appeared to be slowly recovering. Coogee Springs had water quality problems due to livestock access and lack of fringing vegetation. Lake Mariginiup most at risk of excessive summer drying and wetland acidification. EPP 173 exhibited low pH levels. Lake Jandabup appears to be recovering from an acidification that occurred in 1997. Lake Joondalup and Loch McNess showed symptoms of nutrient enrichment.</p>	<p>The listed wetlands and lakes include all the original Gnangara Mound wetlands for which EWPs were set and three of the seven Lexia wetlands for which "interim" EWPs have been established.</p> <p><i>In the absence of clarification of the meaning of "interim" it would appear that the failure to monitor water chemistry in the other four Lexia wetlands may constitute non-compliance.</i></p>
438: P27	Wetland habitats will be mapped along two regional		See above comment – P25.	<i>The proponent requests that the wording of this commitment be changed to remove the</i>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	transects in November, using large scale aerial photography, every year for the first three years, then every three years.		The Water and Rivers Commission seeks amendment of Condition 438: P27 to reflect this change in methodology (eg delete aerial photography).	<i>requirement to use aerial photography. This could be achieved by deletion of the words “, using large scale aerial photograph”. As for P25 (above) the condition could be changed as part of the s46 review.</i>
438: P28	Established terrestrial vegetation transects will continue to be monitored in spring, with at least 6 transects monitored every three years.		Phreatophytic, terrestrial vegetation is monitored triennially. The last survey was conducted in 2001/02. There has been a general shift in vegetation composition from moisture dependent species towards xeriphytic species, which are better adapted to drought conditions. If dry conditions continue, the extent of the impact on the lower and mid slopes in the Pinjar area will increase, as these areas are already very stressed. Their long term recovery potential is of concern	OK
438: P29	Indicator species will be monitored at established terrestrial vegetation transects when transects are monitored in spring. Parameters that will be assessed for each indicator species are age (size), class distribution, vigour and recruitment.		Terrestrial vegetation transects have been established at 13 sites on the Gnangara Mound. Most transects are monitored triennially in spring, some less frequently on occasions as advised by the consultant botanist (Mattiske Consulting Pty Ltd). All tree species are recorded, including details such as diameter at breast height (size), tree condition/health (vigour) and the existence of any seedlings (recruitment). Presence or absence of all understorey species in selected 4mx4m quadrats is noted, and information on density (alive and dead) and percentage foliage cover is recorded. Results are compared with results from previous monitoring. Monitoring of Gnangara terrestrial transects Bell, Bombing Range, Melaleuca, Neaves, P50, Tangletoe, Whiteman Park, Yanchep and Yeal occurred in 2002.	<i>It is not clear whether these indicator species are the same as those referred to in P3. If so, since those indicator species have not been selected, this commitment cannot have been complied with. Nevertheless there has been monitoring focussed on all trees and the larger understorey species. It also appears that similarity indices have not been calculated as required.</i>
438: P30	A Similarity Index for each terrestrial vegetation transect at each monitoring period will		See P29.	<i>The response at P29 makes no mention of similarity indices. Rather, reporting is descriptive. This is not compliant with the</i>



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Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	be calculated with the aim of summarising spatial and temporal changes in vegetation composition.			<i>wording of the commitment. While there must be some subjectivity about the assessment of vegetation health, it is absolutely central to the protection of environmental values on the mound. It is desirable, therefore, not only to quantify the assessments with the use of indices, but also to set target levels for the indices that are not to be breached. This would make these vegetation criteria more comparable with the water level criteria.</i>
438: P31	Continuous water level monitoring in three caves in Yanchep National Park will continue, with further cave monitoring established in suitable caves.		<p>Water levels within 6 cave streams have been monitored since 1993. Loggers have been installed in 3 caves to enable continuous monitoring. CALM artificially maintains water levels in the Tuart root mat habitats located inside the caves. Water levels in lined concrete sumps located in Crystal Cave are also being artificially maintained to protect small populations of rare isopods (Knott and Storey, 2002).</p> <p>Cave stream water levels are generally representative of the surrounding groundwater table. Declining levels are due mainly to low rainfalls, and possibly dense pine plantation upstream, reducing groundwater discharge (Water and Rivers Commission, 1999)</p>	OK
438: P32	Aquatic fauna will be monitored within those cave streams containing root mats once per year in November.		<p>Macroinvertebrate monitoring occurred in Yanchep National park – Boomerang (YN99), Caberet (YN31), Carpark (YN18), Lot 51 (YN55), Unnamed Cave (YN61) and Orpheua (YN256) in September 2001 and January 2002 with the exception of Twilight cave (unsafe to enter)</p> <p>Monitoring of cave fauna and water quality has occurred in November 1996, December 1998, November 2000,</p>	<i>The proponent requests that the wording of this commitment be changed to make the requirement to monitor in November more flexible. This could be achieved by replacing the words "in November" with "during Spring or early Summer". As for P25 (above) the condition could be changed as part of the s46 review.</i>

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>September 2001, January 2002 and September 2002 (Note, not all caves were sampled for water quality and cave fauna on each of the dates above). The paucity of species, low abundance of animals, and the unhealthy appearance of the root mats found in September 2001 prompted a second sampling in January 2002. Four new caves were sampled in September 2002, these were Cave YN61, Jackhammer Cave (YN438), Cave on Lot 51 (YN555) and Orpheus Cave (YN256).</p> <p>The caves sampled in September 2002 were Boomerang Cave (YN99), Cabaret Cave (YN31), Carpark Cave (YN18), Water Cave (YN11), Cave YN61, Jackhammer Cave (YN438), Cave on Lot 51 (YN555) and Orpheus Cave (YN256). Twilight Cave (YN194) should have been sampled but it was unsafe to enter and Gilgie Cave (YN27) was dry so it was not sampled (water cave was sampled instead). This sampling regime was also followed for the September 2003 monitoring.</p> <p>One of the recommendations stated in the 2002 monitoring report is that annual monitoring of the fauna be undertaken in September/October when habitat area is likely to be greatest to assess recovery of the fauna, should any occur. The report also recommended that permanent flows be restored to the cave streams and maintained at levels where by the majority of the root mats are submerged. In addition to the ecologists recommended that active management be initiated to develop and then maintain extensive root mats in the cave streams to provide suitable habitat to support fauna should it recolonise from inaccessible refuges.</p>	



Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>The results continue to indicate that species diversity and abundance has been reduced, mainly due to the decline in water from cave streams. Root mats are now being exposed to the air when previously they were submerged. Sampling difficult due to the dry conditions and it is not appropriate to sample the root mats to complete destruction.</p> <p>Cabaret Cave continues to be of major concern, in January 2002. The stream dried out completely and was still dry in September 2002 and there has been no detectable recovery of fauna. The four caves added in the September 2002 monitoring were of interest but did not contain extensive root mats or associated communities that would classify as new occurrences of the Threatened Ecological Community. However, aquatic fauna was collected from cave YN61 and Orpheus, were different from adjacent, routinely sampled caves and cave on lot YN51 was of some scientific interest. This highlights the diversity and zoological significance of the cave fauna of the area.</p> <p>The results indicate the importance of establishing a more robust and reliable method of supplementation, which will restore or mimic flowing water to cave streams and through root mats.</p> <p>The actual month of cave monitoring may vary from year to year ranging from September to December. To some extent this is dependent on consultant availability. Having this flexibility is desirable. The Water and Rivers Commission seeks amendment to this condition 438: P32 by the deletion of the date of "November" and inclusion</p>	

Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			of the word "spring to early summer".	
438: P33	Water levels in wells for which EWPs have been established will be monitored every month.		Water levels at these sites are monitored monthly. These results are available upon request.	OK
438: 34	Water levels in piezometer transects in the Yanchep area will be monitored every month.		Water levels at these sites are monitored monthly. These results are available upon request.	OK
438: P35	The impact of confined aquifer abstraction on unconfined aquifer water levels will be monitored. If significant impacts are observed the Water and Rivers Commission will discuss the observed impacts with the EPA.		The Water Corporation currently has approval to abstract up to 15 GL from the Yarragadee confined aquifer. The Corporation has been requested to provide monitoring data relating to this abstraction to the Commission. Superficial monitoring bores that were identified in the 'cumulative deviation from the mean' (CDFM) hydrograph analysis studies as showing impacts from pumping the confined aquifers continue to be monitored eg PM1, PM4, PM6, and GC12. The impact of confined aquifer abstraction on the Superficial aquifer is being quantified using Perth Regional Modelling System (PRAMS) for the S46- Stage 2 and the Gnangara Allocation Plan (completion Dec. 2005).	<i>There was no reporting against this commitment in 2000-01 or 2001-02. The date on which the Corporation was asked to provide monitoring data to the Commission is not given. However, the Commission has adequate powers to require the Corporation to provide the data. Since the data are not provided, it is the Commission that is in non-compliance with the requirement.</i>
438: P36	Water levels will continue to be monitored once per month in 28 wetlands within the study area.		Water levels at these sites are monitored monthly. These results are available upon request.	OK
438: P37	Water level monitoring in 13 wetlands for which EWPs have been set will occur more frequently than once per month, when necessary, to determine compliance with set		Water levels at these sites are monitored monthly. These results are available upon request.	OK



Code	Description	Compliance Assessment (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	levels.			
438: P38	Aquatic fauna will be monitored at the 13 wetlands for which EWPs have been set twice per year (but only when open water is present), in November and March.		<p>Macroinvertebrate monitoring occurs in Lakes Jandabup, Joondalup, Mariginiup, Nowergup, Yonderup, Wilgarup, Goollelal, Loch McNess, Gnangara, Coogee Springs, Pipidinny Springs, Lexia 86 & 186, EPP 173 and Egerton/Edgecombe seepages biannually at times of low and high water levels (September and January). If no water is present in the wetland during the summer sampling round, then no monitoring occurs.</p> <p>These results are available upon request.</p>	<i>The months during which monitoring has occurred (September and January) are different from those required under the commitment (November and March). At present this amounts to a minor non-compliance. As the intent of the commitment is still being achieved, this inconsistency could be rectified as part of the s46 review.</i>
438: P39	The Water and Rivers Commission will, on receiving environmental approvals, prepare monitoring protocols for aquatic invertebrate monitoring within the wetlands, to the satisfaction of the EPA.	Monitoring of wetland macroinvertebrates is currently carried out. Suggestions from the improvement of monitoring methodology are given in the monitoring reports (Centre of Ecosystem Management, 2000).	<p>Macroinvertebrate monitoring protocols were established between researchers to maintain consistency with monitoring on both the Jandakot and Gnangara Mounds. Attached are the macroinvertebrate methodologies employed.</p> <p>Approval for these is sought from the EPA.</p>	<i>Clearly this commitment has been in non-compliance for some time, since the protocols were to be prepared to EPA's satisfaction "on receiving environmental approvals" in 1997 and approval is only now being sought. An independent expert assessment of the monitoring protocols should be sought before the commitment is cleared.</i>

C. WETLAND MANAGEMENT OBJECTIVES for STATEMENT 438.

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
438: Lake Jandabup	<ul style="list-style-type: none"> • No expansion in the area of sedge vegetation, but maintenance of existing areas. • Maintenance of the current extent of wading bird habitat. • Maintenance, and if possible, expansion of the <i>M raphiophylla</i> and <i>E rudis</i> fringing woodlands. • Removal of mosquito fish from the Lake. • Maintenance of the high species richness of aquatic macroinvertebrates and macrophytes. 	The existing extent of sedge and wading habitats within the Lake will be maintained (within +/- 10%), and should not change by more than 5% in any 2 year monitoring period.	<p>In order to determine whether the values of the GDEs on the Gnangara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9. Preliminary results of this study indicate that values have been retained for this lake.</p> <p>Mattiske Pty Ltd (2001) reported Vegetation within lakes changed substantially, with extension of sedge species and decrease in condition of tree species on fringes.</p> <p>Water quality has improved in the lake following a 1997 acidification event. Alteration of the artificial maintenance regime to prevent excessive drying of the lake appears to have played a part in lake recovery.</p> <p>Despite long-term declines in surface water levels, artificial maintenance has lead to an increase of 0.21m in peak levels and an increase of 0.08m in minimums since 1998. Continuation of artificial maintenance and the trend in increasing water levels over the next five years should support the ecological values of Lake Jandabup related to diverse sedge and macrophytes and waterbirds and see further improvements in water quality.</p> <p>The EWRs of Lake Jandabup are currently under review.</p>	<i>Given the major difference between the findings of ECU (preliminary, 2003) and Mattiske (2001) the final results of the ECU study should be awaited and scrutinised before compliance can be assessed.</i>
438: Lake Gnangara	<ul style="list-style-type: none"> • To improve water quality through increased water levels, as a means of 	The pH of the Lake should increase. The extent of any expected increase is	In order to determine whether the values of the GDEs on the Gnangara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to	The initial paragraph need not be repeated, it clearly applies to the whole table and could be

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
	enhancing both environmental and social values of the Lake.	unknown.	<p>review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9.</p> <p>Despite increasing water levels, this has not resulted in a general improvement in water quality. pH is low and the lowest recorded was in Spring 2003 (3.68 – 3.73).</p> <p>Quote from J. Clark and P. Horwitz January 2004: Lower water levels at this wetland in recent years, has resulted in reduced inundation of littoral and fringing vegetation and therefore lower wetland habitat complexity. Habitat complexity is important to aquatic macroinvertebrate richness i.e. the more diverse the habitat complexity the more diverse the macroinvertebrate community composition of a wetland (Balla and Davis, 1993). The family richness of Lake Gnangara remains consistently low in comparison to most other wetlands studied as part of the study of wetlands following the Gnangara ERMP. This is due to the poor water quality of Lake Gnangara and in particular the low water pH.</p> <p>Dense mats of (red coloured) filamentous algae were apparent throughout the wetland in Round 14 (with associated high chlorophyll <i>a</i> and turbidity). Nitrogen concentrations at Lake Gnangara are consistently (and often significantly) higher than any other wetlands studied following the Gnangara ERMP. These observations and results show that as well as being acidic, and having declining water levels, symptoms of eutrophication are evident.</p>	<p>provided once in a general row at the head of the table.</p> <p><i>While the water levels have increased, the performance indicator of increased pH has not been achieved. In addition there are high levels of nitrogen and symptoms of eutrophication. The response does not mention any additional, specific, proposed management action to address these problems.</i></p>
438: Lake Mariginu	<ul style="list-style-type: none"> • To maintain the current area of sedge vegetation to within +/- 	The existing sedge area to be maintained to within +/- 10%,	In order to determine whether the values of the GDEs on the Gnangara and Jandakot Mounds had been retained or lost since	<i>It is not possible from the information provided to</i>

Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
p	<p>10%.</p> <ul style="list-style-type: none"> • To maintain the current area of wading bird habitat. • To maintain invertebrate diversity through some lake-bed drying in summer. • To maintain, and if possible, enhance, fringing woodland vegetation. 	and should not change by more than 5% in any 2 year monitoring period.	<p>Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9.</p> <p>The lake is not actively managed in terms of surrounding land used weed and fire control etc (factors beyond the control of the Commission) and these factors should also be taken into account in determining the value of maintaining wetland water levels.</p> <p>The area around Lake Mariginiup was burnt in 1997 that has resulted in loss of cover of <i>Baumea articulata</i>. Although there was extensive resprouting in 2000, in 2001 <i>B. articulata</i> was isolated to shaded areas under trees.</p> <p>In 2002 it was reported that <i>Baumea articulata</i> and <i>Typha orientalis</i> were encroaching further into the wetland as areas become progressively dry. The lake burnt again early summer 2003, and <i>B. articulata</i> and <i>Typha orientalis</i> is widespread and encroaching into the wetland basin. A firebreak was bulldozed through vegetation in the permanent monitoring transect leaving little to assess. By the end of winter Within the transect exotic taxa dominated the understorey showing greater species richness than in recent years. Mean tree health declined significantly. Peak surface water levels at Lake Mariginiup have declined since the late 1960s. Although there has only been a decrease of 0.085m since 1998, a decrease of 0.23m occurred the previous year. The lake has also dried every autumn since 1995. A continuation of this declining water level trend over the next five years could have serious impacts on the ecological values of Lake Mariginiup</p>	<p><i>determine whether or not the objectives and performance indicators have been achieved or not. The information needs to be briefer and to directly address the criteria/indicators.</i></p>



Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
			<p>as water quality declines further. Lakes Mariginiup and Jandabup share similar characteristics including soil types, bathymetry, hydrology and surrounding land-use patterns. Prior to the 1997 collapse, the lakes also shared similar macroinvertebrate family composition. PH levels at Lake Mariginiup have declined since 2000 and are now approaching those recorded at Lake Jandabup immediately before the collapse in 1997. It is envisaged that another drying event over summer 2003/04 may cause the acidification of Lake Mariginiup and the loss of existing macroinvertebrate composition. This in turn may impact on the value of the lake as waterbird habitat thereby seriously affecting the ecological values of Lake Mariginiup.</p> <p>The EWRs of Lake Mariginiup are currently under review as part of the Section 46 Review process.</p>	
438: Lake Joondalup	<ul style="list-style-type: none"> • To conserve existing wetland vegetation, including sedge beds, fringing woodlands, and aquatic macrophytes. • To maintain and if possible enhance the aquatic fauna of the Lake. • To support the full range of habitats for avian fauna found at Lake Joondalup to help ensure its continued value as a major water- bird habitat within the Regions. This includes areas of deep and shallow water, and exposed banks in late summer. 	(none)	<p>In order to determine whether the values of the GDEs on the Gnangara and Jandakot Mounds had been retained or lost since Ministerial conditions had been set, the WRC initiated a study to review the values and EWRs of those systems in March 2003. The study is being conducted by Edith Cowan University and further details of the scope are contained in the responses to M9-1 and P9. Preliminary results indicate that Lake Joondalup is at moderate risk of impact and has retained the following ecological values</p> <p>Retained</p> <ul style="list-style-type: none"> • Waterbird habitat. • Diverse range of macrophytes. • Supports aquatic macroinvertebrates and vertebrates. <p>New</p>	The response does not directly address the objectives, but indicates that they have been achieved during the reporting period, with the possible exception of landscape amenity, which is not mentioned.



Wetland	Water Regime Management Objectives	Performance Indicators	Compliance assessment 2000- 03 Not reported previously	Auditor's comments (These Objectives are part of the EWP and must be complied with)
	<ul style="list-style-type: none"> To ensure the landscape amenity value of the Lake is maintained, except under low rainfall climatic conditions. 		<ul style="list-style-type: none"> Vegetation largely intact, provides range of habitat types. Bushland surrounding wetland supports rare or priority flora. <p>The EWRs of Lake Joondalup are currently under review.</p>	



A. MINISTERIAL CONDITIONS for STATEMENT NO. 496 (APPLICABLE FROM 1999).

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: M1.1	Fulfil the commitments published in EPA Bulletin 904 (Appendix 2) as attached to the Ministers statement 496.	Condition met and ongoing.	Of the total number of 12 environmental water level criteria published in Statement 496- 10, 11, and 9 have been fulfilled in years 2000-01, 2001-02, and 2002-03 respectively. This has been achieved in a climate different to that which was considered when originally setting these criteria levels. Of major significance is that rainfall for the period 2000- 03 is significantly below long- term average rainfall. Climate is the dominant causal factor in non-compliance of water level criteria as public water supply abstraction from the shallow aquifer has declined by 5.5 Gigalitres from a high in 1990 for the Mirrabooka wellfield while private allocation has only increased by 1.4 Gigalitres in the Mirrabooka and Swan Groundwater Areas for the period 2000- 2003.	<i>There have been 2, 1 and 3 non-compliances with water level criteria in 2000/01, 01/02, and 02/03 respectively. In addition several other conditions and commitments have not been complied with.</i> The assertions about cause are better addressed in the text of the report, with evidence to support them.
496: M1.2	Changes to any aspects of the proposal as documented in schedule 1 of the statement that the Minister determines is substantial, shall be referred to the EPA.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 45C into the Act provides a mechanism for the Minister to approve non-substantial changes. The condition could be deleted as part of the s46 review.</i>
496: M1.3	Changes to any aspects of the proposal as documented in schedule 1 of the statement that the Minister determines is non-substantial, can be effected.	Not relevant at this time	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 45C into the Act provides a mechanism for the Minister to approve non-substantial changes. The condition could be deleted as part of the s46 review.</i>
496: M2.1	Implement the consolidated environmental management commitments documented in schedule 2 of the Minister's	These commitments are being met as part of the ongoing management of the area.	<ul style="list-style-type: none"> • Condition is met by Condition 496: M1.1 • The Water and Rivers Commission requests that Condition 496: M2.1 be merged with Condition 496: 	Agree this condition appears to duplicate condition M1.1. They could be consolidated. The EPA could recommend to the Minister that this be done.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	statement.		Condition 496: M2.1 be merged with Condition 496: M1.1.	
496: M2.2	Implement the subsequent environmental management commitments which are made as part of the fulfilment of conditions and procedures in the Minister's statement.	Commitments made to fulfil the conditions and procedures in the Ministers statement are implemented as part of the operating strategy of the Water Corporation.	As for 2000-01 and 2001-02.	<i>As implementation proceeds in response to matters arising, for example, in annual and triennial compliance reports, additional management commitments will be made. Some of these may relate to things the Corporation must do, in which case the response provided would apply. However, others would relate to actions the Commission must take – at the very least ensuring that the operating strategy is updated and implemented. It is necessary to report on compliance with all these additional commitments for full accountability. They should therefore be added to the list of the proponent's commitments and reported annually until cleared.</i>
496: M3.1	The proponent nominated by the Minister for the Environment under section 38(6) or (7) is responsible for implementation of the proposal until such time as the nomination for that proponent is revoked under section 38(7) of the EPA Act and another person is nominated in respect of that proposal.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M3.2	Any request for change in proponent shall be accompanied by a copy of the Minister's Statement endorsed	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be</i>

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
	with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.			<i>deleted as part of the s46 review.</i>
496: M3.3	Notify the DEP of any change of proponent, contact name and address within 30 days of such change.	Not relevant at this time.	Not relevant at this time.	<i>This condition is no longer required. The insertion of section 38(6a) into the Act provides a mechanism for the notification of change of proponent. The condition could be deleted as part of the s46 review.</i>
496: M4.1	Provide evidence to the Minister before 17 February 2004 that the proposal has been substantially commenced.	This document provides this evidence.	Evidence that the proposal has substantially commenced is given in annual and triennial reports previously submitted to the EPA and the Minister. The Water and Rivers Commission seeks clearance of this condition 496: M4.1.	Agree, this condition can be cleared.
496: M4.2	If the proposal has not been substantially commenced before 17 February 2004, the approval to implement the proposal as granted in this statement shall lapse and be void.	Not relevant.	Condition 496: M4.1 has been met. The Water and Rivers Commission seeks clearance of this condition 496: M4.2.	Agree, this condition can be cleared.
496: M4.3	Make an application to the Min for Environment for any extension of approval for the substantial commencement of the proposal beyond 17 February 2004 at least 6 months before 17 February 2004.	Not relevant.	Condition 496: M4.1 has been met. The Water and Rivers Commission seeks clearance of this condition 496: M4.3.	Agree, this condition can be cleared.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: M4.4	If it demonstrated that the parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding 5 years for the substantial commencement of the proposal.	Not relevant.	Condition 496: M4.1 has been met. The Water and Rivers Commission seeks clearance of this condition 496: M4.4.	Agree, this condition can be cleared.
496: M5.1	Submit periodic Performance and Compliance Reports, in accordance with an audit program.	Ongoing. East Gnangara reporting will be incorporated into Gnangara annual reporting as stated in the proponent commitments. Therefore dates set in audit table are irrelevant as Gnangara reports are due prior to these dates.	Submitted jointly with Statement 438. Refer to Condition 438: M10-1.	OK
496: M5.2	Unless otherwise specified, the DEP is responsible for assessing compliance with the conditions, procedures and commitments contained in this Statement and for issuing formal clearances.	Acknowledged. Changes to this arrangement are now necessary due to the merger between WRC and the DEP.	Condition needs to be amended to reflect the EPA is now responsible for assessing compliance with conditions, procedures and commitments.	<i>Agree the reference to DEP is no longer appropriate. The text "DEP" should be replaced with "EPA". The condition could be changed as part of the s46 review.</i>
496: M5.3	The Minister will determine the matter where compliance with any condition, procedure or commitment is in dispute.	Acknowledged.	Acknowledged.	OK

B. PROPONENT COMMITMENTS for STATEMENT 496.



Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P1.1	Manage public and private groundwater abstraction to meet objectives and Environmental Water Provisions (EWPs) as summarised in Table A and B which appear in the attachment to Statement 496.	Of the 12 criteria there was one breach of absolute minimum in the 2001/02 reporting period at wetland Lexia 186. Abstraction from the Lexia GWS commenced in the 2000/01 summer under an interim licence, though only 2.5 GL of the 4 GL quota was abstracted. The Water Corporation negotiating an increase for more, subject to the approval of the wetland mitigation strategy. The Corporation have approval to take 7.75GL from Lexia in 2001/02.	<p>East Gngangara Mound Bores (NR11C, MM12, L30C, L110C, L220C) Water levels were all compliant with interim absolute minimum end of summer levels.</p> <p>WM8, NR6C, WM2 and MM49B. Water levels were all compliant with minimum water levels.</p> <p>East Lexia Wetlands and Seepages (GNM13, GNM14, GNM15, GNM16, GNM17A, B10, B25) There were non-compliances with the absolute summer minimum at GNM15 (Lexia 186) in 2000 – 03. Water Corporation have shut down the four closest production bores so impacts likely to be primarily caused by reduced recharge. Non-compliance with the absolute minimum (>2 in 6 years) of GNM17A (Lexia 94).</p> <p>There was a non-compliance for the first time at Egerton Seep (B25) in 2003. However macroinvertebrate species richness and abundance was good and there had been no significant change in species richness since monitoring began. The next round of monitoring in Spring 2004 will help assess this further.</p> <p>Near average rains in winter 2003 produced groundwater levels higher, on average than the previous years. The Lexia wetlands were 30cm higher and Egerton Seep 34 cm higher than at the same time the previous year.</p> <p>For more details see Table A¹¹</p>	<p><i>Three non-compliances.</i> <i>Despite near average winter rains in 2003 and the shut down of four adjacent bores Lexia 186 was again non-compliant. The claim that this was caused by reduced recharge is weakened by the rains and (temporarily) raised water levels. The response makes no mention of private abstraction</i></p>

¹¹ Table 8 – Gngangara 2002 annual report



Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P1.2	Review interim EWRs in the first triennial report to the EPA and update as appropriate.	Interim EWRs are currently being reviewed as part of the Section 46 review of environmental conditions currently occurring for Gnangara and Jandakot Groundwater Resources.	Work to revise the EWRs was initiated during 2002 with completion expected during 2004 as a component of the current Section 46 review of environmental conditions.	OK
496: P2	Submit annual and triennial reports on the management and monitoring of the East Gnangara Mound.	This Commitment has been met to date and is ongoing.	9/05/01 Condition no longer relevant as superseded by 496: M5.1 (comment in DEP Environmental Audit Branch audit table)	Agree this commitment is addressed by M5.1, and could be deleted. The EPA could recommend to the Minister to do this under s46A.
496: P3.1	Investigate stratigraphy and water regimes in the Lexia wetlands, EPP wetland 173 in Melaleuca Park and Melaleuca Park dampland 78.	Currently occurring as part of the Section 46 review (see P1.2). Preliminary analysis suggests the wetlands are not perched.	Rockwater reported on groundwater wetland relationships on the Gnangara and Jandakot Mounds in July and September 2003 (outside the period of this report), including the Lexia wetlands, EPP wetland 173 in Melaleuca Park and Melaleuca Park dampland 78 to determine possibility of perching. Perching of EPP wetland 173 and dampland 78 is indicated, with possible perching of Lexia 94 swamp.	OK
496: P3.2	Determine EWPs following the investigation undertaken in P3.1	Currently occurring as part of the Section 46 review (see P1.2).	To be undertaken following work to revise the EWRs expected for completion during 2004 as a component of the current Section 46 review of environmental conditions. (expected during late 2004).	OK
496: P4	Provide support to research projects and conduct research and investigations into the EWRs of wetlands, vegetation and seepage areas as defined in Section 16.5 of the PER.	Research into developing EWRs for wetlands, phreatophytic vegetation and other GDEs is occurring as part of the Section 46 review of environmental conditions on Gnangara and Jandakot Mounds. This includes sediment studies, development of monitoring protocols, methodologies for development of interim EWRs etc.	See responses to M9-1 and P9 of Ministerial Statement 438 (Gnangara Groundwater Resources).	OK

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P5	Review and update EWPs and water allocation if necessary by feedback from the monitoring program.	Monitoring is conducted on an ongoing basis with data reviewed on an annual basis. A review of EWPs under Section 46 of the Environmental Protection Act and is currently being conducted.	Monitoring has been conducted on an ongoing basis during the review period, with annual reviews of the data. Work to revise the EWRs was initiated during 2002 with completion expected during 2004 as a component of the current Section 46 review of environmental conditions. This will incorporate consideration of the monitoring data to date. Once completed, this work will be analysed and used in the review of EWPs (expected during late 2004).	The commitment states that the proponent should update (i.e. change) the EWPs in response to monitoring . The EWPs are binding and set by the Minister, and can only be changed by her. However, there is nothing to prevent the proponent, in response to monitoring, adopting more stringent criteria. Indeed, such rapid response may well be needed, given the long time frame for formal amendment through s46.
496: P6	Undertake a monitoring program.	Monitoring is conducted on an ongoing basis. <ul style="list-style-type: none"> • Water levels at criteria sites are monitored monthly • biological monitoring wetland vegetation, invertebrates and frogs occurs annually. • water chemistry is analysed annually • terrestrial vegetation is monitored triennially. 	A monitoring program was conducted during the reporting period. <ul style="list-style-type: none"> • water levels- refer to Attachment 5 (hydrographs) • vegetation- refer to 496: P15.1 • invertebrates- refer to 438: M9-1 • frogs- refer to 438: M4-1 <p>Results are available upon request.</p>	OK
496: P7	Develop a MOU with CALM which includes pine harvesting in State forest 65 (SF65) over 20 years and the Gngara Park establishment.	MOU has been developed and signed in December 1999. MOU is currently being implemented and has recently been amended to accommodate the State Agreement for the LVL plant. Directors' meetings to discuss thinning strategies etc, are currently held bi-monthly.	18/01/00 Condition cleared by DEP Environmental Audit Branch (refer to 438: P7) Update- The MoU has not been effectively upheld since it was signed by WRC and CALM (now FPC) in 1999. Commitment between agencies has been compromised by the signing of the State Agreement to the WESBEAM LVL plant operations in mid 2002. Unfortunately, no provisions for compliance with the requirements of the Pines MoU were included in the State Agreement with	OK. Re "Update" see comment on 438 P11 recommending the proponent seek legal advice re- the primacy of the EPP over the Agreement Act.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>Wesbeam negotiated by FPC and the Office of Major Projects, however, some pine thinning and clearfelling has been accommodated within the constraints of the State agreement for the LVL plant.</p> <p>In recognition of the importance for sustainable management of water resources and pine plantations on the Gngangara Mound, a number of new approaches are being considered and progressed to better achieve the purpose of the MoU. This includes the establishment of the Gngangara Coordinating Committee in April 2003 that comprises Directors from DoE, FPC, WADA, DPI, DCLM, Department of Premier and Cabinet, Water Corporation and CSIRO. The committee meets monthly and aims to provide an integrated, whole of government approach to management on the Gngangara Mound and to better coordinate multiple land and water resource use activities. Under the coordination of the Gngangara Coordinating Committee, the Pines Technical Group, a joint agency group (including members from DoE, DCLM, FPC and Water Corporation) was established to evaluate alternative pine management options to achieve an optimal outcome for the environment, water supply and pine harvesting.</p>	
496: P8	Provide advice on impacts of landuse on groundwater resources to relevant agencies.	The Commission, as the peak body for water resource management, participates as an active member in a large number of committees and groups. It also provides advice, as required to State and Local Government agencies, on statutory and	<p>Advice is provided to State Government Departments, Local Government, Stakeholders and Community groups through the Gngangara Community Consultative Committee (GCCC) (Members List attached)</p> <p>The objective of the Commission's program of community consultation on the Section 46 process is to gain community ownership and understanding of the</p>	The commitment has been complied with. The comments on community consultation are not relevant to this commitment, which relates to the provision of advice to agencies. It is not clear from the response whether the proponent provides advice on specific applications for rezoning, subdivision or development approval. If so, this should be

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
		strategic planning.	<p>water resource problems that are currently being faced on the Gnangara and Jandakot Mounds.</p> <p>The Gnangara Community Consultative Committee is the main medium for community involvement for the Gnangara Mound on the Section 46 Review. The Consultative Committee met on 6 occasions from July 2000 to June 2003 (July 2001, November 2001, March 2002, April 2002, July 2002, and March 2003- agendas available on request). At these meetings, detailed presentations are given by a range of government departments on the following subjects:</p> <ul style="list-style-type: none"> • water levels and current status of the Gnangara Mound; • wetland macroinvertebrates and water quality (acidification of wetlands); • wetland vegetation status; • actual and predicted breaches of ministerial conditions; • the status of individual Section 46 reviews (EWRs, sedimentology, wetland-groundwater level relationships and optimisation of the groundwater monitoring network; • pines management; • Water Corporation abstraction; • Yanchep Caves; and management of private abstraction. <p>2. The Gnangara Coordinating Committee was first convened in April 2003 and is made up of Directors of several government agencies (AgWA, DPI, WCorp, CALM, WRC, FPC, CSIRO and DPC). The</p>	mentioned.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			<p>Coordinating Committee meets monthly. Impacts of landuse on Groundwater resources and management options are regularly discussed. The Terms of Reference and members list are attached.</p> <p>Several other inter-agency committees also exist at which the WRC, CALM, the City of Wanneroo and/or the DPI are represented and the impacts of land use on groundwater resources are discussed. These include the Yanchep Caves Recovery Team, the Yanchep Caves Technical Group, the Pines Technical Group, and the East Wanneroo Land Use and Water Management Strategy Community Consultative Committee.</p> <ul style="list-style-type: none"> A community Water Forum was held in September 2002 at the City of Wanneroo offices and run by the Water and Rivers Commission. Agency representatives and community members attended and the forum involved a full day of discussion centred around groundwater management on Gnangara Mound, and the impacts of land use on GDEs. Outputs of the forum contributed to the Government's Water Symposium held in October 2002. A summary of the forum can be found on the website: http://www.ourwaterfuture.com.au/community/forums_gnangara_mound.asp 	
496: P9	Determine EWPs for new appropriately located bores in the vegetation corridor.	The Commission is currently developing new EWPs, and they are scheduled for completion in 2003/04.	All EWRs and EWPs on the Gnangara Mound are under review as agreed to by the Minister and the EPA in 2001. As part of this review under Section 46 of the Environmental Protection Act, Edith Cowan University has been contracted to review the ecological values and ecological water requirements for GDEs on the Gnangara	OK

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			Mound (more information on the scope of this study is contained in the responses to M9-1 and P9 of Statement 438 (Gnangara Mound Groundwater Resources). This includes the vegetation corridor near the Lexia borefield. This review is due to be completed by the end of 2004.	
496: P10	Chair and provide support for a Consultative Committee as a forum for information exchange.	A combined committee for Gnangara/East Gnangara has been formed.	A combined committee for Gnangara/East Gnangara has been formed (The Gnangara Community Consultative Committee) meets in April and October each year (see Ministerial Statement 438 (Gnangara Groundwater Resources) P-10 for aims and details) Attached is the committee members list.	OK
496: P11	Require the Water Corporation to Phase in production bores closest to phreatophytic vegetation.	Phasing in of bores will form part of the licence conditions on Water Corporation.	The Water Corporation are required by the operating strategy to phase in bores L12, L420, L430, L510, L620 and L710. The operating strategy forms part of the licence. The Water and Rivers Commission seeks clearance of this condition 496: P11.	The condition could be cleared once the phase-in is complete. The response does not make it clear that this is the case.
496: P12.1	Require the Water Corporation to develop a wetlands mitigation strategy for any loss of value in wetlands 132, 156, 158, 164 and 104. The mitigation strategy will; identify actions to minimize loss of values, prior to development; monitor wetlands to determine whether loss of values has occurred, on an ongoing basis; and compensate for any loss of values in the event of adverse impacts becoming apparent.	The Water Corporation provided the draft wetland mitigation strategy to the Commission for comments in 2001. The Commission is currently working with the Water Corporation to reach an agreement on the final strategy.	16/02/01 Condition cleared in part with issue of interim licence to the Water Corporation to commence production subject to conditions (comment from DEP Evaluation Audit Branch audit table) requiring the Corporation to develop a wetlands mitigation strategy.	OK

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P12.2	Require the Water Corporation to implement the mitigation strategy required of P12.1.	The Commission will require the Corporation to implement the mitigation strategy as a condition of holding a licence to take water.	Implementation of the wetland mitigation strategy required by Water Corporation's licence conditions (refer Condition 7). The strategy is due for review on 2004.	For full accountability the Corporation should be required to report to the Commission (and thence to the EPA) on compliance with the wetland mitigation strategy.
496: P13.1	Require the Water Corporation to prepare an operations plan (with environmental commitments to meet EWP's) for the Lexia and East Mirrabooka groundwater scheme.	The operation plan has been finalised.	Operation plan due for review in 2004. 10/02/00 Condition cleared by DEP Environmental Audit Branch.	OK
496: 13.2	Require the Water Corporation to submit yearly production plans as part of the operating strategy.	The requirement for yearly production plans forms part of the operating strategy.	Yearly production plans are submitted by the Water Corporation during negotiations in November each year to determine the amount that can be abstracted from the Gnangara Mound without breaching EWP's.	Given the ongoing breaches of EWP's this system is inadequate. The Corporation should be required to address past and predicted compliance with the "environmental commitments" referred to in 496 P13.1 (above), and the Commission should incorporate that information into this compliance report.
496: P14	Map vegetation communities on the Gnangara Mound.	Stage 1 of the mapping project has commenced. The project is expected to be completed by mid-2004.	The three-year vegetation mapping project has recently been completed. The study was conducted by Mattiske Consulting and a final report and ArcView information has been submitted to the WRC, DEP, CALM and the Water Corporation.	OK. It is not clear from the response whether the completed project is "Stage 1" referred to in the earlier response, or whether there is a Stage 2 still to come.

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
496: P15.1	Monitor water levels and establish a vegetation transect in wetland 132. - Pre-Operation	A water level monitoring bore has been installed and a vegetation transect has been established in this wetland.	As part of the Water Corporation's Lexia wetland mitigation strategy, vegetation transects have been established by the Corporation at wetlands 104, 132, 156, 158 and 164. The vegetation at these wetlands has been visually assessed by Edith Cowan University ecologists monthly, or fortnightly in summer over the 2001-2003 period. Water level monitoring has been conducted at the same time as the visual assessments. The Commission is provided with the results of these assessments at regular intervals (generally monthly). The Water Corporation has obtained preliminary agreement from the Commission to alter the monitoring programme in line with the annual programme currently in place for wetlands monitored by the Commission. Water levels will continue to be monitored monthly.	OK This commitment relates to the "Pre-Operation" that is now complete. It could be cleared.
496: P15.2	Monitor water levels and establish a vegetation transect in wetland 132. - Operation		As for P15.1	This is the ongoing commitment to continue monitoring during operations.
496: P16	Liaise with the Swan Valley Nyungah Community regarding the proposal.	Liaison with the Swan Valley Nyungah Community has been undertaken. A representative of the Community sits on the Gnangara/East Gnangara Community Consultative Committee.	Mr Iva Hayward-Jackson, a representative of the Swan Valley Nyungah Community, has been a member of the Gnangara Community Consultative Committee since late 2000. Mr Hayward-Jackson has generally declined to attend meetings in person, however, the WRC has sent Mr Hayward-Jackson copies of the meeting agendas and minutes. The Commission has also met with Mr Hayward-Jackson at the Swan Valley Nyungah premises and again at the Yanchep Caves in 2001. Since the Swan Valley Nyungah Community was closed down in 2003, the Commission has attempted to contact Mr Hayward-Jackson but so far has been unsuccessful.	OK <i>Given the representative's attendance record, and present unknown whereabouts his effectiveness must be questioned. A new representative should be sought.</i>
496: P17.1	Undertake a dieback survey.	A dieback survey was conducted in 1996 and again in 2000.	A dieback survey was conducted in September 2003. A survey is conducted every 3 years (commitment made in East Gnangara Water Provisions Plan (WRC, 1997).	OK

Code	Description	Compliance Assessment Reported (2001- 02)	Compliance Assessment (2000- 03)	Auditor's comments
			The 2003 report has recommending that sections of the survey be done each year rather than all at one time.	
496: P17.2	Prepare dieback management procedures. - Pre-Operation	Completed.	Water and Rivers Commission monitoring personnel have a standard policy of keeping vehicles clean between trips. Dieback quarantine areas are managed by CALM and have unique levels of restrictions associated with it. Due to sandy nature of the Gngara Mound in general, the transmission of dieback from soil adhering to vehicle tyres and shoes of people walking through dieback areas is of lower risk than in clayey areas such as in the Darling Range. The Water and Rivers Commission is not aware of special requirements for the Gngara Mound area.	<i>The commitment requires that procedures (however simple) be prepared. It appears that the proponent has decided to adopt the Commissions general procedures, but it is not clear that these have been submitted in clearance of this commitment.</i>
496: P17.3	Implement the dieback management procedures as required in P17.2 – Operation	Ongoing.	<ul style="list-style-type: none"> • Refer to 496: P17.2 	OK

Appendix 4

Water and Rivers Commission (2004). Response to Audit of Compliance report

EPA AUDIT – ENVIRONMENTAL MANAGEMENT OF GROUNDWATER ABSTRACTION FROM THE GNANGARA MOUND 2000–2003

WRC RESPONSE TO THE EPA AUDIT REPORT OF 1 APRIL 2004

1. General Background

The WRC manages the groundwater resources of the Gngangara Mound primarily through controlling abstractions that might affect environmental values associated with groundwater dependent ecosystems over critical areas of the Mound. The means of controlling abstraction is through licensing required under the *Rights in Water and Irrigation Act 1914*. However, groundwater and associated wetland water levels are also influenced by climate, land use (particularly urbanisation and silvicultural activities) and by other activities such as artificial supplementation of wetlands. These other factors can have significantly more influence on groundwater levels than abstraction although WRC has no jurisdiction or control over them.

Over recent years, a number of environmental criteria for the Gngangara Mound have consistently not been met despite significant efforts by the WRC to reduce public and private abstraction in sensitive areas. These non-compliances have been largely in the form of groundwater and wetland levels falling below criteria set within the environmental conditions. Examination of the environmental condition associated with wetlands and areas of phreatophytic vegetation have shown varied impacts from water levels falling below criteria levels. This suggests that some of the criteria may be inadequate in representing an appropriate level of risk for environmental condition.

In response to these findings the WRC requested a review of the existing Ministerial conditions. This resulted in the Minister for the Environment's request to the EPA to "inquire into and advise on changes to the existing Ministerial conditions" and EPA endorsement of a two-stage approach to the review. The first stage (report due in August 2004) involves an initial investigation into the critical areas where non-compliances with environmental conditions have occurred and propose amendments to current conditions. The second stage (report due in early 2005) will provide all available information on environmental values, factors affecting groundwater levels and a proposed set of appropriate conditions that can be achieved via groundwater licensing.

Progress with the review has been affected by the post-2001 winter contingency study and a lack of resources. However some of the progress is limited by information, not resources. The WRC has agreed timeframes and information requirements with the EPA since the section 46 review commenced in 2001. Cutting short investigations to reset criteria may result in a poorer outcome than completing them. A two stage process was agreed in 2002 to allow studies to be completed. WRC can expedite Stage 1 and 2 reporting but the recommendations will then be incomplete and these may again need revision once the current investigations are complete.

Water levels are an indicator that the risk of environmental stress has been raised, not that environmental damage has taken place. It is important that both be measured. In fact environmental condition should be the primary monitor. It has been proposed to the EPA (January 2003, July 2003) that levels be used as a trigger for more investigations (as occurs for Cockburn Sound) and this will be considered further by the EPA in December 2004 when the Stage 2 report is submitted.

The WRC considers that it would be poor management if damage were to occur when levels were above the criteria (ie technically complying but wetlands area affected) because of a focus on a surrogate and not the environment itself.

However, the continued non-compliances with water level criteria are of concern to WRC and a range of actions to mitigate these effects continue to be investigated, trialed and implemented. In addition, a whole of Government approach is required to manage the many factors influencing groundwater levels on the Mound. Many of the identified values on the Mound are under a range of threats, only one of which is excessive groundwater level variations. Encroaching urbanisation, sub-optimal agricultural and silvicultural practices, drainage and inadequate fire and weed control are some of the human-induced threats also requiring management. To this end the WRC is developing an integrated management strategy through the Gngangara Co-ordinating Committee that consists of senior officers from relevant government agencies. This Committee has received formal Cabinet endorsement.

2. WRC Responses to Table 1: Recommended actions

WRC notes that the auditor of its triennial compliance report has not been involved in the management of Gngangara and this provides advantages to the process in terms of objectivity. The WRC reports should be stand alone documents that provide sufficient information to demonstrate whether the proponent has met its Ministerial conditions. Any gaps in the WRC report are highlighted and the audit can be free of bias towards the parties involved.

However, WRC also sees potential disadvantages relating to the mitigation actions recommended where the auditor does not have a background in groundwater management and an understanding of the complex relationships between causative factors, groundwater levels, and ecosystem health. In some instances this can lead to simplistic conclusions and recommendations that, if implemented, may make the situation worse rather than better. Therefore these comments on the audit report include some background hydrogeological information so that, where necessary, the WRC response is placed in context.

Overall, WRC supports the recommendations in the Audit Report. In some instances, however, a slightly different approach is proposed where WRC believes a more appropriate outcome can be achieved or the recommendation is impractical. These are detailed in the table and text below.

Table 1 responses

Issue Number	Recommended Action	WRC response
1. Failure to comply with objectives and EWPs	Set interim criteria to protect environment and feasibly comply with in dry years. Long term management criteria to be set and complied with.	Interim criteria (s46A of the <i>Environmental Protection Act 1986</i>) are used to improve the impact on the environment. WRC considers this may not be possible for many situations on the Gngangara Mound because of the long term lag between action (eg reducing abstraction) and response. Changing criteria where they are no longer correct or appropriate is to be addressed in the Stage 1 report (due August 2004). Therefore, WRC is able to respond to the second recommended action.
2. Relationship between areas of increased abstraction and non-compliance	Present map showing changes in abstraction and non-compliances	WRC can provide a map showing areas of increased extraction relative to newly non-compliant criteria bores. This will show that the increases were located away from the transgressions in Mirrabooka and Lexia. Decisions about annual extraction levels are based on groundwater modelling and expert hydrogeological advice, not just on proximity

Issue Number	Recommended Action	WRC response
		to GDEs. Groundwater flow directions and the interconnectivity of the aquifers are important considerations as well as proximity.
3. Measurement of private abstraction.	Meter all licensed bores and report use.	<p>WRC is currently implementing a \$6 million private use metering program to measure use above 5,000 kL/annum in areas of Gngangara Mound where intensive licensed private use occurs close to sensitive environments. All metering data collected can be reported to the EPA as required.</p> <p>WRC is also implementing a major program to increase water use efficiency amongst private growers on certain areas of the Mound where private use is most likely to influence groundwater levels close to sensitive environments.</p> <p>Funding is being provided to assist growers' participation in the Waterwise on the Farm Program and to provide and install in-field measuring equipment (meters) to enable individual on-site monitoring of irrigation elements that affect overall water use and nutrient leaching. It will help to clarify the impact of private extraction on groundwater levels and the dependent ecosystems. The <i>Program</i> is being introduced to educate irrigators in developing better water management practices with a target of achieving a 20% reduction in abstraction through irrigation efficiency gains. Increased irrigation efficiencies will return water to the environment.</p> <p>Although there are some merits in metering private water use in Gngangara, the value of this information in achieving environmental benefit needs consideration. Previous use surveys have determined that there was more underuse of allocations than over use on the Jandakot and Gngangara Mounds. Metering is of most benefit to the environment where overuse is occurring as it enables the WRC to monitor compliance with allocations and reduce usage as appropriate, and where usage is impacting on GDEs. There is no environmental gain when unused allocations are resumed because the unused water is already going to the environment (ie. not being drawn from the aquifer).</p> <p>Therefore, a detailed study, including metering, of the likely impact of private abstraction on environmentally sensitive areas may be of more value and cost effective than intensive metering of all licensed users. Use of the updated PRAMS computer model is likely to be beneficial in assessing such impact. In areas where modelling suggests detrimental impact, ground truthing by select metering and surveys of private use may be required.</p> <p>Discussions with the EPA on metering versus other approaches (eg. PRAMS modelling) in the management of private abstraction is proposed.</p>
4. Rules for management of private abstraction	Develop rules to give priority to EWPs and take back allocations.	<p>Where EWPs are already set by WRC, these have priority over abstractions through incorporation into allocation limits. WRC is currently reviewing its allocation setting processes for ground and surface water. Rules are already in place to take back unused allocations in the form of a Policy on Managing Unused Licensed Allocations. WRC has taken back unused allocations and given the water to the environment in the past.</p> <p>With the Gngangara Mound, WRC is undertaking extensive investigations to determine the relative contribution of various factors on groundwater levels at locations where current EWPs are not met. This is required to determine the most appropriate action</p>

Issue Number	Recommended Action	WRC response
		<p>to be taken in each sensitive area. In areas where abstraction is a significant contributing factor, WRC agrees it should use the powers it has available to manage abstraction. Where the main causes are climate for example, managing private use would produce little change in water levels.</p> <p>It should also be noted that abstractions are not just approved on the basis of an allocation limit. Where key values are at risk, site-specific impact assessments are carried out to ensure acceptability of the abstraction. For example, near Lake Mariginiup, water trades into certain localised areas can only occur if the taking of water from that area is, amongst other requirements, environmentally acceptable. This is regardless of the fact that the allocation limit will not be exceeded.</p> <p>It is also important to measure actual use to see whether it is use or allocations that need to be reduced first. Hence the targeted approach to metering noted in issue 3 above.</p>
5. 18 private use management initiatives	Develop more effective management options.	New management options are being pursued (see Issue 3 above) but even these may not be enough "to ensure no subsequent non-compliance" in the 2004/05 summer because of the lag time between action and impact on groundwater levels; the fact that many of the conditions need reviewing to ensure they reflect the current environmental values of the Mound and non-abstraction factors affecting low groundwater levels such as climate and landuse. This situation was acknowledged in the audit report summary.
6. Rainfall records	Ensure reliability of rainfall data for Wanneroo.	WRC requests clarification on the comment "ensure that the reliability of rainfall data in the early and mid-1990s has been rectified." Rainfall data cannot be collected retrospectively.
7. Management of pines	Seek legal advice on whether FPC has contravened EPP.	Preparation and review of EPPs is the responsibility of the EPA under Part III of the <i>Environmental Protection Act 1986</i> . Compliance, as WRC understands it, is the responsibility of DoE under other provisions of this Act. WRC does not have the delegated authority to ensure compliance and, therefore, recommends EPA or DoE seeks legal advice on possible contravention of the EPP.
8. Redundant conditions	Delete conditions as part of section 46 review	Agreed and these should be rectified in the Stage 1 report
9. Integrity of groundwater dependent ecosystems	Demonstrate integrity of all groundwater dependent ecosystems, which are likely to be impacted by groundwater abstraction, shall be protected..	<p>This conditions presents problems for both parties as it is not possible for either party to determine unambiguously whether non-compliance has occurred. The auditor's comments state that moderate, significant or severe declines in mean vegetation health constitute a probable non-compliance. The condition is unclear in that integrity is not defined nor is its scope or the GDEs likely to be impacted by abstraction.</p> <p>WRC has demonstrated that negative impacts on GDEs have occurred and, in some cases, this is primarily due to factors other than groundwater abstraction. These factors are a significant reason for initiating the s46 review and reviewing environmental values. Results will be included in the Stage 1 and 2 reports and, where feasible, these reports will propose more auditable and relevant conditions.</p>
10. Maintenance of	Demonstrate	See 9 above

Issue Number	Recommended Action	WRC response
ecological systems	maintenance has been obtained.	
11. Review of basis of management decisions and criteria	Commence more frequent, internal, transparent review processes.	<p>Estimation of the impact of public extraction on groundwater levels and associated ecosystems are made before an agreed extraction quota is allocated to each bore. In recent years this has involved PRAMS modelling as well as hydrograph analyses. The fact that the number and severity of non-compliances is usually well estimated six months in advance indicates that the current level of understanding is good. These estimates are provided each November to the EPA with a retrospective analysis (previous summer) and a prospective analysis (next summer). Therefore, the basis for management decisions happens each year (not once over many years). In addition, an adaptive management response is taken with the condition of GDEs being regularly assessed and the frequency of monitoring increased if levels are close to or below criteria levels.</p>
12. Publication of limits on groundwater availability.	Publish more widely to change community attitudes.	<p>All current and potential licensed users of groundwater are well aware of the constraints on supply as the publication of limits has targeted these groups. Groundwater availability is published on the WRC website. The performance of the mound is the subject of regular press releases across the State. Consultative groups receive regular briefings (Gnangara Groundwater Advisory Group, Wanneroo Groundwater Advisory Committee, Gnangara Advisory Group, Gnangara Community Consultative Committee, Gnangara Coordinating Committee, Conservation Council of WA, the Water Taskforce and the Premier's Cabinet Sub-committee on Water. WRC is also conducting an extensive publicity campaign as part of its private use metering program that will include regular feedback on metering results in the context of the health of the Mound to water users and the community. See also Issue 3 – Water wise on the Farm (WWOTF).</p> <p>Changing community attitudes requires far more than publishing information on allocation limits. Context and consequence of water abstraction also needs to be understood and acknowledged by the community. WRC considers the most significant factors influencing community attitudes at the moment are the sprinkler restrictions of public scheme users (that personally affect up to 1.6 million people) and local government and the release of the State Water Strategy in February 2003. WRC will continue with its current publication/consultation activities and direct its main efforts to implementation of and education about the State Water Strategy, private use metering and WWOTF.</p>
13. Indicator species	Demonstrate present form of vegetation monitoring is adequate.	<p>Present wetland vegetation monitoring involves annual sampling of permanent transects and includes assessments of tree health, species cover and abundance, and calculations of weediness and regeneration indices. The results of each round of monitoring are compared with the results of previous years, revealing trends in vegetation composition, condition and health. To date, although there is a reasonable understanding of which species are more sensitive to water level changes, specific indicator species have not been selected and similarity indices are not calculated. While that approach has some merit, there is also a danger in such a 'reductionist approach' to monitoring, where one or two species and their relationship to a number or index is focused on rather than</p>

Issue Number	Recommended Action	WRC response
		general system trends. The biological monitoring program is currently being reviewed by Edith Cowan University, and recommendations of this review will be available by September 2004 and incorporated into the Stage 2 report. A change in the approach to monitoring, incorporating detailed species lists and measurements of composition and abundance will require a considerable increase in current funding.
14. Research on minimising impacts of groundwater abstractions	Initiate studies.	Studies have been initiated. An extensive research program has been developed with CSIRO and the Water Corporation as full partners in an MOU and with CALM, FPC, DPI, Agriculture Department and DPC as associate members. This program is spending in excess of \$2m per annum gaining greater understanding of factors affecting groundwater levels on the Mound and how they may be best managed to minimise impacts.
15. Repetition of conditions	Consolidate conditions as part of section 46 review.	Agreed. WRC will propose some conditions for consolidation.
16. Artificial supplementation of Coogee Springs	Comply or demonstrate why commitment should be changed.	Lake Coogee has lost its environmental values due to clearing and grazing in the area. This has been communicated to the EPA through formal reports on several occasions, both before and after the pumping was switched off. WRC intends to propose this condition be removed as part of the Stage 1 report. .
17. Review of EWPs	Expedite section 46 review process. Set interim measures to address on-going non-compliance.	The section 46 review has previously agreed timeframes with the EPA to submit the Stage 1 report in August 2004 and the Stage 2 report in early 2005. The review could be expedited further than it has already but the scientific information would not be as comprehensive. The amendment to conditions proposed in the reports would then require another round of amendment a few months later in response to the additional information. WRC proposes to abide by the current timelines.
18. Aerial photography for wetland vegetation mapping	Remove requirement	WRC supports this.
19. Water quality in Lexia wetland	Demonstrate compliance or amend monitoring program to comply.	Monitoring of some Lexia wetlands (in particular Lexia 94) is not undertaken as there is no permanent or ephemeral water present on site to monitor. WRC proposes amending condition to reflect this. Consultants conducting the monitoring also recommend changes to monitoring programs at Lexia sites as some are unsuitable for detecting long term trends. WRC proposes condition is changed and consultant's recommendations will be forwarded to EPA to support this.
20. Monitoring at required times of year..	Comply or demonstrate that commitment should be changed.	Monitoring undertaken where water levels at their highest or fauna presence likely in order to assess recovery. Changes to monitoring times occurred following consultant's recommendation for more appropriate monitoring times. WRC intends to submit this information to the EPA to support a change in condition.
21. Monitoring of impact of confined abstraction.	Require Water Corporation to monitor impact.	Regional monitoring of the levels in the Yarragadee confined aquifer is carried out by WRC and monitoring of the Yarragadee aquifer production bores is carried out by the Water Corporation (WC). In areas where studies have indicated that pumping from the Yarragadee aquifer is having an adverse impact on levels in the Superficial aquifer, additional monitoring of the Superficial aquifer is carried out by the WRC. In 2003, as part of the drought relief

Issue Number	Recommended Action	WRC response
		<p>strategy, the WC constructed three additional production bores (one each at Scarborough Gwelup and Carine) to abstract an additional 15 GL/year from the Yarragadee aquifer. Monitoring information was submitted to WRC in April 2004 and the WRC is in the process of negotiating a monitoring strategy for these three bores with the WC.</p> <p>More information on this can be provided to the EPA if required.</p>
22. Macro-invertebrate monitoring protocols.	EPA to seek independent expert review.	WRC supports this.
23. Conditions already met	EPA to clear commitments and conditions.	WRC supports this.
24. Inadequate response for some commitments to determine compliance	WRC to provide additional information.	WRC proposes a meeting with EPA representatives to determine the type of information required.
25. Nyungah representative non-attendance	WRC to seek new representative.	Non attendance of Nyungah representative to be further discussed at the time of organising another meeting and, if practicable, a suitable replacement sought.
26. Criteria for monitoring vegetation, macroinvertebrates and water quality.	Criteria should be developed as part of section 46 review.	Under the current Ministerial conditions, compliance with minimum water level criteria in conjunction with monitoring of environmental (biological) condition has been the focus of management. It is difficult for the WRC to set, and manage to, quantitative conditions on vegetation, water quality and fauna, as while the WRC has some control over water level changes through water licensing, it has very little influence over other factors, such as land use changes, that affect the biological systems and water chemistry. However, the biological monitoring program is currently being reviewed by Edith Cowan University, and the review will consider whether it is applicable to set quantitative biological criteria as Ministerial conditions i.e. whether any measurable aspects of biological condition have a defined relationship with water levels and could be used in conjunction with water level criteria. Recommendations of the ECU review will be available by September 2004 and included in the Stage 2 report.
27. Consistency in approach between Jandakot and Gnangara approvals.	Use section 46 review to harmonise approach and, if possible, bring reporting together.	The Stage 2 report will provide all available information on environmental values, factors affecting groundwater levels and a proposed set of appropriate conditions that can be achieved via groundwater licensing. Where practicable, this work will also propose more consistency in approach and reporting.

*shaded rows indicate actual or possible non-compliances.

3. Additional comments on audit report

1. Mention is made (page 1) of the impact of declining water levels attributed to declining rainfall and the possibility that reducing abstraction may not reverse these trends. This observation is absent in later recommendations that propose private and/or public abstraction should be reduced or ceased altogether if criteria are being breached. Such recommendations do not appear to recognise the influence of other factors on groundwater levels.

2. The expedition of the section 46 process by splitting it into two components (page 2) has already been agreed between WRC and the EPA. Stage 1, if accepted will reduce the number of non-compliances significantly before summer 2004/05.
3. Negotiation with the Water Corporation on public abstraction quotas (page 2) implies both agencies mutually agree the quota. WRC in its role as resource manager and regulator approves the quota which is then submitted to the EPA for information (commitment 496:P14). Whilst agreement between WRC and WC is desirable, it is not essential.
4. The conceptual model that is inferred throughout the Audit Report is that the Mound consists of a single 'bucket' of water and abstraction at any point will result in lower water levels throughout. Modelling and monitoring has shown that groundwater can be safely abstracted from some areas of the Mound without affecting levels (and by implication, non-compliances) in others. To reduce abstraction uniformly across the whole Mound, without demonstrable environmental benefit, would create unnecessary social and economic burdens.

As an example, and as explained in several meetings with the EPA, some transgressions may be solely driven by reduced rainfall and no groundwater abstraction or land use change can rectify the situation. An example is Lexia 186 which has breached since 1997/98, four years prior to the Lexia wellfield commencing pumping.

5. The audit report states that WRC does not understand the way the environmental approval process works (page 6). WRC assumes this statement refers to the previous paragraph relating to the setting of allocation limits by WRC after taking into account environmental, social and economic considerations. WRC is responsible for setting allocation limits and these do not require approval by the EPA. Juxtaposing the two paragraphs gives the impression the WRC does not understand how it sets its own allocation limits and that it requires EPA approval to do so.
6. The report (page 6) questions whether the EPA is aware of predicted non-compliances when it agrees to quotas for public abstraction. Advice on public abstraction quotas and predicted non-compliances is provided to the EPA each year in the same report (for example, Progress Report 2003, sections 6.2 and 7, respectively).
7. The Audit Report is incorrect in stating that there has only been one review (page 19). There have been two previous reviews, the first in 1988 and another in 1995 plus the current review.
8. Review of EWPs (page 19) is not a trivial exercise, as it involves review of environmental values, review of ecological water requirements (EWRs), then reassessment of social values and social water requirements, and consideration of economic values of the resource. If the EWP that is subsequently proposed is less than the EWR and there is potential for environmental impact, review of the new proposed EWP by the Environmental Protection Authority is required under WRC's EWP Policy.

The auditor suggests that if a review of EWPs results in greater protection of the environment, then this could be done outside the Section 46 process, and therefore would take less time and could be done more frequently. The difficulty is that in situations such as Gngangara, where most areas are fully allocated, groundwater levels are declining, EWPs are being breached and long-term rainfall has declined, revising EWPs in favour of the environment is extremely difficult as it requires significant reductions in allocation limits and 'claw-back' of allocated water. Essentially there is no simple, quick way of reviewing EWPs in this kind of situation.

If the situation in Gngangara were different i.e. water use was well below allocation limits, EWPs were not being breached and water levels were not declining, reviewing EWPs would be a much simpler process. However, it would still take considerable time, as it likely that for EWPs to be reviewed, there would need to be improved information about the environmental values, improved methodologies for developing EWRs, both of which take time to collect or develop, and social surveys would still need to be conducted to get to revised EWPs.

10. The report states, in relation to four instances, that Ministerial conditions are legally binding and “cannot be changed unilaterally by the proponent.” (page 20). WRC does not intend to unilaterally change any conditions. With Coogee Springs for example, WRC has informed the EPA regularly about its intent not to artificially supplement the location and its proposal to request amendment of that condition in the Stage 1 report.