

Gnangara Mound Groundwater Resources — Change to Environmental Conditions

Department of Water

**Section 46 Report and Recommendations
of the Environmental Protection Authority**

**Environmental Protection Authority
Perth, Western Australia
Report 1324
May 2009**

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
26/9/07	Request received from Minister	
7/1/08	Proponent Document Released for Public Comment	15
4/2/08	Public Comment Period Closed	4
5/8/08	Final Proponent response to the issues raised	26
4/5/09	EPA report to the Minister for the Environment	

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Assessment No. 1540

Summary and recommendations

The Minister for Environment has requested the Environmental Protection Authority (EPA) to consider and provide advice under Section 46(6) of the Environmental Protection Act 1986 on the Department of Water's proposal to remove some criteria sites from the current environmental approval for the use of the Gngangara Mound Groundwater Resource and to rationalise other conditions and commitments of the approval.

Section 46(6) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on whether or not the proposed changes to conditions and procedures should be allowed. In addition, the EPA may make recommendations as it sees fit.

Conclusion

The EPA has considered the request by the Department of Water to remove some criteria sites from the current environmental approval and to rationalise other conditions and commitments of the approval.

The EPA agrees that seven of nine criteria sites initially proposed for removal can be removed from the Implementation Statement as the proponent has demonstrated that these sites have either lost their original environmental values or are predominantly affected by climate variation and land use, rather than abstraction.

The EPA also recommends that a number of administrative changes be made to the Implementation Statement. These changes arise from changes in the structure of government departments over time, the fulfilment of a number of environmental commitments, and identification of small transcription errors in previous Implementation Statements.

In addition, the EPA has provided some other advice on how it intends to have input into the Gngangara Sustainability Strategy, which the State Government has initiated to put in place an integrated land and water management plan to address issues related to declining water levels in the Gngangara Mound Groundwater System.

Recommendations

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

1. That the Minister notes that this report is pursuant to Section 46(6) of the *Environmental Protection Act 1986* and thus is limited to consideration of proposed changes to the original conditions of Implementation Statement No 687.
2. The Minister notes that the proposed changes are to remove some criteria sites from the current environmental approval and to rationalise other conditions and commitments of the approval.
3. The EPA recommends that the Minister considers the report on the proposed changes to the Implementation Statement as set out in Sections 3 and 4 of this report.
4. The Minister imposes the amended conditions, commitments and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the information provided in the Department of Water's environmental review document and response to submissions the EPA recommends that the existing Ministerial Conditions be applied to the project (Implementation Statement 687 published on 31 August 20), subject to modifications necessary to:

- remove seven criteria sites (Lake Gngangara, Edgecombe Seepage, WM6, MM49B, PM25, Lexia 94, and NR11C) from Table 2 of the statement; and
- make a number of administrative changes to the statement as detailed and recommended in Section 4 of this report.

The amended conditions and amended Consolidated Commitments statement are presented in Appendix 4 of this report.

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1. Introduction and background

The Minister for Environment has requested the Environmental Protection Authority (EPA) to consider and provide advice under Section 46(6) of the *Environmental Protection Act 1986* on the Department of Water's (DoW) proposal to remove some criteria sites from the current environmental approval and to rationalise other conditions and commitments of the approval.

The current environmental approval (Implementation Statement 687) for the Gngangara Mound Groundwater Resources is the result of a number of assessments by the EPA since 1987 (EPA 1987, EPA 1996, EPA 1998, and EPA 2004). The last assessment (EPA 2004) was the first stage of the Section 46 review that was to reassess management of the Gngangara Groundwater Mound in circumstances where annual rainfall had declined and where land use and land management on the mound were changing. This assessment in 2004 made amendments to the Implementation Statement that altered some water level criteria, removed inappropriate or inconsistent environmental conditions/commitments, made changes to improve consistency between the Gngangara and Jandakot Mound Implementation Statements, and consolidated the Gngangara and East Gngangara Implementation Statements. The anticipated second stage review was at that time intended to more strategically address the question of environmental water provisions and future management approach for the Gngangara Mound.

This current assessment is not the strategic review envisaged in 2004, as this function is now being progressed through the Gngangara Sustainability Strategy that State Government has initiated. The Gngangara Sustainability Strategy is expected to provide the basis for a comprehensive review of the environmental conditions set on the mound, together with sustainable abstraction limits and an appropriate land use strategy to optimise recharge.

In the interim, the Minister for Environment has requested that, in view of changes in climate and land use which has occurred, the EPA review and report on:

1. whether the water level criteria for any environmental monitoring site should be removed or varied, including as a result of changes to environmental values which have occurred at the site since the criteria were originally set; and
2. whether the water level criteria for any environmental monitoring site should be removed or varied due to water levels at the site being predominantly affected by climate variation rather than abstraction.

In order to inform this review, the DoW prepared an environmental review document (DoW 2008) addressing each criteria site of the current approval and reviewing the need for some administrative changes to the current approval. This environmental review document was made available for public review and submissions for 4 weeks' (7 January 2008 until 4 February 2008).

Further details of the proposed changes are presented in Section 2 of this Report. Sections 3 and 4 contain the EPA's assessment of the proposed changes. The conditions and procedures to which the proposal should be subject, should the Minister concur with the EPA's recommendations, are set out in Section 5. Other advice is provided in Section 6. Section 7 presents the EPA's conclusions and Section 8, the EPA's Recommendations.

A list of people and organisations that made submissions is included in Appendix 1 and References are listed in Appendix 2. Implementation Statement No 687, published on 31 August 2005 is presented in Appendix 3. The recommended conditions and procedures and proponent's commitments are provided in Appendix 4.

Appendix 5 contains a summary of the public submissions and the proponent’s response. The summary of public submissions and the proponent’s response is included as a matter of information only and do not form part of the EPA’s report and recommendations. The EPA has considered issues arising from this process in assessing the proposed changes.

2. The proposal

In response to the Minister for Environment’s request to review the environmental monitoring sites in light of changes in environmental values and the predicted influence of climate variability the DoW has proposed to remove some criteria sites from the current environmental approval and to rationalise other conditions and commitments of the approval. These proposed changes are set out in the environmental review document (DoW 2008), specifically Tables 10, 11, 12, and 13 of the document.

The DoW initially requested that five criteria sites be removed from the Implementation Statement (Statement 687, Appendix 3) due to a loss of ecological values as a result of land clearing and disturbance activities that the department believed were outside of its control. These sites were Lake Gngangara, Edgcombe Seepage, WW6, MM49B, and PM25.

Based on its current modelling of the Gngangara groundwater system the DoW also recommended that an additional four criteria sites be removed for the implementation statement as groundwater levels at these sites are predominantly affected by climate and land use, but not by groundwater abstraction. While the DoW also believed its modelling identified other sites where groundwater levels were predominantly affected by factors other than abstraction, the Department adopted a precautionary approach to retain these sites while they are investigated further. These sites initially identified for removal were Loch McNess, Lake Yonderup, Lexia 94, and NR11C. However, in response to submissions on the environmental review document the DoW accepts that there is not sufficient certainty in its conclusions for Loch McNess and Lake Yonderup to support removal of these sites. The DoW therefore now proposes to maintain Loch McNess and Lake Yonderup as criteria sites in the Implementation Statement.

In summary, the DoW now proposes the sites listed in Table 1 below be removed from the Implementation Statement.

Table 1: Criteria sites proposed for removal from the Implementation Statement

Reason for removal	Sites
Sites where ecological values have been lost.	<ul style="list-style-type: none"> • Lake Gngangara • Edgcombe Seepage • WM6 • MM49B • PM25
Sites where abstraction is not the predominant cause of groundwater decline.	<ul style="list-style-type: none"> • Lexia 94 • NR11C

The other changes to conditions and commitments proposed by the DoW are administrative changes rather than changes to criteria sites or environmental outcomes. These changes are described and addressed in detail in Section 4. The proposed changes arise from changes in

the structure of government departments over time, the fulfilment of a number of environmental commitments, and identification of small transcription errors in previous Implementation Statements.

3. Assessment of sites proposed for removal

Section 46(6) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on whether or not the proposed changes to conditions or procedures should be allowed. In addition, the EPA may make recommendations as it sees fit.

3.1 Sites where ecological values have been lost

3.1.1 Lake Gngangara

This site was recommended for removal as the groundwater related ecological values no longer exist. Lake Gngangara was identified as a significant wetland for management in the 1986 assessment and Environmental Water Requirement levels were set in the 1996 review of conditions (EPA 1996). Since then, there has been a significant impact on vegetation communities at Lake Gngangara. A decline in the density and condition of fringing vegetation species and encroachment of shrub and tree species into the wetland basin has been noted. There is also evidence of terrestrialisation. Results of water quality monitoring show elevated conductivity levels, low pH and increased sulphate concentrations. There is also evidence of declining macroinvertebrate species richness.

The EPA notes that the original environmental values of this area for which this was initially chosen as a criteria site have been lost. It is also noted that this site is not associated with a vegetation transect, which have been established over the Gngangara Mound to provide a direct measure of impacts on groundwater dependent ecosystems and improve understanding of the relationships between groundwater levels and ecosystem health. However, through submissions, it is claimed that while previous ecological values had been lost, new ecological values exist in the area with the surrounding bushland supporting priority flora. The EPA understands that the DoW is undertaking a Perth Shallow Groundwater Systems (SGS) investigation in collaboration with the Department of Environment and Conservation as part of the Gngangara Sustainability Strategy (GSS) and that this would identify new sites that could potentially become criteria sites.

As the current criteria were not set to protect potential new environmental values, but the old ones which have been lost, the EPA considers that the site should be removed from the Implementation Statement and the need for the establishment of a new site (presumably linked to a vegetation transect) assessed through the GSS process.

The EPA recommends that this criteria site be removed from the Implementation Statement.

3.1.2 Edgecombe Seepage

This site has suffered a high level of disturbance and loss of ecological values. Edgecombe Seepage has historically supported a unique assemblage of macroinvertebrates, and was selected as a wetland of significance on this basis. Monitoring has reported reductions in spring discharge and declines in faunal abundance, particularly following a drying of the spring in 1999. This has been exacerbated by clearing and earthmoving activities nearby.

The DoW monitors the ecological values of the site annually and recent monitoring has found that the values for which the site was originally chosen have been lost.

The EPA notes that based on the most recent reports, the original values of this area have been lost.

The EPA therefore recommends that this criteria site be removed from the Implementation Statement.

3.1.3 WM6

Clearing has decreased the value of this site as undisturbed phreatophytic vegetation. The nearby 'Neaves' vegetation transect is two metres up gradient of groundwater levels in WM6 and so it is not considered representative of the groundwater levels supporting the vegetation transect.

The EPA notes that the original values of this area have been lost. Some submissions suggested that a new criteria site associated with the 'Neaves' vegetation transect be considered. However, this current assessment is not intended to be a comprehensive review of the need for new criteria sites. It is expected that the GSS would address the issue of whether additional sites are needed. Therefore it is more appropriate that any replacement site for the nearby 'Neaves' vegetation transect should be considered as part of the studies associated with the GSS.

The EPA therefore recommends that this criteria site be removed from the Implementation Statement.

3.1.4 MM49B

Clearing at this site has led to loss of the *Banksia* woodland, and remaining vegetation is not representative of high priority conservation areas within Whiteman Park. The DoW has advised that in the 2004 review of ecological values across the mound it was noted that "the *Banksia* woodland at this site has been largely cleared in recent times and, as a result, it has been suggested it be replaced as a criteria site".

The EPA notes that the original values of this area have been lost. Some submissions recommended that while this site should be removed as a criteria site, its replacement with GD10 should be considered after an investigation as to the representativeness of this site. As previously discussed for the 'WM6' site the EPA believes that consideration of replacement sites would be more appropriate to leave to the GSS. The EPA therefore recommends that as part of the studies for the GSS consideration should be given to whether GD10 would be a useful replacement for this site.

The EPA therefore recommends that this criteria site be removed from the Implementation Statement.

3.1.5 PM25

The *Banksia* woodland at this site has been completely cleared for rural use.

The EPA notes that this is now a cleared site that is not associated with a vegetation transect and is relatively close to another monitoring site for Lake Pinjar.

The EPA therefore recommends that this criteria site be removed from the Implementation Statement.

3.2 Sites where abstraction is not the predominant cause of groundwater decline

3.2.1 Lexia 94

Modelling used by the DoW (Cumulative Deviations From Mean rainfall [CDFM], and the Perth Regional Aquifer Modelling System [PRAMS]) indicate that climate and land use are the predominant factors influencing groundwater levels at this site.

Lexia 94 is a 18.9 ha dampland located in the Maralla Rd Bushland (Bush Forever Site No. 300) within the Bassendean North Vegetation Complex. It is a Conservation category wetland and has been listed on the Interim Register of the National Estate. This wetland has a broad basin dominated by *Leptocarpus tenax* and *Pericalymma ellipticum* with other myrtaceous shrubs on the fringes. The undisturbed nature of the wetland and the vegetation assemblages supported were identified as ecological values by the Water and Rivers Commission in 1997.

The EPA notes that modelling indicates that abstraction is not a factor influencing water levels at this site. In addition, there are two nearby sites (Lexia 186 & 86) closer to private abstraction bores where modelling shows that private abstraction is a secondary factor influencing groundwater levels. The EPA therefore considers that these other two bores are adequate and superior indicators of possible abstraction impacts and hence the removal of this site would not significantly reduce monitoring coverage in this area.

The EPA therefore recommends that this criteria site be removed from the Implementation Statement.

3.2.2 NR11C

Both modelling techniques used by the DoW (CDFM and PRAMS) indicate that climate is the predominant factor influencing groundwater levels. Land use is also a factor. The PRAMS modelling scenario involved a substantial (44%) reduction in abstraction from the Wanneroo Borefield (4.5 GL/year to 2.5 GL/year), yet no impact on water levels was predicted.

The EPA notes that modelling indicates that abstraction is not a factor influencing water levels at this site. In addition, the proximity of 3 other criteria sites nearby means that the removal of this site would not significantly reduce monitoring coverage in this area.

The EPA therefore recommends that this criteria site be removed from the Implementation Statement.

4. Administrative changes to the Implementation Statement

The DoW has proposed modification or deletion of a number of conditions and commitments. It has also requested corrections to some of the water level criteria in the Implementation Statement.

The EPA's assessment of these proposed changes is presented in the following two sections. Appendix 4 presents a draft Implementation Statement based on the recommendations arising from the EPA's assessment.

4.1 Conditions and commitments

The EPA has used a recent audit of the Compliance Reports for 2003-06 (Triennial) and 2006-07 (Annual) as the basis for determining whether the proposed changes to the conditions and commitments should be allowed (DEC 2009). The EPA's assessment and recommendations are presented in Table 2 below.

In addition, this assessment also provides the opportunity to make minor changes to conditions and commitments to reflect the current names of State Government agencies. Such changes do not require detailed assessment.

Table 2: Assessment of proposed changes to conditions and commitments

Condition (M) or Commitment (P) number	Summary of requirements of condition/commitment	EPA assessment and recommendation
M4.1	The proponent shall provide evidence to the Minister for Environment within five years of the date of this statement that the proposals have been substantially commenced.	The proposal has commenced and this condition can be deleted. Delete
M5.1, M5.2, M5.3, & M5.4	Compliance Audits and Performance Reviews submitted to EPA under delegation issued on 18 June 2004.	This delegation was made to address a possible conflict of interest when the DEC and the DoW were a merged department. With the de-merger of the departments this delegation was revoked on 31 August 2007 and so references to the EPA should be replaced by references to the Department of Environment and Conservation, as is the norm. Modify
P7	Require the Water Corporation, through licence conditions, to phase in production bores closest to phreatophytic vegetation to allow the vegetation to adapt slowly to the drawdown and minimise the overall impacts on drawdown.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P12	Liase with the Swan Valley Nyungah Community regarding the East Gnangara proposal.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P14:1	1. Upgrade the artificial maintenance facility for Lake Nowergup to provide more rapid recharge when it becomes necessary to meet EWP's	The auditor recommends this condition could be cleared and so it can be deleted. Delete

Condition (M) or Commitment (P) number	Summary of requirements of condition/commitment	EPA assessment and recommendation
P15	Conduct operations in accordance with proponent protocol for dieback management.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P17	Request the Water Corporation to establish further monitoring bores for monthly monitoring and more frequently if required within 200 metre radius of production bores located in phreatophytic vegetation.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P18	Establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation.	The auditor notes that while this commitment could be cleared, it is understood that DoW is continuing work in this area, and so it should be retained as an avenue for reporting on that work. Retain
P19	Select a range of indicator species at transects to determine an acceptable rate of change in vegetation composition. Also calculate similarity indices when monitoring.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P20	Require the Water Corporation to prepare an environmental operations plan to provide specific detail on environmental management of groundwater schemes in the study area, which includes detailed management prescriptions for well field operators and water resource managers.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P21	Develop a Memorandum of Understanding on pine management regimes with CALM.	The auditor recommends this condition could be cleared and so it can be deleted. Delete
P22	Prepare a Water Resource Allocation and Management Plan for the Lexia area (East Gngangara area) to identify groundwater allocation, which includes detailed groundwater modelling to optimise groundwater availability while minimising environmental impacts.	The auditor recommends this condition could be cleared and so it can be deleted. Delete

4.2 Corrections to Ministerial criteria site water levels

The DoW has identified a number of possible errors in Table 2 of the existing Implementation Statement (refer to Appendix 3) and requested that these be corrected.

The EPA's assessment of these proposed corrections is provided in Table 3 below.

Table 3: Assessment of proposed corrections

Possible error identified by the Department of Water in Table 2 of Implementation Statement No. 687	EPA assessment and recommendation
For Loch Mc Ness and Lake Yonderup sites the levels are listed as "Preferred Minimum" (allowed to be exceeded 2 in 6 years) rather than an "Absolute	Levels were originally referred to in Implementation Statement 438 in 1997 via Commitment 8 which in turn referred to Table 16 of Water and River

Possible error identified by the Department of Water in Table 2 of Implementation Statement No. 687	EPA assessment and recommendation
minimum”.	<p>Commission’s environmental review for the 1996 Section 46 (refer to Appendix 3 of EPA Bulletin 817 [EPA 1996])</p> <p>In Bulletin 817 the levels referred to were “Minimum Water Levels” not “Preferred Minimum Levels”.</p> <p>There is no reference to changing these levels in the later Section 46 assessment (EPA Bulletin 1155 [EPA 2004]), although the draft conditions of that bulletin now list the levels as an end of summer “Preferred Minimum”.</p> <p>This appears to have been a simple transcription error that can be corrected.</p>
<p>For the Wilgarup site 4.8 m AHD is listed as an “Absolute minimum” for the end of summer. The correct values should be 4.8 m as a “Preferred Minimum” (allowed to be exceeded 2 in 6 years) and 4.5 m as an “Absolute Minimum”.</p>	<p>In the EPA’s audit of the 2000-03 triennial report (EPA Bulletin 1139, [EPA 2004a]) Wilgarup was not yet a formal criteria site, but indicative water criteria level were set for reporting. These levels were set out in Table 6 of Bulletin 1139, where the end of summer “Preferred Minimum” was 4.8 m and the “Absolute Minimum” was 4.5 m.</p> <p>Wilgarup was added to the list of formal criteria sites in the 2004 Section 46 (Bulletin 1155), with 4.5 m as the “Absolute Minimum”. There was no specific discussion of this site in the bulletin.</p> <p>This appears to have been a simple transcription error that can be corrected.</p>

5. Conditions and commitments

Section 46(6) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on whether or not the proposed changes to conditions or procedures should be allowed. In addition, the EPA may make recommendations as it sees fit.

5.1 Recommended conditions

Having considered the information provided in the Department of Water’s environmental review document and response to submissions the EPA recommends that the existing Ministerial Conditions be applied to the project (Implementation Statement 687 published on 31 August 20), subject to modifications necessary to:

- remove seven criteria sites (Lake Gngangara, Edgecombe Seepage, WM6, MM49B, PM25, Lexia 94, and NR11C) from Table 2 of the statement; and
- make a number of administrative changes to the statement as detailed and recommended in Section 4 of this report.

The amended conditions and amended Consolidated Commitments statement are presented in Appendix 4 of this report.

6. Other Advice

The EPA notes the progress of the Gngangara Sustainability Strategy and supports the intentions of this process to put in place an integrated land- and water-management plan to address issues related to declining water levels in the Gngangara Mound Groundwater System. This is the type of review that the EPA has argued for in its previous reviews and audit reports (EPA 2004, EPA 2005, and EPA 2007) and while it would have been better if the review process had been initiated earlier, the EPA is encouraged that a strategy is now being developed, supported by a broad and comprehensive range of studies.

The EPA intends to provide advice on the Gngangara Sustainability Strategy (GSS) under S16e of the *Environmental Protection Act 1986*. Depending on the outcomes of the GSS and any new regulatory system under the GSS and Water Legislation, the EPA would, as per normal practice, determine the extent of any subsequent review of Environmental Conditions.

7. Conclusions

The EPA has considered the request by the Department of Water to remove some criteria sites from the current environmental approval and to rationalise other conditions and commitments of the approval.

The EPA agrees that seven of nine criteria sites initially proposed for removal can be removed from the Implementation Statement as the proponent has demonstrated that these sites have either lost their original environmental values or are predominantly affected by climate variation and land use, rather than abstraction.

The EPA also recommends that a number of administrative changes be made to the Implementation Statement. These changes arise from changes in the structure of government departments over time, the fulfilment of a number of environmental commitments, and identification of small transcription errors in previous Implementation Statements.

In addition, the EPA has provided some other advice on how it intends to have input into the Gngangara Sustainability Strategy, which the State Government has initiated to put in place an integrated land and water management plan to address issues related to declining water levels in the Gngangara Mound Groundwater System.

8. Recommendations

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

1. That the Minister notes that this report is pursuant to Section 46(6) of the *Environmental Protection Act 1986* and thus is limited to consideration of proposed changes to the original conditions of Implementation Statement No 687.
2. The Minister notes that the proposed changes are to remove some criteria sites from the current environmental approval and to rationalise other conditions and commitments of the approval.
3. The EPA recommends that the Minister considers the report on the proposed changes to the Implementation Statement as set out in Sections 3 and 4 of this report.
4. The Minister imposes the amended conditions, commitments and procedures recommended in Appendix 4 of this report.

Appendix 1

List of Submitters

State/Local Government

- Department of Environment and Conservation
- Forest Products Commission
- Department of Industry and Resources
- Department of Indigenous Affairs
- Water Corporation
- City of Wanneroo
- Department for Planning and Infrastructure
- Town of Cambridge
- Town of Cottesloe
- Shire of Peppermint Grove

Organisations

- Conservation Council of Western Australia Inc.

Individuals

- David W Robinson
- Rob Foulds
- Associate Professor Pierre Horwitz
- Kylie McKay
- Associate Professor Ray Froend
- Tonja Boyd
- Robyn Loomes
- Harry Gratte

Appendix 2

References

- EPA 1987, *Gnangara Mound Groundwater Resources, Water Authority of Western Australia, Report and Recommendations of the Environmental Protection Authority*. Environmental Protection Authority Bulletin 295, August 1987.
- EPA 1996, *Gnangara Mound groundwater resources, Water and Rivers Commission, Proposed Change to Environmental Conditions, Report and Recommendations of the Environmental Protection Authority*. Environmental Protection Authority Bulletin 817, May 1996.
- EPA 1998, *Groundwater resource allocation, East Gnangara, Water and Rivers Commission, Report and Recommendations of the Environmental Protection Authority*. Environmental Protection Authority Bulletin 904, October 1998.
- EPA 2004, *Review of Environmental Conditions on the Gnangara and Jandakot Mounds, Water and Rivers Commission, Section 46 Report and Recommendations of the Environmental Protection Authority*. Environmental Protection Authority Bulletin 1155, November 2004.
- EPA 2004a, *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*. Environmental Protection Authority Bulletin 1139 June 2004.
- EPA 2005, *Environmental Management of Groundwater Abstraction from the Gnangara Mound July 2003 – June 2004 Annual Compliance Report, Water and Rivers Commission, Report by the Environmental Protection Authority under section 48(1a) of the Environmental Protection Act 1986*. Environmental Protection Authority Bulletin 1187 August 2005.
- EPA 2007, *Environmental Management of Groundwater Abstraction from the Gnangara Mound July 2004 – June 2005 - Annual Compliance Report, Water and Rivers Commission, Report by the Environmental Protection Authority under section 48(1a) of the Environmental Protection Act 1986*. Environmental Protection Authority Bulletin 1252 March 2007.
- DoW 2008, *Review of Ministerial Conditions on the Groundwater Resources of the Gnangara Mound*, Department of Water, January 2008.
- DEC 2009, *November 2008 Report for the Department of Environment and Conservation Audit of Compliance Reports 2003-06 (Triennial) and 2006-07 (Annual) Environmental Management of Groundwater Abstraction from the Gnangara Groundwater Mound* Department of Environment and Conservation, May 2009.

Appendix 3

Implementation Statement (31 August 2005)



GOVERNMENT OF WESTERN AUSTRALIA

Statement No.

MINISTER FOR THE ENVIRONMENT; SCIENCE

000687

**STATEMENT TO AMEND CONDITIONS APPLYING TO PROPOSALS
(PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

STATEMENT FOR THE WATER AND RIVERS COMMISSION

**GNANGARA MOUND GROUNDWATER RESOURCES
[INCLUDING GROUNDWATER RESOURCE ALLOCATION, EAST GNANGARA
CITY OF SWAN]**

Proposals: The management and abstraction of groundwater for public and private water supply from the Gnangara Mound, with provision for environmental water requirements, as documented in this statement.

Proponent: The Water and Rivers Commission (Joint)

Proponent Address: Level 2, 3 Plain Street
EAST PERTH WA 6004

Assessment Number: 1540-1

Previous Assessment Numbers: 041 / 697 / 932

Previous Statement Numbers: Statement No. 021 (Published on 8 March 1988)
Statement No. 437 (Published on 6 February 1997)
Statement No. 438 (Published on 6 February 1997)
Statement No. 496 (Published on 17 February 1999)

Report of the Environmental Protection Authority: Bulletin 1155

Previous Reports of the Environmental Protection Authority: Bulletins 295 / 817 / 904

The implementation and management of groundwater and groundwater allocations for the Gnangara Mound Groundwater Resources is subject to the following conditions and procedures, which replace all previous conditions and procedures applicable to the abovementioned proponent (See note 2 at foot of this statement):

Published on

1 Implementation

- 1-1 The proponent shall implement the proposals as documented in “Section 46 Review of Environmental Conditions on Management of the Gngangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions” (August 2004), as modified and documented in Environmental Protection Authority Bulletin 1155, which revised the Environmental Review and Management Programme (1986), published in Environmental Protection Authority Bulletin 295 as Appendix D; and which were consolidated in May 1996 and reported on in Environmental Protection Authority Bulletin 817, as revised in November 1996, and also revised in the Public Environmental Review (1997), published in Environmental Protection Authority Bulletin 904 as Appendix 3.

2 Proponent Commitments

- 2-1 The proponent shall implement the environmental management commitments, as revised in December 2004, and documented in schedule 1 of this statement, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

3 Proponent Nomination and Contact Details

- 3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposals until such time as the Minister for the Environment has exercised the Minister’s power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposals.
- 3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposals will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposals shall also be provided.
- 3-3 The nominated proponent shall notify the Environmental Protection Authority of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

- 4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposals have been substantially commenced or the approvals granted in the statements of 8 March 1988 and 17 February 1999 shall lapse and be void.

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program and submit compliance reports to the Environmental Protection Authority which address:

1. the status of implementation of the proposals;
2. evidence of compliance with the conditions and commitments; and
3. the performance of the environmental management plans and programs.

Note: Under delegation No. 54 issued on 18 June 2004 and section 48(1) of the *Environmental Protection Act 1986*, the Environmental Protection Authority is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

5-2 The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the Environmental Protection Authority, which address:

1. compliance with the conditions;
2. the achievement of environmental objectives set for the proposal;
3. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and
4. proposed environmental management over the next three years to comply with conditions and environmental objectives set for the proposal.

5-3 The proponent shall make the reports required by condition 5-2 publicly available, to the requirements of the Environmental Protection Authority.

5-4 The proponent shall report any breach or anticipated breach of the environmental criteria set out in Tables 1 and 2 or environmental objectives to the Environmental Protection Authority immediately it becomes evident to the proponent.

6 Management of the Water Resource

6-1 The proponent shall base decisions affecting the management of groundwater resources of the Gngara Mound on the concept of sustainable yield of resources and maintenance of ecological systems in accordance with the objectives of the State Conservation Strategy (1987).

- 6-2 The proponent shall subject to regular review the basis for groundwater management decisions, including groundwater allocations and licences, and the criteria specified for conservation of the environment and the groundwater resource of the Gngangara Mound, to the requirements of the Environmental Protection Authority on advice of the Department of Conservation and Land Management.

7 Groundwater Allocation

- 7-1 The proponent shall ensure that the allocation of water to public and private users and the operation of the Pinjar Stages 1, 2 and 3, Wanneroo, Mirrabooka and Lexia Groundwater Schemes comply with environmental water provisions.

8 Groundwater-dependent Ecosystems

- 8-1 The proponent shall ensure that the integrity of all groundwater-dependent ecosystems located on the Gngangara Mound that may be impacted as a result of groundwater abstraction are protected, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

9 Groundwater Availability

- 9-1 The proponent shall widely publish by the end of October each year the limits on groundwater availability for the Gngangara Mound.
- 9-2 The proponent shall update annually the figures published according to the requirements of condition 9-1, with emphasis on those areas of high allocation relative to sustainable yield of the groundwater resource so that limits to use and development can be clearly seen by all interested parties. The updated figures shall also be widely published.

10 Water Conservation

- 10-1 The proponent shall actively encourage further reduction in public and private water demand in accordance with the State Water Strategy (2003) and other water conservation initiatives.

11 Research and Monitoring

- 11-1 The proponent shall participate in and undertake research and monitoring on the Gngangara Mound which includes:
1. clarification of the relationship between groundwater level and rainfall under conditions of declining long-term rainfall;
 2. improvement in the understanding of the relationship between groundwater levels and vegetation, including plantations;

3. improvement in the understanding of the relationship between groundwater level and abstraction from unconfined and confined aquifers of the Gnangara Mound;
4. clarification of the relationship between groundwater level and wetland water levels and wetland water quality;
5. improvement in the understanding of the relationship between groundwater level and water levels in the Yanchep caves; and
6. improvement in the understanding of the conservation value of wetlands and other groundwater-dependent ecosystems on the Gnangara Mound,

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

Procedures

- 1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will prepare the written notice to the proponent.
- 2 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice.
- 3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Environmental Protection Authority.

Notes

- 1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority over the fulfilment of the requirements of the conditions.
- 2 The conditions and commitments of Statement No. 437 for which the Water Corporation is primarily responsible have not been reviewed during the section 46 consideration which has led to the amended conditions of this statement.

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT; SCIENCE

11/11/10

Proponent's Environmental Management Commitments

December 2004

**GNANGARA MOUND GROUNDWATER RESOURCES
[INCLUDING GROUNDWATER RESOURCE
ALLOCATION, EAST GNANGARA]**

(Assessment No. 1540-1)

Water and Rivers Commission

**Gnangara Mound Groundwater Resources [Including Groundwater Resource Allocation, East Gnangara] (Assessment No. 1540-1)
December 2004**

Note: The term “commitment” as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the objective of the commitment;
- the “action” to be undertaken by the proponent;
- the timing requirements of the commitment; and
- the body / agency to provide technical advice to the Environmental Protection Authority.

No.	Topic	Objective	Action	Timing	Advice
1	Gnangara Mound allocations		Manage public and private groundwater abstraction to meet objectives and Environmental Water Provision (EWP) criteria presented in Tables 1 and 2 (attached).	Ongoing	
2	Management objectives and Criteria		Management objectives and criteria and water allocation limits will be regularly reviewed and amended as information becomes available to provide for ongoing adaptive management.	Ongoing	CALM
3	Yeal Groundwater Scheme	To minimise environmental and/or significant impact	Prepare a Water Resources Allocation and Management Plan for the Yeal area to identify groundwater allocations.	Prior to grant of an allocation to the Yeal scheme	
4	Yanchep caves	To minimise environmental and/or significant impact	Continue to develop catchment strategies to minimise change in hydrological regime within the caves of Yanchep National Park. Monitor water levels and cave fauna.	Ongoing	CALM
5	Strategic drainage plans		Prepare strategic drainage plans for the study area including options for the management of high water levels in Lakes Joondalup, Goollelal, Mariginiup and Jandabup.	Ongoing	

6	Research and investigation program		<ol style="list-style-type: none"> 1. Prepare a research and investigation program for submission to the EPA for review and subsequent finalisation of the program to the satisfaction of the EPA. The research and investigation program will be prepared with the objective of improving understanding of: <ul style="list-style-type: none"> • groundwater-environmental relationships on the Swan Coastal Plain; • the associated management requirements; and • potential management techniques; and will incorporate all relevant aspects of research and investigation work currently committed to under Ministerial Statements 438 and 496. 1. Implement the research and investigation program to the satisfaction of the EPA. 2. Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA. 	Within four months of a revised statement being issued following the 2004 Stage 1 section 46 review/ Ongoing	CALM
7	Vegetation protection	To minimise environmental and/or significant impact	Require the Water Corporation, through licence conditions, to phase in production bores closest to phreatophytic vegetation to allow the vegetation to adapt slowly to the drawdown and minimise the overall impacts of drawdown.	Ongoing	
8	Environmental monitoring program		<ol style="list-style-type: none"> 1. Prepare an environmental monitoring program for submission to the EPA for review and subsequent finalisation of the program to the satisfaction of the EPA. The monitoring program will include: <ul style="list-style-type: none"> • monitoring of groundwater levels in all relevant aquifer systems; • relevant wetland water levels and water quality; • condition of vegetation and fauna associated with groundwater-dependent ecosystems; and • cave water levels. 2. Implement the approved environmental monitoring plan to the satisfaction of the EPA. 3. Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA. 	Within four months of a revised statement being issued following the 2004 Stage 1 section 46 review/ Ongoing	CALM

9	Development advice		Continue to provide advice to the City of Wanneroo, the Department for Planning and Infrastructure, CALM and other relevant agencies on the impact of land use on groundwater resources.	Ongoing	
10	Gnangara inter-agency technical advisory group		Convene and provide ongoing executive support for an inter-agency technical advisory group for water resources planning and management issues on the Gnangara Mound. The group will consider planning and management issues in the context of recommendations of the Select Committee on Metropolitan Development and Groundwater Supplies.	Ongoing	
11	Community consultation		Continue to chair and provide support for the Gnangara Consultative Committee as an ongoing forum for information exchange and advice.	Ongoing	
12	Aboriginal consultation		Liaise with the Swan Valley Nyungah Community regarding the East Gnangara proposal.	Ongoing	
13	Vegetation protection		Limit potential for tree deaths around production wells to 100 metres radius for normal (average) climate conditions and within 200 metres in extreme conditions.	Ongoing	
14	Lake Nowergup supplementation		1 Upgrade the artificial maintenance facility for Lake Nowergup to provide more rapid recharge when it becomes necessary to meet EWPs; and 2 Should EWPs in Lake Nowergup not be met by November 1, artificial supplementation will be used until the EWP is reached.	Ongoing	
15	Dieback protocols		Conduct operations in accordance with proponent protocol for dieback management.	Ongoing	
16	Reporting		Require the Water Corporation to submit yearly production plans as part of the operating strategy and to report on compliance with environmental commitments made in the operating strategy.	Ongoing	
17	Monitoring wells	To minimise environmental and/or significant impact	Request the Water Corporation to establish further monitoring bores for monthly monitoring and more frequently if required within a 200 metre radius of production bores located in phreatophytic vegetation.	Before 5 May 1997	

18	Vegetation protection	To minimise environmental and/or significant impact	Establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation.	Before 5 May 1997	
19	Vegetation monitoring	To minimise environmental and/or significant impact	Select a range of indicator species at transects to determine an acceptable rate of change in vegetation composition. Also calculate similarity indices when monitoring.	By spring 1997	
20	Environmental management plan		Require the Water Corporation to prepare an environmental operations plan to provide specific detail on environmental management of groundwater schemes in the study area, which includes detailed management prescriptions for wellfield operators and water resource managers.	Before 5 August 1997	
21	Pine plantations		Develop a Memorandum of Understanding on pine management regimes with CALM.	By June 1997	CALM and FPC
22	Lexia Groundwater Scheme		Prepare a Water Resources Allocation and Management Plan for the Lexia area (East Gngangara area) to identify groundwater allocations, which includes detailed groundwater modelling to optimise groundwater availability while minimising environmental impacts.	Prior to construction of the Lexia scheme	
23	East Gngangara wetlands		Require the Water Corporation to implement its 2001 wetland mitigation strategy and subsequent approved revisions and report to the Department of Environment on implementation.	Prior to commissioning of Lexia scheme/ Ongoing	
24	East Gngangara wetlands		Determine EWPs for new appropriately located bores in the East Gngangara vegetation corridor.	By 17 February 2002	

Abbreviations

CALM = Department of Conservation and Land Management

EPA = Environmental Protection Authority

EWPs = Environmental Water Provisions

FPC = Forest Products Commission

Gnangara Mound Criteria (2004)

Table 1 – Monitoring Wells

Groundwater Monitoring Well	End of Summer	
	Preferred Minimum (mAHD)	Absolute minimum (mAHD)
MM16	-	38.8
MM18	-	38.6
MM49B	-	24.7
MM53	-	33.3
MM55B	-	29.5
MM59B	-	36.3
MT3	-	43.0
NR6C	-	58.5
PM9	-	56.3
PM24	-	40.5
PM25	-	42.3
WM1	-	55.7
WM2	-	66.5
WM6	-	58.3
WM8	-	64.8
NR11C (G61611042)	-	55
MM12 (G61610989)	-	42
L30C (G61611010)	-	47.2
L110C (G61611011)	-	55.7
L220C (G61611018)	-	52.2

Gnangara Mound Criteria (2004)

Table 2 – Wetlands

Wetlands		End of Summer (mAHD)		Spring (mAHD)	
		Preferred Minimum	Absolute minimum	Preferred Min. peak	Absolute Min. peak
Lake Goollelal	Q6162517	* 26.2	26		
Lake Gnangara	(Q6162591 staff) (G61618440 bore)	42	41.3		
Loch McNess	(Q6162564)	6.95			
Yonderup	(Q6162565)	5.9			
Lake Joondalup	(Q6162572 staff) (G61610661 bore)	* 16.2	15.8		
Mariginiup Lake	(Q6162577 staff) (peak levels recorded) (G61610685 bore)			* 42.1	41.5
Lake Jandabup Artificially maintained	(Q6162578)		44.3	* 44.7	44.2
Nowergup Lake Artificially maintained	(Q6162567) (peak levels recorded)			* 17	16.8
Wilgarup	(Q6162623 staff) (61618500 bore)		4.8	6.10	5.65
Pipidinny Swamp	(Q6162624)		1.6	2.70	2.40
Lexia 94	(GNM17a) G61613216	* 45.8	45.5		
Lexia 86	(GNM16) G61613215	* 47.3	47		
Lexia 186	(GNM15) G61613214	* 47.5	47.2		
Melaleuca Park (EPP) 173	(GNM14) Q6162628 staff Bore G61613213		50.2		
Melaleuca Park (Dampland) 78	(GNM31) G61613231	* 65.4	65.1		
Edgecombe	(B10) (G61618606)		14.35		
Egerton	(B25) (G61618607)		39.29		

* water levels allowed between minimum and absolute minimum at a rate of 2 in 6 years to replicate natural drying cycles.

Appendix 4

Recommended Environmental Conditions and Proponent's Consolidated Commitments

**STATEMENT TO AMEND CONDITIONS APPLYING TO PROPOSALS
(PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

STATEMENT FOR THE DEPARTMENT OF WATER

**GNANGARA MOUND GROUNDWATER RESOURCES
[INCLUDING GROUNDWATER RESOURCE ALLOCATION, EAST GNANGARA
CITY OF SWAN]**

Proposals: The management and abstraction of groundwater for public and private water supply from the Gnangara Mound, with provision for environmental water requirements, as documented in this statement.

Proponent: The Department of Water

Proponent Address: The Atrium
168 St George's Terrace
PERTH Western Australia 6842

Assessment Number: 1540-1

Previous Assessment Numbers: 041/ 697/ 932

Previous Statement Numbers: Statement No. 021 (Published on 8 March 1988)
Statement No. 437 (Published on 6 February 1997)
Statement No. 438 (Published on 6 February 1997)
Statement No. 496 (Published on 17 February 1999)
Statement No. 687 (Published on 31 August 2005)

Report of the Environmental Protection Authority: Bulletin 1324

Previous Reports of the Environmental Protection Authority: Bulletins 295 / 817 / 904 /
1155

The implementation and management of groundwater and groundwater allocations for the Gnangara Mound Groundwater Resources is subject to the following conditions and procedures, which replace all previous conditions and procedures applicable to the abovementioned proponent (See note 2 at foot of this statement):

1 Implementation

1-1 The proponent shall implement the proposals as documented in "Section 46 Review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions" (August 2004), as modified and documented in Environmental Protection Authority Bulletin 1155, which revised the Environmental Review and Management Programme (1986), published in Environmental Protection Authority Bulletin 295 as Appendix D; and which were

consolidated in May 1996 and reported on in Environmental Protection Authority Bulletin 817, as revised in November 1996, and also revised in the Public Environmental Review (1997), published in Environmental Protection Authority Bulletin 904 as Appendix 3.

2 Proponent Commitments

2-1 The proponent shall implement the environmental management commitments, as revised in May 2009, and documented in schedule 1 of this statement, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposals until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposals.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposals will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposals shall also be provided.

3-3 The nominated proponent shall notify the Chief Executive Officer of the Department of Environment and Conservation of any change of contact name and address within 60 days of such change.

4 Compliance Audit and Performance Review

4-1 The proponent shall prepare an audit program and submit compliance reports to the Chief Executive Officer of the Department of Environment and Conservation which address:

1. the status of implementation of the proposals;
2. evidence of compliance with the conditions and commitments; and
3. the performance of the environmental management plans and programs.

4-2 The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the Chief Executive Officer of the Department of Environment and Conservation, which address:

1. compliance with the conditions;
2. the achievement of environmental objectives set for the proposal;

3. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and
 4. proposed environmental management over the next three years to comply with conditions and environmental objectives set for the proposal.
- 4-3 The proponent shall make the reports required by condition 5-2 publicly available, to the requirements of the Chief Executive Officer of the Department of Environment and Conservation.
- 4-4 The proponent shall report any breach or anticipated breach of the environmental criteria set out in Tables 1 and 2 or environmental objectives to the Chief Executive Officer of the Department of Environment and Conservation immediately it becomes evident to the proponent.

5 Management of the Water Resource

- 5-1 The proponent shall base decisions affecting the management of groundwater resources of the Gngangara Mound on the concept of sustainable yield of resources and maintenance of ecological systems in accordance with the objectives of the State Conservation Strategy (1987).
- 5-2 The proponent shall subject to regular review the basis for groundwater management decisions, including groundwater allocations and licences, and the criteria specified for conservation of the environment and the groundwater resource of the Gngangara Mound, to the requirements of the Environmental Protection Authority on advice of the Department of Environment and Conservation.

6 Groundwater Allocation

- 6-1 The proponent shall ensure that the allocation of water to public and private users and the operation of the Pinjar Stages 1, 2 and 3, Wanneroo, Mirrabooka and Lexia Groundwater Schemes comply with environmental water provisions.

7 Groundwater-dependent Ecosystems

- 7-1 The proponent shall ensure that the integrity of all groundwater-dependent ecosystems located on the Gngangara Mound that may be impacted as a result of groundwater abstraction are protected, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Environment and Conservation.

8 Groundwater Availability

- 8-1 The proponent shall widely publish by the end of October each year the limits on groundwater availability for the Gngangara Mound.
- 8-2 The proponent shall update annually the figures published according to the requirements of condition 9-1, with emphasis on those areas of high allocation relative to sustainable yield of the groundwater resource so that limits to use and development can be clearly seen by all interested parties. The updated figures shall also be widely published.

9 Water Conservation

- 9-1 The proponent shall actively encourage further reduction in public and private water demand in accordance with the State Water Strategy (2003) and other water conservation initiatives.

10 Research and Monitoring

- 10-1 The proponent shall participate in and undertake research and monitoring on the Gngangara Mound which includes:
1. clarification of the relationship between groundwater level and rainfall under conditions of declining long-term rainfall;
 2. improvement in the understanding of the relationship between groundwater levels and vegetation, including plantations;
 3. improvement in the understanding of the relationship between groundwater level and abstraction from unconfined and confined aquifers of the Gngangara Mound;
 4. clarification of the relationship between groundwater level and wetland water levels and wetland water quality;
 5. improvement in the understanding of the relationship between groundwater level and water levels in the Yanchep caves; and
 6. improvement in the understanding of the conservation value of wetlands and other groundwater-dependent ecosystems on the Gngangara Mound,

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Environment and Conservation.

Procedures

- 1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will prepare the written notice to the proponent.
- 2 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice.
- 3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Chief Executive Officer of the Department of Environment and Conservation.

Notes

- 1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority over the fulfilment of the requirements of the conditions.
- 2 The conditions and commitments of statement no. 437 for which the Water Corporation is primarily responsible have not been reviewed during the section 46 consideration which has lead to the amended conditions of this statement.

Proponent's Environmental Management Commitments

May 2009

**GNANGARA MOUND GROUNDWATER RESOURCES
[*INCLUDING GROUNDWATER RESOURCE
ALLOCATION, EAST GNANGARA*]**

(Assessment No. 1540-1)

Department of Water

**Gnangara Mound Groundwater Resources [Including Groundwater Resource Allocation, East Gnangara] (Assessment No. 1540-1)
May 2009**

Note: The term “commitment” as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the objective of the commitment;
- the “action” to be undertaken by the proponent;
- the timing requirements of the commitment; and
- the body / agency to provide technical advice to the Environmental Protection Authority.

No.	Topic	Objective	Action	Timing	Advice
1	Gnangara Mound allocations		Manage public and private groundwater abstraction to meet objectives and Environmental Water Provision (EWP) criteria presented in Tables 1 and 2 (attached).	Ongoing	
2	Management objectives and Criteria		Management objectives and criteria and water allocation limits will be regularly reviewed and amended as information becomes available to provide for ongoing adaptive management.	Ongoing	DEC
3	Yeal Groundwater Scheme	To minimise environmental and/or significant impact	Prepare a Water Resources Allocation and Management Plan for the Yeal area to identify groundwater allocations.	Prior to grant of an allocation to the Yeal scheme	
4	Yanchep caves	To minimise environmental and/or significant impact	Continue to develop catchment strategies to minimise change in hydrological regime within the caves of Yanchep National Park. Monitor water levels and cave fauna.	Ongoing	DEC
5	Strategic drainage plans		Prepare strategic drainage plans for the study area including options for the management of high water levels in Lakes Joondalup, Goollelal, Mariginiup and Jandabup.	Ongoing	
6	Research and investigation		1. Prepare a research and investigation program for submission to the EPA for review and subsequent finalisation of the program to the	Within four months of a revised	DEC

No.	Topic	Objective	Action	Timing	Advice
	program		<p>satisfaction of the EPA. The research and investigation program will be prepared with the objective of improving understanding of:</p> <ul style="list-style-type: none"> • groundwater-environmental relationships on the Swan Coastal Plain; • the associated management requirements; and • potential management techniques; <p>and will incorporate all relevant aspects of research and investigation work currently committed to under Ministerial Statements 438 and 496.</p> <ol style="list-style-type: none"> 1. Implement the research and investigation program to the satisfaction of the EPA. 2. Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA. 	statement being issued following the 2004 Stage 1 section 46 review/ Ongoing	
7	Environmental monitoring program		<ol style="list-style-type: none"> 1. Prepare an environmental monitoring program for submission to the EPA for review and subsequent finalisation of the program to the satisfaction of the EPA. The monitoring program will include: <ul style="list-style-type: none"> • monitoring of groundwater levels in all relevant aquifer systems; • relevant wetland water levels and water quality; • condition of vegetation and fauna associated with groundwater-dependent ecosystems; and • cave water levels. 2. Implement the approved environmental monitoring plan to the satisfaction of the EPA. 3. Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA. 	Within four months of a revised statement being issued following the 2004 Stage 1 section 46 review/ Ongoing	DEC
8	Development advice		Continue to provide advice to the City of Wanneroo, the Department for Planning and Infrastructure, DEC and other relevant agencies on the impact of land use on groundwater resources.	Ongoing	
9	Gnangara inter-agency technical		Convene and provide ongoing executive support for an inter-agency technical advisory group for water resources planning and management	Ongoing	

No.	Topic	Objective	Action	Timing	Advice
	advisory group		issues on the Gngangara Mound. The group will consider planning and management issues in the context of recommendations of the Select Committee on Metropolitan Development and Groundwater Supplies.		
10	Community consultation		Continue to chair and provide support for the Gngangara Consultative Committee as an ongoing forum for information exchange and advice.	Ongoing	
11	Vegetation protection		Limit potential for tree deaths around production wells to 100 metres radius for normal (average) climate conditions and within 200 metres in extreme conditions.	Ongoing	
12	Lake Nowergup supplementation		Should EWPs in Lake Nowergup not be met by November 1, artificial supplementation will be used until the EWP is reached.	Ongoing	
13	Reporting		Require the Water Corporation to submit yearly production plans as part of the operating strategy and to report on compliance with environmental commitments made in the operating strategy.	Ongoing	
14	Vegetation protection	To minimise environmental and/or significant impact	Establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation.	Before 5 May 1997	
15	East Gngangara wetlands		Require the Water Corporation to implement its 2001 wetland mitigation strategy and subsequent approved revisions and report to the Department of Environment on implementation.	Prior to commissioning of Lexia scheme/ Ongoing	
16	East Gngangara wetlands		Determine EWPs for new appropriately located bores in the East Gngangara vegetation corridor.	By 17 February 2002	

Abbreviations

DEC = Department of Environment and Conservation
EPA = Environmental Protection Authority
EWPs = Environmental Water Provisions
FPC = Forest Products Commission

Gnangara Mound Criteria (2004)

Table 1 – Monitoring Wells

Groundwater Monitoring Well	End of Summer	
	Preferred Minimum (mAHD)	Absolute minimum (mAHD)
MM16	-	38.8
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MM53	-	33.3
MM55B	-	29.5
MM59B	-	36.3
MT3	-	43.0
NR6C	-	58.5
PM9	-	56.3
PM24	-	40.5
WM1	-	55.7
WM2	-	66.5
WM8	-	64.8
MM12 (G61610989)	-	42
L30C (G61611010)	-	47.2
L110C (G61611011)	-	55.7
L220C (G61611018)	-	52.2

Gnangara Mound Criteria (2004)

Table 2 – Wetlands

Wetlands		End of Summer (mAHD)		Spring (mAHD)	
		Preferred Minimum	Absolute minimum	Preferred Min. peak	Absolute Min. peak
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Loch McNess	(Q6162564)		6.95		
Yonderup	(Q6162565)		5.9		
Lake Joondalup	(Q6162572 staff) (G61610661 bore)	* 16.2	15.8		
Mariginiup Lake	(Q6162577 staff) (peak levels recorded) (G61610685 bore)			* 42.1	41.5
Lake Jandabup Artificially maintained	(Q6162578)		44.3	* 44.7	44.2
Nowergup Lake Artificially maintained	(Q6162567) (peak levels recorded)			* 17	16.8
Wilgarup	(Q6162623 staff) (61618500 bore)	4.8	4.5	6.10	5.65
Pipidinny Swamp	(Q6162624)		1.6	2.70	2.40
Lexia 86	(GNM16) G61613215	* 47.3	47		
Lexia 186	(GNM15) G61613214	* 47.5	47.2		
Melaleuca Park (EPP) 173	(GNM14) Q6162628 staff Bore G61613213		50.2		
Melaleuca Park (Dampland) 78	(GNM31) G61613231	* 65.4	65.1		
Egerton	(B25) (G61618607)		39.29		

* water levels allowed between minimum and absolute minimum at a rate of 2 in 6 years to replicate natural drying cycles.

Appendix 5

**Summary of Submissions and
Proponent's Response to Submissions
(On attached CD)**