

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
Perth, Western Australia
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Environmental Impact Assessment Process Timelines

| Date | Progress stages | Time (weeks) |
|-----------------|---|-------------------------|
| 06/04/01 | Request for section 46 Advice | 178 |
| 15/09/04 | Proponent Document Released for Public Comment | |
| 13/10/04 | Public Comment Period Closed | 4 |
| 22/11/04 | Final Proponent response to the issues raised | 5 |
| 29/11/04 | EPA report to the Minister for the Environment | 1 |

Summary and recommendations

Following a request from the Water and Rivers Commission (WRC), the Minister for the Environment requested the Environmental Protection Authority (EPA) to inquire into the environmental conditions applying to management of the Gngangara and Jandakot groundwater mounds. Three statements are applicable to this request, namely Nos 253, 438 and 496.

The Department of Environment, on behalf of the Water and Rivers Commission, prepared a review of the environmental conditions applying to management of the Gngangara and Jandakot groundwater mounds and proposed a number of changes to conditions and commitments in these statements.

This is the first stage of a more extensive review of environmental conditions and environmental management of the Jandakot and Gngangara Mounds being undertaken by the DoE, in concert with other agencies.

Section 46(1) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the 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.

This report provides the EPA's advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposal

Relevant environmental factors

It is the EPA's opinion that the following is the environmental factor relevant to the proposal, which requires detailed evaluation in the report:

- (a) Groundwater-dependent ecosystems

Conclusion

The EPA has considered the proposal by the Water and Rivers Commission to change a number of the conditions and commitments applying to the Jandakot and Gngangara Mounds and has concluded that some of these changes can meet the EPA's objectives for the relevant environmental factors.

In undertaking this review, the EPA has placed considerable emphasis on ensuring that any changes should not compromise the protection of environmental values on the Jandakot and Gngangara Mounds. The EPA is concerned that over the last decade there has been increasing stress on the groundwater-dependent ecosystems on the mounds resulting from factors including pumping, climate change and land use impacts.

The EPA expects the WRC, the body with statutory responsibility for water resource management, to ensure that management of groundwater delivers protection to those environmental values. On both the Jandakot and Gngangara Mounds, maintenance and support of wetlands and phreatophytic vegetation has been an important consideration by the EPA over the past two decades. The EPA has reaffirmed this position recently in its audits of compliance by the WRC with environmental conditions on the Jandakot and Gngangara Mounds (EPA 2004a and 2004b). In doing so, the EPA has acknowledged the increasing complexity under which protection of water-related values must be achieved. While recognising also that there has been non-compliance with criteria at a number of the sites subject to this Stage 1 section 46 review, the EPA has examined the proposed changes in the broader context of environmental values.

A matter of increasing concern to the EPA is climate change. This concern has been reinforced in recent work by the DoE and others on the Stirling Dam Catchment, which predicts a further 11 per cent decline in rainfall over the next thirty years (Berti et al 2004). Declines in rainfall and its contribution to groundwater over the Jandakot and Gnamagara Mounds can be expected. What this will mean for the future management of the mounds will be a key issue, and the DoE will need to ensure that climate change prediction and also measures of change are built into management of the mounds. It is relevant to point out that the Water Corporation has de-rated its existing surface storages by two-thirds over the past twenty five years, but groundwater allocations have increased over the same time, including over the past decade. This, in the view of the EPA, is not sustainable.

Many of the sites on the Jandakot Mound with environmental criteria established in 1992 have experienced substantial urban development, leading to the loss of the value to be protected. In some other instances, there has been a change in the environmental value such that a different criteria may be more appropriate. Under these circumstances the EPA has accepted the proposed changes. However, the EPA has also pointed to the need to review the adequacy of the remaining vegetation criteria sites to ensure that groundwater levels are managed to protected significant areas of phreatophytic vegetation and wetlands.

The EPA has not been prepared to accept some other proposed changes to criteria and to criteria sites on the Jandakot Mound. In the EPA's view, any change would be premature on the basis of existing information and would be likely to affect unacceptably environmental values.

Fewer changes have been proposed for sites on the Gnamagara Mound at this time. The EPA has accepted that values would not be further threatened by the deletion of three sites and also Coogee Springs. The EPA has not supported changes to environmental criteria for Lake Nowergup.

Greater focus will be placed on the Gnamagara Mound as part of the Stage 2 section 46 due in early 2005.

In addition to the above, the EPA considers that conditions attaching to the environmental approval should be updated. It has therefore reported also on the updating of conditions.

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.
2. The Minister notes that the proposed change is to revise the list of sites, environmental criteria, and conditions and commitments applying to the Jandakot and Gnamagara Mounds.
3. The EPA recommends that the Minister considers the report on the relevant environmental factor as set out in Section 3.
4. That the Minister notes that the EPA has concluded that some of the proposed changes can meet the EPA's objectives, and thus not impose an unacceptable impact on the environment provided there is satisfactory implementation by the proponent of the amended conditions, including the proponent's commitments, as set out in Section 4.

5. The Minister imposes the amended conditions, commitments and procedures recommended in Appendix 4 of this report.

Conditions

The EPA recommends that the following conditions, which are set out in detail in Appendix 4, be imposed if the proposal by the Water and Rivers Commission is approved for implementation:

- (a) The existing Ministerial Conditions applied to the Jandakot Groundwater Scheme Stage 2 (Ministerial Statement Number 253 published on 29 April 1992), be subject to modifications necessary to:
 - revise some environmental criteria and sites to which they apply; and
 - revise wording of conditions and commitments to improve their clarity and relevance.
- (b) The existing Ministerial Conditions applied to the Gngangara Mound Groundwater Resources and East Gngangara (Ministerial Statement Number 438 published on 6 February 1997 and Ministerial Statement Number 496 published on 17 February 1999, respectively), be subject to modifications necessary to:
 - revise some environmental criteria and sites to which they apply; and
 - revise wording of conditions and commitments to improve their clarity and relevance.

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1. Introduction and background

Following a request from the Water and Rivers Commission (WRC) in 2001, the Minister for the Environment requested the Environmental Protection Authority (EPA) to inquire into the environmental conditions applying to management of the Gngangara and Jandakot groundwater mounds. Three statements are applicable to this request are Jandakot Groundwater Scheme, Stage 2 (Statement 253), Gngangara Mound Groundwater Resources (Statement 438) and Groundwater Resource Allocation, East Gngangara, Shire of Swan (Statement 496). These statements were issued in 1992, 1997 and 1999 respectively.

The Department of Environment (DoE), on behalf of the Water and Rivers Commission, prepared a section 46 review of the environmental conditions applying to management of the Gngangara and Jandakot groundwater mounds. This is the first part of the review of environmental conditions applying to the Gngangara and Jandakot Mounds. This Stage 1 review proposes:

- amendments to specific environmental water level criteria, including removal of some of the sites to which criteria apply;
- removal of conditions and commitments that do not apply to the WRC, or where there are inconsistencies between conditions and commitments;
- modifications to several conditions and commitments to improve the consistency of approach between the Gngangara and Jandakot Mounds; and
- consolidation of the Gngangara and East Gngangara conditions and commitments

This section 46 review arose from concern by the WRC that circumstances were changing significantly on the two groundwater mounds with the result that a number of environmental conditions were no longer being consistently met. The EPA reported in May and June of this year on the WRC's compliance with conditions. As a result of land use changes over the past decade, a number of sites with environmental criteria were considered to be no longer relevant, particularly in the protection of groundwater-dependent vegetation.

The second stage of the Section 46 review, which will more strategically address the question of environmental water provisions and future management approach, is expected to be submitted to the EPA in March 2005.

Further details of the proposal are presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal. The Conditions and procedures to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 presents the EPA's conclusions and Section 6, 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. Environmental Condition Statement Nos 253, 438 and 496, published on 29 April 1992, 8 February 1997 and 17 February 1999 respectively, are presented in Appendix 3. The recommended conditions and procedures and proponent's commitments are provided two draft statements 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 relating to identifying and assessing relevant environmental factors.

2. The proposal

The proposed changes by the Water and Rivers Commission comprise two parts. The first is to revise and update the conditions applying to the Jandakot and Gnangara Mounds. In the case of the Gnangara Mound, the WRC has proposed that the two relevant statements be combined to form a single consolidated statement. The second component has been to review and revise or delete some of the proponent commitments and environmental criteria that were established through the Ministerial Statements.

The details of the changes are outlined in sections 6, 7 and 8 of the Section 46 review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions (DoE 2004)

In relation to the Jandakot Mound, the section 46 review proposed that the environmental criteria be amended at the following sites:

- Lake Forrestdale
- North Lake
- Shirley Balla Swamp
- Monitoring Well JM19
- Rare Flora Monitoring Well JM7, JM8 and JM45

In addition to these amendments on the Jandakot Mound, the DoE has proposed to delete the following monitoring well sites from the Ministerial Statements:

- JM5, JM15, JM18, JM24, JM27, JM29, JM31, JM33, JE1B, JE12C, JE18C, JE20C, JE23C, J310, JE19C

A plan showing the location of all of these sites proposed for revision or deletion is provided in Figure 2 of the section 46 review.

Changes proposed to sites or criteria on the Gnangara Mound only apply to the Gnangara Mound Groundwater Resources (Statement 438). These are for the amendment of the criteria for Lake Nowergup and the deletion of criteria from Coogee Springs and monitoring well sites JB5, PM6, PM7 and are shown on Figure 1 of the section 46 review.

Following further consideration of these proposed changes, the DoE has subsequently decided that Lakes Forrestdale and Nowergup should retain their current criteria at this time, while the change to North Lake's criteria should be less that proposed. Monitoring well JM50, located within the Atwell urban development, has also been proposed by the DoE for deletion from the criteria list.

In addition to these changes, the section 46 review proposed that a criteria applying to sites on both the Jandakot and Gnangara Mounds be deleted. This criteria specified that water levels were required to be below the preferred minimum but above the absolute minimum levels no more than 2 in 6 years. The section 46 review proposed that this criteria be deleted from the following sites on the Jandakot and Gnangara Mounds.

| Jandakot Mound | Gnangara Mound | |
|-----------------------|------------------------------|-------------------|
| Bibra Lake | Lake Goollelal | Nowergup Lake |
| Twin Bartram Swamp | Lake Joondalup | Lexia 94 wetland |
| Shirley Balla Swamp | Mariginiup Lake | Lexia 86 wetland |
| Beenyup Road Swamp | Lake Jandabup | Lexia 186 wetland |
| | Melaleuca Park (Dampland) 78 | |

During the consideration of the revisions contained in the section 46 review, the DoE has subsequently decided not to proceed with the deletion of this criteria at this time.

As a result, the number of changes to the Ministerial Statements has reduced, although the proposed revision and updating of the statements has remained.

A detailed description of the proposal is provided in Sections 6, 7 and 8 of the Section 46 Review of Environmental Conditions on Management of the Gngangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions (Department of Environment, 2004).

There are no changes to the public water supply schemes subject to the existing Ministerial statements nor to private allocations on the Gngangara or Jandakot Mounds arising from this section 46 review.

3. Relevant environmental factors

Section 46(6) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the 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.

Having considered appropriate references, public and government submissions and the proponent's response to submissions, it is the EPA's opinion that its inquiry into the proposed modification to Management of the Gngangara and Jandakot Groundwater Mounds should address the following relevant factor:

(a) Groundwater-dependent ecosystems

The above relevant factor was identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the section 46 document and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts), the adequacy of the proponent's response and commitments, and the effectiveness of current management. On this basis, the EPA considers that other factors do not require further evaluation by the EPA.

The environmental significance of the above issue and its assessment is discussed in Section 3.1 of this report. The description of the issue shows how it relates to the project. The assessment of the issue, combined with the consideration of the environmental factors relevant to it, is where the EPA considers if the proposal can be managed to meet its environmental objectives.

3.1 Groundwater-dependent ecosystems

Description

Changes proposed by the DoE to the environmental conditions applying to groundwater management on the Jandakot Mound primarily relate to two issues. The first is that substantial areas of remnant vegetation on the Jandakot Mound have been cleared for urban development and expansion of sand mining, leading to the loss of vegetation considered to be groundwater dependent in 1992. The second is that, as a result of declining groundwater levels, primarily due to lower average rainfall over the past two decades, groundwater levels in a number of sites are consistently below the current environmental criteria.

The DoE has also proposed changes to several conditions and commitments to improve the consistency of approach between the Jandakot and Gnangara Mounds, as well as taking this opportunity to combining the current Gnangara and East Gnangara statements (438 and 496).

This is the first part of the review of environmental conditions applying to the Gnangara and Jandakot Mounds. This Stage 1 review:

- identifies a number of current sites where environmental criteria sites are believed to be no longer relevant, mainly due to land use changes;
- identifies a number of sites where current environmental criteria need revision; and
- proposes revision of the three statements and proponent commitments, including combining the two Gnangara Mound statements.

As a result of the revisions that were made to the proposed changes following publication of the Stage 1 section 46 review, the proposed changes considered by the EPA are listed here.

Proposed modified criteria sites

| Jandakot Mound | Gnangara Mound |
|---|----------------|
| Lake Forrestdale | Lake Nowergup |
| North Lake | |
| Shirley Balla Swamp | |
| Monitoring Well JM19 | |
| Rare Flora Monitoring Wells JM7, JM8 and JM45 | |

Proposed deletion of criteria sites

| Jandakot Mound | Gnangara Mound |
|--|---|
| Monitoring well JM5, JM15, JM18, JM24, JM27, JM29, JM31, JM33, JM50, JE1B, JE12C, JE18C, JE20C, JE23C, J310, and JE19C | Coogee Springs Monitoring well JB5, PM6, PM7 |

Agency and public comments

Submissions generally expressed concern about the declining condition of wetlands and preferred that environmental criteria for vegetation and wetlands should not be removed or reduced until there was more information through the Stage 2 section 46 review. The need for a holistic and whole of government approach to integrated management of the land and groundwater of the mounds was emphasised in submissions as being important.

The Water Corporation supported the proposed changes to environmental criteria and conditions, but pointed out that there remains the need to clarify the institutional arrangements between the WRC, DoE, Water Corporation and EPA. The Water Corporation considers that the critical issue is the sustainability of ecological values under conditions of climate change, and the importance of the Gnangara Mound to the Integrated Water Supply System.

Assessment

This assessment addresses the proposed changes to the Jandakot Mound separately to those on the Gnangara Mound as the two mounds are discrete. The majority of changes apply to criteria or sites on the Jandakot Mound.

In undertaking this review, the EPA has placed considerable emphasis on ensuring that any changes should not compromise the protection of environmental values on the Jandakot and

Gnangara Mounds. The EPA is concerned that over the last decade there has been increasing stress on the groundwater-dependent ecosystems on the mounds resulting from factors including pumping, climate change and land use impacts.

The EPA expects the WRC, the body with statutory responsibility for water resource management, to ensure that management of groundwater delivers protection to those environmental values. On both the Jandakot and Gnangara Mounds, maintenance and support of wetlands and phreatophytic vegetation has been an important consideration by the EPA over the past two decades. The EPA has reaffirmed this position recently in its audits of compliance by the WRC with environmental conditions on the Jandakot and Gnangara Mounds (EPA 2004a and 2004b). In doing so, the EPA has acknowledged the increasing complexity under which protection of water-related values must be achieved. While recognising also that there has been non-compliance with criteria at a number of the sites subject to this Stage 1 section 46 review, the EPA has examined the proposed changes in the broader context of environmental values.

A matter of increasing concern to the EPA is climate change. This concern has been reinforced in recent work by the DoE and others on the Stirling Dam Catchment, which predicts a further 11 per cent decline in rainfall over the next thirty years (Berti et al 2004). Declines in rainfall and its contribution to groundwater over the Jandakot and Gnangara Mounds can be expected. What this will mean for the future management of the mounds will be a key issue, and the DoE will need to ensure that climate change prediction and also measures of change are built into management of the mounds. It is relevant to point out that the Water Corporation has de-rated its existing surface storages by two-thirds over the past twenty five years, but groundwater allocations have increased over the same time, including over the past decade. This, in the view of the EPA, is not sustainable.

Jandakot Mound

The area considered for assessment of this factor is generally bounded by South Street, Ranford Road, Thomas Street and Rockingham Road, within which is located the Jandakot Groundwater Scheme and much of the Jandakot Mound.

The EPA's environmental objective for this factor is to maintain the abundance, diversity, geographic distribution and productivity of groundwater-dependent ecosystems as species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge.

There have been substantial changes in the environmental values in the northern portion of the Jandakot Mound as a consequence of urban development and sand mining since 1992, when the EPA assessed of the expansion of the Jandakot Groundwater Scheme. This is described in some detail in the Stage 1 section 46 review (DoE 2004). The EPA accepts that many of the environmental values intended to be maintained have been lost through clearing. Under these circumstances, the EPA supports the proposal to delete the following groundwater monitoring wells that had a primary purpose of protecting groundwater-dependent vegetation:

- Monitoring well JM5, JM15, JM18, JM24, JM27, JM29, JM31, JM33, JM 50, JE1B, JE12C, JE18C, JE20C and JE23C.

In addition, the EPA accepts the position presented by the DoE that groundwater monitoring wells J310, and JE19C no longer need to be retained to protect possible rare flora.

All of these wells would be retained by the DoE as part of its regional groundwater level monitoring programme, but would no longer be subject to compliance with defined levels.

Despite the removal of these criteria sites, there remain significant environmental values in the northern part of the Jandakot Mound. For example, Bush Forever Sites 263, 344, 388, 390 and 492 are located in this area (Government of Western Australia, 2000). The DoE should review the location of its existing monitoring wells to determine if additional wells need to be constructed to ensure that groundwater beneath these areas continues to be managed to protect their values. New wells constructed for this purpose should have environmental criteria applied to them.

The WRC has also identified a number of sites where it has requested that the current environmental criteria be changed. The EPA provides the following comments on these proposed changes:

- Lake Forrestdale – While the EPA understand the difficulty in relation to the existing criteria, it is very mindful of the fact the Lake Forrestdale is a Ramsar listed wetland, and is therefore subject to international obligations to protect its waterbird values. It cannot support a change to the existing criteria at this time, and especially cannot agree to adopt a criteria based on groundwater levels when the relationship between groundwater and lake levels is so poorly understood. This is clearly a matter that requires further investigation, as proposed by the DoE.
- North Lake – The EPA accepts that a lower criteria level could be set for North Lake, but does not support the use of the notion of levels based on ‘rising stage’ or ‘falling stage’, nor does it consider that the proposed level of 12.32 mAHD was justified on the basis of information available. As a consequence, the EPA agrees that new criteria levels of 13.29 mAHD (preferred) and 12.68 m AHD (absolute) should apply.
- Shirley Balla Swamp – In agreeing to the DoE proposed change of criteria, the EPA notes that a level of 24.5 mAHD has been exceeded in recent years and this site may therefore continue to be in non-compliance.
- Monitoring Well JM19 – The DoE has proposed that this site be retained but that compliance reporting is suspended pending some decisions in relation to a nearby private bore. The EPA notes the reasons for non-compliance and encourages early resolution in relation to the operation of the private bore. In view of the adjoining mining activity and possible future development of the mine area, the DoE should consider relocating the bore to better represent groundwater levels in the vegetation of this site.
- Rare Flora Monitoring Wells JM7, JM8 and JM45 – The EPA agrees to the DoE proposed change of criteria and notes that the new criteria of a decline in groundwater levels of less than 0.1 m/yr has been exceeded in recent years.

The retention of the criteria only allowing water levels to fall between the minimum and absolute levels no more than 2 in 6 years to replicate natural cycles is supported. The EPA accepts that this criteria is relatively crude, but believes that it should only be relaxed with a criteria that is more relevant, on the basis of further investigation and understanding of the affects of low water levels in wetlands.

Gnangara Mound

The area considered for assessment of this factor is generally bounded by the Moore River, Gingin Brook, Gingin Brook, Chandala Brook, Ellen Brook, Swan River and the coast, within which is located the Gnangara Mound.

The EPA’s environmental objective for this factor is to maintain the abundance, diversity, geographic distribution and productivity of groundwater-dependent ecosystems as species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge.

The DoE has proposed to modify the environmental criteria applying to Lake Nowergup. The EPA is concerned that the declining water level in Lake Nowergup is having a significant effect on the environmental values of the lake. Without artificial supplementation of the lake water level, this decline would be even larger. The EPA does not support the proposed change to criteria at this time, as greater reductions in criteria water levels are likely to lead to further loss of environmental values of the lake and its surrounding vegetation.

Declining water levels in Lake Nowergup highlights a number of management issues. Supplementation of water levels by pumping water into wetlands doesn't generally appear to be as effective as originally thought and clearly is not a sustainable solution. Supplementation is being applied in areas where draw was predicted to be 'excessive' and supplementation has been used to address this. However, supplementation doesn't achieve the stated objective and other options will need to be explored, including reducing abstraction in the wetland catchment. Nowergup Lake and Jandabup Lake are supplemented and this has reduced the consequences of lower levels but has not achieved protection of all values.

Coogee Springs is the other Gnangara Mound wetland subject to this Stage 1 section 46 review. Coogee Springs has been supplemented until recently, but land use changes have had a substantial impact on the site, leading to the loss of the main ecological values. This highlights the difficulty of protecting environmental values where control of change factors is incomplete or uncoordinated. The EPA reluctantly agrees with the removal of Coogee Springs as a criteria site.

The EPA is satisfied that the removal of vegetation monitoring well sites PM6 and PM7 should not lead to adverse impacts on the surrounding vegetation, as a result of the investigations undertaken at those sites. Removal of monitoring well JB5 as a criteria site will not reduce the level of protection or management requirements for Lake Jandabup. As a consequence, the EPA agrees with these three deletions from the criteria sites for the Gnangara Mound.

Summary

Having particular regard to the:

- (a) changes in environmental values resulting from clearing for urban and other development; and
- (b) improved understanding of the dependency of vegetation to groundwater levels in some locations;

it is the EPA's view that the following changes to sites with environmental criteria can meet the EPA's environmental objective for groundwater-dependent ecosystems.

| Jandakot Mound | Gnangara Mound |
|--|---|
| <i>Modified criteria</i> | |
| North Lake | |
| Shirley Balla Swamp | |
| Rare Flora Monitoring Wells JM7, JM8 and JM45 | |
| <i>Delete criteria site</i> | |
| Monitoring well JM5, JM15, JM18, JM24, JM27, JM29, JM31, JM33, JM50, JE1B, JE12C, JE18C, JE20C, JE23C, J310, and JE19C | Coogee Springs Monitoring well JB5, PM6, PM7 |

4. Conditions and commitments

Section 46(1) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the 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.

The DoE has proposed and the EPA agrees that the current statements applying to the Jandakot and Gngangara mounds should be substantially revised, to improve the clarity of requirements and to simplify the conditions.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The EPA acknowledges the proponent's intent behind the commitments, however the recommended draft conditions in this case supercede the requirement for any additional commitments.

Consistent with the desire to improve the conditions, the opportunity has also been taken to review proponent commitments. For example, the current Jandakot statement includes many commitments made by the then Water Authority related to construction of the Jandakot Groundwater Scheme Stage 2. Since proponent responsibility has moved to the WRC, it would be preferable for these commitments to be directly applied to the Water Corporation, which is responsible for the groundwater scheme. This should be an objective to be achieved through the overall section 46 process.

As a result, the EPA has substantially altered the recommended conditions that would apply through the WRC to groundwater management of the Jandakot and Gngangara Mounds. The commitments that would be attached to the conditions have also been revised, but to a lesser extent.

4.1 Recommended commitments

The Water and Rivers Commission has made changes to commitments to reflect discussions with the DEP which have been part of the assessment process. The proponent's commitments as set out in the Stage 1 section 46 review document (Department of Environment, 2004) and subsequently modified, as shown in Appendix 4, should be made enforceable conditions.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA recommends that the following conditions be imposed if the proposal by the Water and Rivers Commission is approved for implementation:

- (a) The existing Ministerial Conditions applied to the Jandakot Groundwater Scheme Stage 2 (Ministerial Statement Number 253 published on 29 April 1992), be subject to modifications necessary to:
 - revise some environmental criteria and sites to which they apply;
 - revise wording of conditions and commitments to improve their clarity and relevance.
- (b) The existing Ministerial Conditions applied to the Gngangara Mound Groundwater Resources and East Gngangara (Ministerial Statement Number 438 published on 6 February 1997 and Ministerial Statement Number 496 published on 17 February 1999, respectively), be subject to modifications necessary to:

- revise some environmental criteria and sites to which they apply;
- revise wording of conditions and commitments to improve their clarity and relevance.

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

5. Conclusions

The EPA has considered the proposal by the Water and Rivers Commission to change some of the conditions and commitments applying to the Jandakot and Gnangara Mounds and has concluded that some of these changes can meet the EPA's objectives for the relevant environmental factors.

Many of the sites on the Jandakot Mound with environmental criteria established in 1992 have experienced substantial urban development, leading to the loss of the value to be protected. In some other instances, there has been a change in the environmental value such that a different criteria may be more appropriate. Under these circumstances the EPA has accepted the proposed changes. However, the EPA has also pointed to the need to review the adequacy of the remaining vegetation criteria sites to ensure that groundwater levels are managed to protected significant areas of phreatophytic vegetation and wetlands.

The EPA has not been prepared to accept some other proposed changes to criteria and to criteria sites on the Jandakot Mound. In the EPA's view, any change would be premature on the basis of existing information and would be likely to affect unacceptably environmental values.

Fewer changes have been proposed for sites on the Gnangara Mound at this time. The EPA has accepted that values would not be further threatened by the deletion of three sites and also Coogee Springs. The EPA has not supported changes to environmental criteria for Lake Nowergup.

Greater focus will be placed on the Gnangara Mound as part of the Stage 2 section 46 due in early 2005.

In addition to the above, the EPA considers that conditions attaching to the environmental approval should be updated. It has therefore reported also on the updating of conditions.

6. Recommendations

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.
2. The Minister notes that the proposed change is to revise the list of sites, environmental criteria, and conditions and commitments applying to the Jandakot and Gnangara Mounds.
3. The EPA recommends that the Minister considers the report on the relevant environmental factor as set out in Section 3.

4. That the Minister notes that the EPA has concluded that some of the proposed changes can meet the EPA's objectives, and thus not impose an unacceptable impact on the environment provided there is satisfactory implementation by the proponent of the amended conditions, including the proponent's commitments, as set out in Section 4.
5. The Minister imposes the amended conditions, commitments and procedures recommended in Appendix 4 of this report.

Appendix 1

List of Submitters

State/Local Government

- Water Corporation of Western Australia
- City of Wanneroo

Organisations

- Conservation Council of Western Australia
- Wetlands Conservation Society

Individuals

- P Evans

Appendix 2

References

Berti, M. L., Bari, M. A., Charles, S. P., Hauck, E. J. (2004), *Climate change, catchment runoff and risks to water supply in the south-west of Western Australia*, Department of Environment.

Department of Environment (2004), *Section 46 Review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions*

Environmental Protection Authority (2004a), *Environmental Management of Groundwater Abstraction from the Jandakot Groundwater Mound – 2002/03 Annual Compliance Report. EPA Bulletin 1134*

Environmental Protection Authority (2004b), *Environmental Management of Groundwater Abstraction from the Gnangara Groundwater Mound, July 2000 – June 2003 Triennial Report. EPA Bulletin 1139*

Government of Western Australia (2000), *Bush Forever*

Appendix 3

Statements of Environmental Conditions of Approval

Jandakot Groundwater Scheme, Stage 2 (1992)

Gnangara Mound Groundwater Resources (1997)

Groundwater Resource Allocation, East Gnangara (1999)



WESTERN AUSTRALIA
MINISTER FOR THE ENVIRONMENT

**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

JANDAKOT GROUNDWATER SCHEME, STAGE 2 (196)

WATER AUTHORITY OF WESTERN AUSTRALIA

This proposal may be implemented subject to the following conditions:

1. Proponent Commitments

In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the Public Environmental Review and included as Appendix 1 in Environmental Protection Authority Bulletin 587 (A copy of the commitments is attached).

2. Implementation

Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3. Operation of the Wellfield

3-1 Prior to 1 December each year, the proponent shall determine anticipated public water supply abstraction limits and shall advise the Environmental Protection Authority of those limits, the period to which the limits apply and details of the actual and anticipated environmental effects of abstraction.

3-2 The proponent shall operate within the limits and the period specified in condition 3-1.

3-3 The proponent shall inform the Environmental Protection Authority immediately of any proposed change to the anticipated abstraction limit and period. Changes made after 1 December each year shall be to the satisfaction of the Environmental Protection Authority.

4. Monitoring, Reporting and Auditing

Monitoring is to be conducted by the proponent in order to assess the environmental impacts of the project and to provide feedback for future management. On-going monitoring and reporting requirements will be reviewed by the Environmental Protection Authority after submission of the third triennial report.

Published on

29 APR 1992

4-1 Prior to commissioning the wellfield, the proponent shall prepare a detailed environmental monitoring plan, to the satisfaction of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management. This monitoring plan shall include, but not be limited to monitoring the following:

- 1 vegetation ;
- 2 fauna ;
- 3 habitat ; and
- 4 groundwater levels.

4-2 The proponent shall submit brief annual and more detailed triennial reports addressing, but not limited to the following:

- 1 the quantity of water abstracted for public use and estimated quantity for private use;
- 2 environmental monitoring results;
- 3 compliance with the environmental criteria and the commitments;
- 4 compliance with the environmental objectives;
- 5 a review of the effectiveness of the criteria in meeting the environmental objectives; and
- 6 any proposed changes to management, monitoring or mitigation of wetland impacts,

to the satisfaction of the Environmental Protection Authority.

4-3 The proponent shall submit the reports required by condition 4-2 to the Environmental Protection Authority and shall make them publicly available. The annual reports shall be submitted by 1 December and the triennial reports by 1 March, following commencement of the operation of the scheme.

4-4 The proponent shall report any breach or anticipated breach of the environmental criteria or environmental objectives to the Environmental Protection Authority immediately.

4-5 If impacts are detected which are deemed to be unacceptable by the Environmental Protection Authority, the proponent shall modify sub-area water allocations and abstraction strategies for the Jandakot Public Water Supply Area to the satisfaction of the Environmental Protection Authority.

5. Wetland Management

Wetlands are to be protected, except in those instances where it is not practical to protect the wetland function and area, in which case these losses shall be mitigated by the proponent.

5-1 Prior to commissioning the wellfield, the proponent shall prepare a plan to mitigate losses of wetland area and wetland function that are likely to occur as a consequence of the development and operation of the wellfield, based initially on the anticipated impacts associated with the likely future land use/abstraction scenario for the area, to the satisfaction of the Minister for the Environment on advice of the Environmental Protection Authority. This plan shall include but not necessarily be limited to:

- 1 a description of the processes used for identifying the likely wetland impacts;
- 2 the identification of individual wetlands that will be affected, quantification of the likely changes in water level expected to occur, and the likely impacts of these changes on the areas and functions of the wetlands;

- 3 identification of wetlands that are likely to be dry on 1 December each year as a result of abstraction (ie. the area of free water is less than 1000 square metres or less than 20 percent of the wetland area);
- 4 the existing importance of the areas that will be affected (eg rare and endangered flora and fauna present, number of breeding waterbird species);
- 5 a strategy to mitigate losses of wetland area and function, including details of compensatory action. This should include details of the strategy to mitigate against impacts on Twin Bartram and Solomon Road Swamps, using all reasonable and practicable means;
- 6 a commitment to modify the plan to the satisfaction of the Environmental Protection Authority, based on the results of future environmental impact monitoring; and
- 7 a commitment to modify the plan to the satisfaction of the Environmental Protection Authority, if impacts are detected which are deemed to be unacceptable by the Environmental Protection Authority.

5-2 The plan required by condition 5-1 shall be made available for public comment.

5-3 Subsequent to conditions 5-1 and 5-2, the proponent shall commence implementation of the approved wetland management plan within two years of commissioning the wellfield, to the satisfaction of the Environmental Protection Authority.

6. Environmental Management Programme

6-1 Prior to the commissioning of the wellfield, the proponent shall prepare a comprehensive environmental management programme to the satisfaction of the Minister for the Environment on advice of the Environmental Protection Authority. This programme shall reflect the anticipated future land use/abstraction scenario for the area and shall include, but not necessarily be limited to:

- 1 an environmental monitoring plan as required by condition 4, and
- 2 a wetland management plan as required by condition 5.

6-2 The proponent shall implement the comprehensive environmental management programme required by condition 6-1, to the satisfaction of the Environmental Protection Authority.

7. Decommissioning

The proponent is responsible for decommissioning and removal of the public water supply installations and rehabilitating the site and its environs.

7-1 At least six months prior to decommissioning the wellfield, the proponent shall prepare a decommissioning and rehabilitation plan, to the satisfaction of the Environmental Protection Authority.

7-2 The proponent shall implement the decommissioning and rehabilitation plan required by condition 7-1, to the satisfaction of the Environmental Protection Authority.

8. Proponent

No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

9. **Time Limit on Approval**

If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority).

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

29 APR 1992



MINISTER FOR THE ENVIRONMENT;
EMPLOYMENT AND TRAINING

Ass # 697
Bull # 817
State # 438

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

STATEMENT FOR THE WATER AND RIVERS COMMISSION

PROPOSAL: GNANGARA MOUND GROUNDWATER
RESOURCES (041/697)

CURRENT PROPONENT: THE WATER AND RIVERS COMMISSION (JOINT)

CONDITIONS SET ON: 8 MARCH 1988

The implementation and management of groundwater allocations for the Gnangara Mound Groundwater Resources are now subject to the following conditions which replace all previous conditions applicable to the above-mentioned proponent (see note at foot of this statement):

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

- 1-1 In implementing the proposal, the proponent shall fulfil the relevant environmental management commitments made in "Review of Proposed Changes to Environmental Conditions", which revised the Environmental Review and Management Programme (November 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 in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

The environmental management commitments were published in Environmental Protection Authority Bulletin 817 (Appendix 3) and a copy as revised in November 1996 is attached.

Published on

- 6 FEB 1997

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

- 2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.
- 2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Groundwater Allocation

- 3-1 The proponent shall ensure that the allocation of water to public and private users and the operation of Pinjar Stages 1, 2 and 3, Wanneroo and Mirrabooka groundwater schemes comply with the environmental water provisions set as part of the assessment.

4 Groundwater-dependent Ecosystems

- 4-1 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.

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.
- 5-2 In conjunction with the Ministry for Planning and the Department of Conservation and Land Management, the proponent shall subject to regular review the basis for management decisions and the criteria specified for conservation of the environment and of the groundwater resource of the Gngangara Mound, to the requirements of the Department of Environmental Protection.

6 Groundwater Availability

- 6-1 The proponent shall continue the current approach in widely publishing the limits on groundwater availability for the Gngangara Mound.
- 6-2 The proponent shall update and publish annually the figures published according to the requirements of condition 6-1 with emphasis on those areas of high conflict for the use of the resource so that limits to growth and development can be clearly seen by all interested parties.

7 Water Conservation

- 7-1 The proponent shall actively encourage further reduction in public water demand through its Water Conservation Strategy.

8 Referral of Subsequent Schemes

- 8-1 The proponent shall refer proposals to allocate groundwater for subsequent public water supply schemes on the Gngangara Mound to the Environmental Protection Authority. This includes the Yeal, Barragoon and Muchea Schemes.

9 Research and Monitoring

- 9-1 In addition to those areas of research and monitoring proposed in the existing monitoring programme, as detailed in the revised and consolidated commitments of May 1996, the proponent shall undertake the following specific areas of research and monitoring:

- 1 clarification of the relationship between groundwater level and wetland water quality; and
- 2 improvement in understanding of the conservation value of wetlands on the Gngangara Mound, especially those for which information on their value is limited;

to the requirements of the Environmental Protection Authority.

10 Reporting

- 10-1 The proponent shall submit brief annual and more detailed triennial reports on environmental monitoring and management of the Gngangara Mound, to the requirements of the Department of Environmental Protection.

11 Proponent

These conditions legally apply to the nominated proponent.

- 11-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

12 Compliance Auditing

To help determine environmental performance and compliance with the conditions, periodic reports on the implementation of the proposal are required.

- 12-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

- 1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.
- 2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.
- 3 The Water and Rivers Commission, the Water Corporation, the Ministry for Planning and the City of Wanneroo will ensure efficient interaction and liaison between land use planning and water resource planning through relevant plans, policies and strategies.

- 4 The Water and Rivers Commission and the Department of Conservation and Land Management will enter into a 'Memorandum of Understanding' to document the management of land vested in the Department of Conservation and Land Management on the Gnangara Mound.

The 'Memorandum of Understanding' will include consideration of the following issues:

- 1 In the existing or proposed management plans for land on the Gnangara Mound, the principle objectives should include protection of native vegetation (in areas other than areas where control of vegetation is required, such as adjacent to young pines);
 - 2 Wetland management should have a high priority and management objectives for the wetlands should be consistent with the water levels specified by the Department of Environmental Protection; and
 - 3 Management plans, as far as they relate to State Forest 65, should clearly reflect "water production" as a priority purpose. The pine plantations in State Forest 65 should be managed with the objective of achieving and maintaining their water use at a level that is no more than that of the pre-existing native vegetation. This should be based on progressively moving towards an average basal area within the pine plantation of approximately 11 square metres per hectare.
- 5 The Western Australian Planning Commission and the Department of Conservation and Land Management will initiate the consolidation into managed conservation reserves, of those wetlands and other native vegetation areas on the Gnangara Mound identified by the Environmental Protection Authority as having conservation value.

Note

- 1 Conditions for this proposal, applicable to the Water Corporation as joint proponent, were amended in a separate statement issued on the same date as below.


CHERYL EDWARDES (Mrs) MLA
MINISTER FOR THE ENVIRONMENT

- 5 FEB 1997

Proponent's Environmental Management Commitments

November 1996

GNANGARA MOUND GROUNDWATER RESOURCES (041/697)

WATER AND RIVERS COMMISSION RESPONSIBILITY

The following commitments made by the Water and Rivers Commission on the allocation and management of groundwater within the study area of the Gngangara Mound are revised commitments associated with the Section 46 Review, which replace all previous commitments.

COMMITMENTS TO BE FULFILLED AT SPECIFIC TIMES DURING THE PROJECT

- 1 The Water and Rivers Commission will, within three months of receiving environmental approvals, request the Water Corporation to establish further monitoring wells at a 200 m radius from production wells located within areas of phreatophytic vegetation. These wells will be monitored monthly, and more frequently if necessary, to guide wellfield operators in minimizing environmental impacts.
- 2 The Water and Rivers Commission will, within three months of receiving environmental approvals, establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation, to the satisfaction of the EPA.
- 3 The Water and Rivers Commission will, by spring 1997, select a range of indicator species at established terrestrial vegetation transects and determine an "acceptable" rate of change in vegetation composition at those transects impacted by groundwater abstraction. Rates of change will be measured using the indicator species and similarity indices.
- 4 The Water and Rivers Commission will, within six months of receiving environmental approval, require the Water Corporation, through their licence conditions, to prepare an environmental operations plan to provide specific detail on environmental management of groundwater schemes in the study area. This will provide detailed management prescriptions for wellfield operators and water resource managers.
- 5 The Water and Rivers Commission will prepare a water resources allocation and management plan for the Yeal area to identify groundwater allocations, prior to the development of the Yeal Groundwater Scheme, to the satisfaction of the EPA.
- 6 The Water and Rivers Commission will prepare a water resources allocation and management plan for the Lexia area to identify groundwater allocations, prior to the development of the Lexia Groundwater Scheme, to the satisfaction of the EPA. In particular, it will include detailed modelling of the Lexia Groundwater Scheme to optimise groundwater availability while minimizing environmental impacts.
- 7 The Water and Rivers Commission will, by June 1997, in conjunction with the Department of Conservation and Land Management and the Water Corporation develop a memorandum of understanding on pine management regimes within State Forest 65 which recognizes the dual use of water and forests, and optimises water and timber production, while minimizing environmental impacts.

ON-GOING COMMITMENTS THROUGHOUT THE LIFE OF THE PROJECT

General

- 8 The Water and Rivers Commission will manage all groundwater allocation and use on the Gngangara Mound with the aim of meeting wetland management objectives listed in table 15. Environmental water provisions have been determined to aid achievement of these

objectives. The Water and Rivers Commission will manage all groundwater allocation and use on the Gngangara Mound to meet the environmental water provisions which are listed in table 16 and to minimize environmental impacts. (The achievement of wetland objectives and performance criteria will be measured against minimum water level requirements only. Other landuse impacts will not be managed by the Water and Rivers Commission).

- 9 The Water and Rivers Commission will continue to facilitate and undertake strategic research on environmental water requirements, and the management of groundwater use to minimize environmental impacts.
- 10 The Water and Rivers Commission will continue to provide advice to the City of Wanneroo, the Ministry for Planning, the Department of Conservation and Land Management, and other relevant agencies, on the impact of land uses on groundwater resources.
- 11 The Water and Rivers Commission will, as necessary, in conjunction with the Department of Conservation and Land Management, continue to develop catchment strategies to minimize change in the hydrological regime within the caves in Yanchep National Park.
- 12 The Water and Rivers Commission will, as necessary to manage water levels, prepare strategic drainage plans for the study area, including options for management of high water levels in lakes Joondalup, Goollelal, Mariginiup and Jandabup.

Administrative Arrangements

- 13 In consultation with other relevant agencies, the Water and Rivers Commission will, within six months of receiving environmental approvals, reconvene and provide on-going executive support for an inter-agency technical advisory group for water resources planning and management issues on the Gngangara Mound. This will be done in the context of the recommendations of the Select Committee on Metropolitan Development and Groundwater Supplies.
- 14 The Water and Rivers Commission will continue to chair and provide support for the Community Consultative Committee as an on-going forum for information exchange and advice to the Water and Rivers Commission on general water management issues.

Reporting

- 15 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, compliance with environmental water provisions and environmental conditions, and environmental impacts. In those years when a triennial report is not submitted, the Water and Rivers Commission will report to the Department of Environmental Protection on compliance with environmental conditions.

Contingency Plans

- 16 The Water and Rivers Commission will require the Water Corporation as a part of their licence conditions to design and operate production wells to limit the potential for tree deaths around production wells to within specific distances from those wells. Tree deaths will only occur within a 100 m radius of the well under normal climatic conditions, and within a 200 m of the well in climatic extremes (eg droughts, high temperatures). Contingency measures may include closing down wells in sensitive areas during extreme climatic conditions.

- 17 The Water and Rivers Commission will, when necessary to meet Environmental Water Provisions (EWPs), upgrade the artificial maintenance facility for Lake Nowergup to provide more rapid recharge to the lake, to the satisfaction of the EPA.
- 18 The Water and Rivers Commission will when necessary to meet EWPs, establish an artificial maintenance facility for Coogee Springs, to the satisfaction of the EPA.
- 19 For Lakes Nowergup and Coogee Springs, should environmental water provisions not be met by 1 November, the Water and Rivers Commission will implement artificial supplementation until the EWP has been reached. For Lake Jandabup, should environmental water provisions not be met by 1 November, the Water and Rivers Commission will request the Water Corporation to implement artificial supplementation until the EWP has been reached. This requirement will form part of the Water Corporation's licence conditions.
- 20 Where water levels below preferred water levels are permitted 2 years in every 6, the Water and Rivers Commission will, where possible, only allow drops below the preferred level to occur in low-rainfall years in order to mimic natural regimes.

Management and Monitoring Programme

- 21 The Water and Rivers Commission will formally review the environmental water provisions every six years as a minimum, or as required for adaptive management, as a component of reporting to the Environmental Protection Authority, to the satisfaction of the EPA. Any review will incorporate mechanisms for public involvement.
- 22 The Water and Rivers Commission will, after receiving environmental approvals, implement and undertake the following monitoring programme, to the satisfaction of the EPA:
 - 23 Groundwater level monitoring across the established monitoring network, at a frequency of 1 or 3 months, depending on the wells.
 - 24 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.
 - 25 Wetland vegetation will be mapped every two years from large scale aerial photography for Lakes Jandabup, Mariginiup, Nowergup and Loch McNess.
 - 26 Water quality will be monitored annually in November at all wetlands for which EWPs have been set.
 - 27 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.
 - 28 Established terrestrial vegetation transects will continue to be monitored in spring, with at least 6 transects monitored every three years.
 - 29 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.
 - 30 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.

- 31 Continuous water level monitoring in three caves in Yanchep National Park will continue, with further cave monitoring established in suitable caves.
- 32 Aquatic fauna will be monitored within those cave streams containing root mats once per year in November.
- 33 Water levels in wells for which EWPs have been established will be monitored every month.
- 34 Water levels in piezometer transects in the Yanchep area will be monitored each month.
- 35 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.
- 36 Water levels will continue to be monitored once per month in 28 wetlands within the study area.
- 37 Water level monitoring in the 13 wetlands for which EWPs have been set will occur more frequently than once per month, when necessary, to determine compliance with set levels.
- 38 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.
- 39 The Water and Rivers Commission will, on receiving environmental approvals, prepare monitoring protocols for aquatic fauna monitoring within the wetlands, to the satisfaction of the EPA.



MINISTER FOR THE ENVIRONMENT;
LABOUR RELATIONS

Statement No.

000496

**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

**GROUNDWATER RESOURCE ALLOCATION, EAST GNANGARA
SHIRE OF SWAN**

Proposal: The abstraction of groundwater for public and private water supply from the East Gnangara Mound, with provision for environmental water requirements, as documented in schedule 1 of this statement.

Proponent: Water and Rivers Commission

Proponent Address: 3 Plain Street, EAST PERTH WA 6004

Assessment Number: 932

Report of the Environmental Protection Authority: Bulletin 904

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

1 Implementation

- 1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.
- 1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.
- 1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

Published on

17 FEB 1999

2 Proponent Commitments

- 2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.
- 2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Proponent

- 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 proposal 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 in respect of the proposal.
- 3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this 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.
- 3-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

4 Commencement

- 4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.
- 4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.
- 4-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 4-1 and 4-2.
- 4-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

5 Compliance Auditing

- 5-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

5-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal clearances.

5-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

CHERYL EDWARDES (Mrs) MLA
MINISTER FOR THE ENVIRONMENT

17 FEB 1999

Schedule 1

The Proposal

The proposal is to allocate groundwater for abstraction from the eastern side of the Gngangara Mound to the Water Corporation and other uses, while allowing for provision of groundwater to the environment. Abstraction will provide for urban development in the north-east corridor in addition to supplementing the Perth metropolitan water supply, and groundwater for private users.

Table 1. Key environmental criteria for terrestrial vegetation, wetlands and seepages in East Gngangara study area.

| Location | Monitoring Well | EWR (minimum water level metres AHD) | EWP (minimum water level metres AHD) | EWP < EWR (metres) |
|---------------------|-----------------|--------------------------------------|--------------------------------------|--------------------|
| Vegetation | | | | |
| Melaleuca Park | WM6 | 58.8 | 58.3 | 0.5 |
| Melaleuca Park | WM8 | 65 | 64.8 | 0.2 |
| Melaleuca Park | NR6C | 58.5 | 58.5 | - |
| Melaleuca Park | WM2 | 67 | 66.5 | 0.5 |
| Melaleuca Park | NR11C | 55 | 55 | - |
| Whiteman Park | MM49B | 24.7 | 24.7 | - |
| Whiteman Park | MM53 | 33.3 | 33.3 | - |
| Whiteman Park | MM55B | 29.5 | 29.5 | - |
| Whiteman Park | MM18 | 38.6 | 38.6 | - |
| Whiteman Park | MM59B | 36.3 | 36.3 | - |
| Vegetation Corridor | MM12 | 43 | 42 | 1.0 |
| Vegetation Corridor | L30C | 47.5 | 47.2 | 0.3 |
| Vegetation Corridor | L110C | 57 | 55.7 | 1.3 |
| Vegetation Corridor | L220C | 52.5 | 52.2 | 0.3 |
| | | EWR^a | | |
| Wetlands | | Minimum | Absolute minimum | |
| Melaleuca Park 78 | GNM13 | 5.5m below ground | 5.8m below ground | |
| Melaleuca Park 173 | GNM14 | 0.1m above ground | 0.1m above ground | |
| Lexia 186 | GNM15 | 0.8m below ground | 1.1m below ground | |
| Lexia 86 | GNM16 | 1.0m below ground | 1.3m below ground | |
| Lexia 94 | GNM17A | 1.5m below ground | 1.8m below ground | |
| | | EWR | EWP | |
| Seepages | | | | |
| Edgecombe | B10 | 14.35 ^b | ^b | |
| Egerton | B25 | 39.29 ^c | 39.29 ^c | |

Key:

EWR = Environmental Water Requirements.

EWP = Environmental Water Provisions.

- a - Interim EWRs and absolute minimum water levels have been determined for these wetlands. EWPs will be provided following investigation of stratigraphy and water regimes, and reported in the triennial review.
- b - Recommendation for management only. The seepage is outside the zone of influence of the proposal; final water levels are expected to be affected by factors unrelated to groundwater abstraction for public water supply.
- c - Access to land required before monitoring can be conducted.

Locations of East Gngangara study area and abovementioned wells, wetlands and vegetation are shown in Figures 1, 2 and 3 (attached).

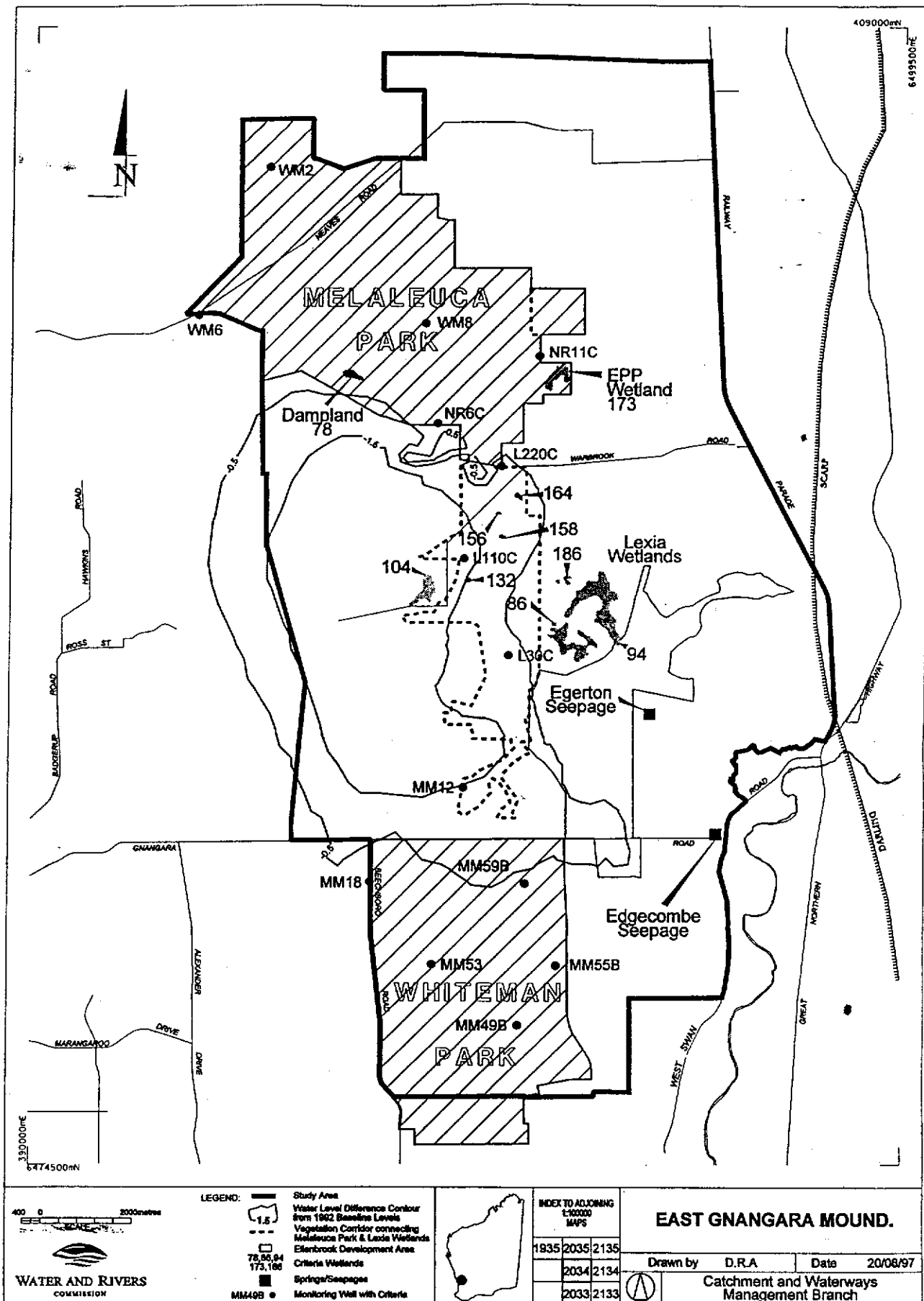


Figure 1. Location of monitoring wells, wetlands and seepages in the East Gungahra study area (Source: WRC 1998).

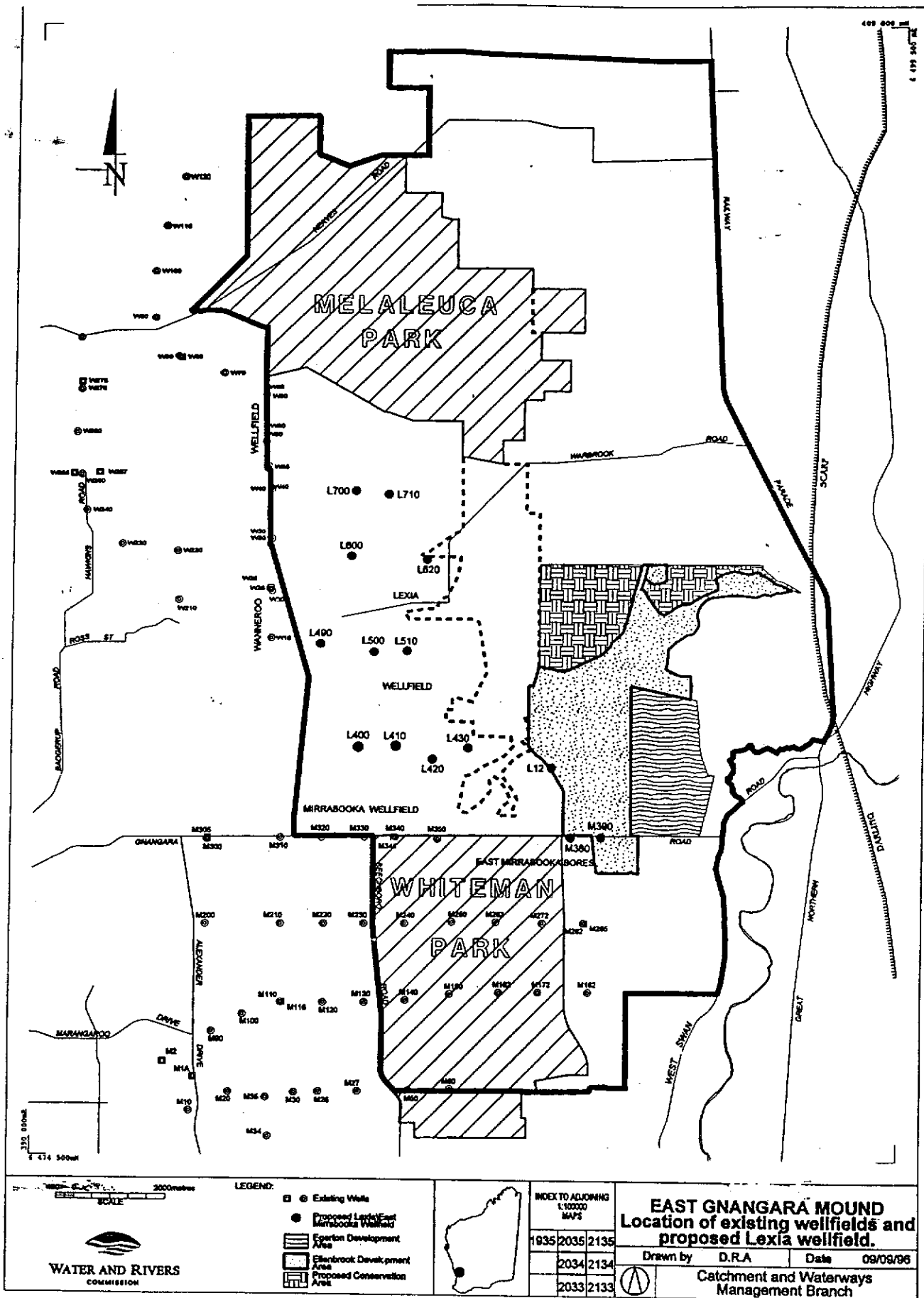


Figure 2. Location of production wells for the proposed Lexia wellfield (Source: WRC 1997).

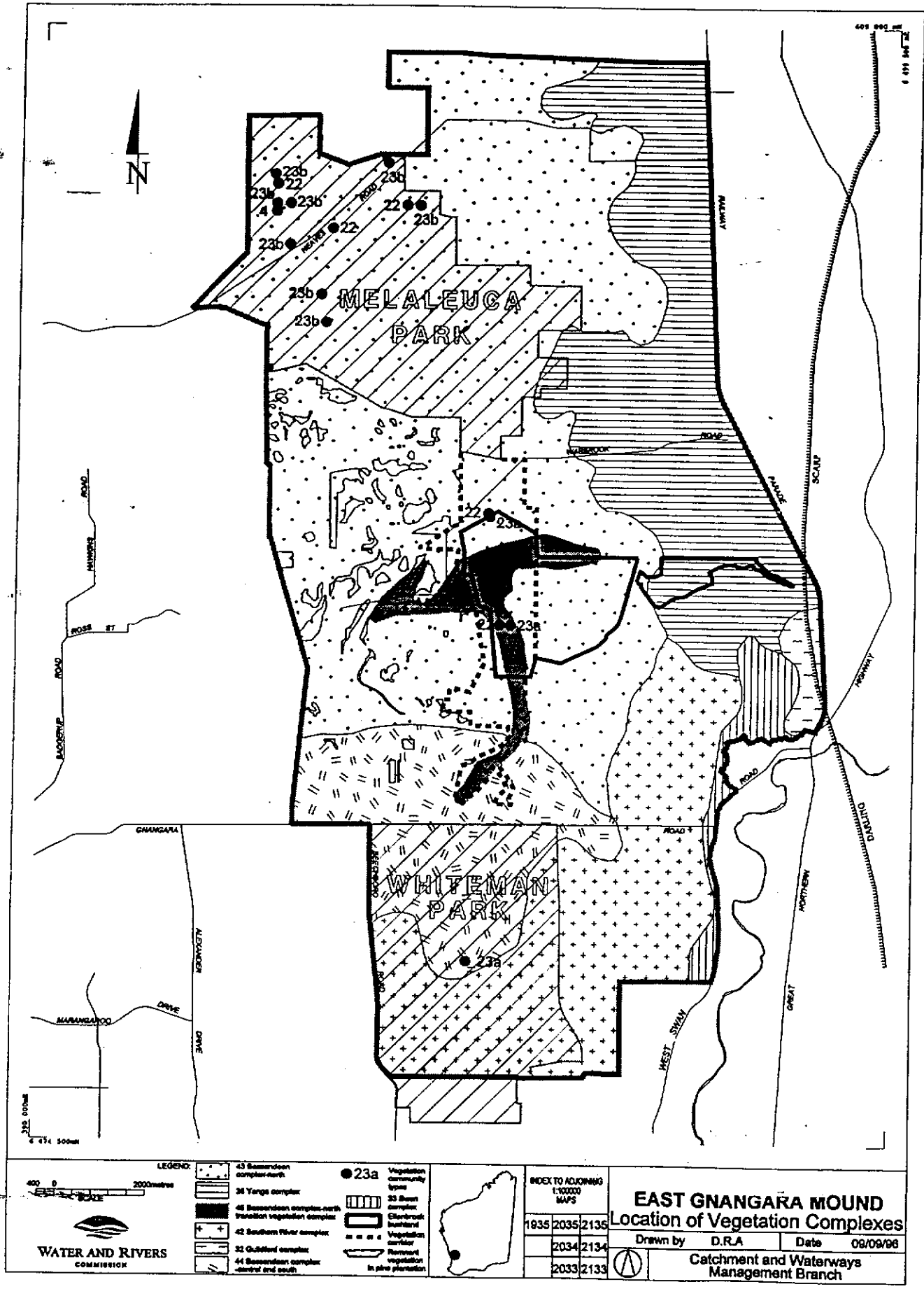


Figure 3. Vegetation complexes in the East Gungahra study area (Source: WRC 1997).

**Proponent's Consolidated Environmental Management
Commitments**

February 1999

**GROUNDWATER RESOURCE ALLOCATION
EAST GNANGARA, SHIRE OF SWAN (932)**

Water and Rivers Commission

**GROUNDWATER RESOURCE ALLOCATION, EAST GNANGARA, SHIRE OF SWAN - ENVIRONMENTAL
MANAGEMENT COMMITMENTS (ASSESSMENT NO. 932) - FEBRUARY 1999**

| Commitment number | Commitment (What) | Objective (Why) | Action (How/Where) | Timing (When) | Whose advice (to Whom) | Measurement/ Compliance criteria |
|--------------------------|--|---|--|--|-------------------------------|--|
| 1. | Manage public & private groundwater abstraction to meet objectives and EWPs*. | As per column 3 of table A | As per column 4 in table A (& columns 2&3 in table B). | Ongoing particularly summer / autumn | DEP | Annual/ Triennial reports & as necessary |
| 2. | Prepare annual & triennial reports. | Report on compliance, impacts, review abstraction & criteria etc | Review abstraction, monitoring etc. | annually, triennially | DEP | Annual/ Triennial reports |
| 3. | Investigate water regimes and stratigraphy in Lexia wetlands, and wetland 173 and dampland 78 in Melaleuca Park. | To identify if perched, degree of dependence on groundwater, and to confirm EWRs* | By a drilling and monitoring programme. | In first 3 years following project approval | DEP | First triennial report |
| 4. | Conduct research on EWRs*. | Improve knowledge | provide support to research projects, conduct investigations. | - ongoing - major vegetation project will finish end 1999 | DEP | Triennial reports |
| 5. | Review EWPs*. | Adaptive management - incorporate new knowledge. | By monitoring / research. | Six yearly or more frequently as necessary | DEP | Triennial reports & as necessary |
| 6. | Implement monitoring programme. | Feedback to EWPs* | water level, vegetation, invertebrate and frog monitoring as outlined 6.1-6.17 in attached document "Commitments (932)". | monthly, yearly, triennially & ongoing. | DEP | Annual & Triennial reports & as necessary. |

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| 7. | Determine pine management regime for SF65. | Optimise water and timber production / development of Gngangara Park while minimising environmental impacts. | Develop a MOU with CALM which includes pine harvesting over 20 years and Gngangara Park establishment. | June 1999 | DEP | MOU and monitoring results in annual reports |
| 8. | Provide advice on impacts of landuse on groundwater resources. | Assist protection / management groundwater resources. | Provide advice as required. | Ongoing | Other agencies, especially Shire of Swan and MFP. | - |
| 9. | Determine EWPs* for new, appropriately located, wells in the vegetation corridor. | To assist groundwater resource management and to be in compliance with EWPs* for new wells. | Collect and review monitoring data. | In first 3 years following project approval | DEP | Triennial report |
| 10. | Chair Consultative Committee for the Gngangara Mound. | To exchange information/advice with stakeholders. | Conduct meetings at local shire. | Annually | local government, relevant government agencies, conservation and community groups | Meeting minutes and brief documentation in triennial reports. |
| 11. | Production wells close to phreatophytic vegetation to be appropriately phased in by the Water Corporation. | To allow vegetation to adapt and minimise impacts of groundwater drawdown. | Include requirement in licence conditions. | When groundwater licence for Lexia wells provided. | Water Corporation DEP | Licence conditions. Annual reports by Water Corporation. |
| 12. | Require the Water Corporation to develop and implement a wetland mitigation strategy for any loss of values in 132, 156, 158, 164 and 104. | Compensate for any loss of wetland values. | Assist with determining an appropriate wetland mitigation strategy and include requirement in licence conditions. | Develop strategy prior to commissioning of Lexia wellfield and implement actions as necessary to avoid or compensate loss of values as impacts become apparent | Water Corporation CALM DEP | Licence conditions |

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|-----|---|--|---|---|------|---|
| 13. | Require the Water Corporation to prepare operations plans (with environmental commitments to meet EWPs*) for the Lexia and East Mirrabooka groundwater schemes. | To ensure that operation of the Water Corporation's groundwater schemes complies with Water & Rivers Commission environmental conditions / commitments on EWPs*. | Include requirement for operations plan in licence conditions. | In 6 months following project approval and prior to commissioning of the Lexia wellfield | DEP | Licence conditions Operations Plan |
| 14. | Map vegetation community types on the Gnangara Mound. | To assist future groundwater management and water supply planning. | Develop and undertake a vegetation mapping programme. | To be determined in development of mapping programme which will be submitted 3 months after approvals of the East Gnangara Plan obtained. | DEP | Mapping programme and maps |
| 15. | Monitor water levels and vegetation in wetland 132. | To obtain information on drawdown impacts. | Monitor water levels monthly & vegetation transect in spring. | Establish monitoring prior to commissioning of wellfield and conduct for 3 years, then review. | DEP | Licence conditions Annual / Triennial reports. |
| 16. | Liaise with Aboriginal community. | Provide an understanding of the proposal and how it relates to Aboriginal issues. | The proponent will consult directly with Swan Valley Nyungah Community. | In 6 months following project approval and prior to commissioning of Lexia wellfield | DEP | Meeting minutes & brief documentation in annual report. |
| 17. | Carry out dieback survey. | To ensure the disease is not introduced into dieback-free areas. | Prepare and implement dieback management procedures. | Prior to and during commissioning of Lexia wellfield. | CALM | Annual report. |

* - EWR and EWP denote Environmental Water Requirements and Environmental Water Provisions, respectively.

Table A: Environmental Criteria (932) - February 1999

| WELL | LOCATION | Environmental Water Provisions (EWPs) | | |
|--------|---|---|----------------------------|-------------------------------------|
| | | Management Objective | Minimum water level (mAHD) | Absolute minimum water level (mAHD) |
| WM6 | Melaleuca Park | Protect native vegetation from any further groundwater abstraction impacts | 58.3 | * |
| WM8 | Melaleuca Park | Protect native vegetation from any further groundwater abstraction impacts | 64.8 | * |
| NR6C | Melaleuca Park | Protect native vegetation from any further groundwater abstraction impacts | 58.5 | * |
| WM2 | Melaleuca Park | Protect native vegetation from any further groundwater abstraction impacts | 66.5 | * |
| NR11C | Melaleuca Park | Protect native vegetation from any further groundwater abstraction impacts | 55 | * |
| MM49B | Whiteman Park | Protect native vegetation from any further groundwater abstraction impacts | 24.7 | * |
| MM53 | Whiteman Park | Protect native vegetation from any further groundwater abstraction impacts | 33.3 | * |
| MM55B | Whiteman Park | Protect native vegetation from any further groundwater abstraction impacts | 29.5 | * |
| MM18 | Whiteman Park | Protect native vegetation from any further groundwater abstraction impacts | 38.6 | * |
| MM59B | Whiteman Park | Protect native vegetation from any significant groundwater abstraction impacts | 36.3 | * |
| MM12 | Native vegetation corridor | Protect native vegetation but allow a slow change to a drier community structure | 42 | * |
| L30C | Native vegetation corridor | Protect native vegetation but allow a slow change to a drier community structure | 47.2 | * |
| L110C | Native vegetation corridor | Protect native vegetation but allow a slow change to a drier community structure | 55.7 | * |
| L220C | Native vegetation corridor | Protect native vegetation but allow a slow change to a drier community structure | 52.2 | * |
| GNM13 | Dampland 78 ¹ - Melaleuca Park | Maintain existing areas of wetland vegetation | ** | ** |
| GNM14 | EPP 173 - Melaleuca Park | <ul style="list-style-type: none"> • Maintain existing areas of wetland and stream • Maintain existing areas of wetland vegetation • Protect invertebrate communities dependent on the wetland and stream • Protect the fish, <i>Galaxiella nigrostrata</i> | ** | ** |
| GNM15 | Lexia wetland 186 | <ul style="list-style-type: none"> • Protect current vegetation assemblages in and fringing the wetland • Protect any aquatic invertebrate fauna dependent on the wetland | ** | ** |
| GNM16 | Lexia wetland 86 | <ul style="list-style-type: none"> • Protect current vegetation assemblages in and fringing the wetland • Protect any aquatic invertebrate fauna dependent on the wetland | ** | ** |
| GNM17A | Lexia wetland 94 | Protect current vegetation assemblages in the wetland | ** | ** |
| B10 | Edgecombe seepage | Maintain a permanent flow of water in the seepage | 14.35 *** | * |
| B25 | Egerton seepage | Maintain a permanent flow of water in the seepage | 39.29 ***** | * |

* not applicable

** to be determined

*** Recommendation for management only

**** Cannot be monitored until access to the land granted

¹ wetland reference numbers from Water and Rivers Commission Public Environmental Review document.

Table B: Interim Environmental Water Requirements - October 1998 (932)

| Wetland | Interim Environmental Water Requirement ¹ | |
|-----------------------|--|--|
| | Minimum | Absolute minimum |
| Lexia wetland 1 (94) | 1.5m below ground (45.8 mAHD - well GNM 17A) | 1.8m below ground (45.5 mAHD - well GNM 17A) |
| Lexia wetland 2 (86) | 1m below ground (47.3 mAHD - well GNM 16) | 1.3m below ground (47 mAHD - well GNM 16) |
| Lexia wetland 3 (186) | 0.8m below ground (47.5 mAHD - well GNM 15) | 1.1m below ground (47.2 mAHD - well GNM 15) |
| EPP wetland 173 | 0.1m above ground (in western sector) | |
| Dampland 78 | 5.5m below ground (65.4 mAHD - well GNM 13) | 5.8m below ground (65.1 mAHD - well GNM 13) |

1. Note that these Environmental Water Requirements are by necessity, interim, due to a range of difficulties in establishing appropriate criteria taking into account "perching" of water levels and accurate survey information. Final criteria monitoring points are still to be established in some wetlands.

Commitments (932) - February 1999

1. The proponent will manage public and private groundwater abstraction to meet the water regime management objectives and Environmental Water Provisions (EWPs) summarised in Table A. The proponent will also manage abstraction to meet the interim EWRs in Table B. As these EWRs are interim, they will be reviewed in the first triennial report to the EPA and updated as appropriate.
2. The proponent will report on the management and monitoring of the Eastern Gngangara Mound to the EPA as a part of the reporting in place for the Gngangara Mound. Triennial reports will include information on the operation of groundwater schemes by the Water Corporation and private groundwater use, compliance with EWPs and environmental conditions and outline any environmental impacts. Annual reports will provide information on compliance with environmental conditions.
3. The proponent will investigate stratigraphy and water regimes in the Lexia wetlands, EPP wetland 173 in Melaleuca Park and Melaleuca Park dampland 78. For those showing characteristics of perching, the importance of groundwater to wetland water levels will be established and EWRs updated for the first triennial report to the EPA. EWPs will also be determined at this time.
4. The proponent will support further research and investigations into the EWRs of wetlands, vegetation and seepage areas as defined in Section 16.5 of the PER document.
5. EWPs will be reviewed every six years in triennial reports or more frequently if necessary. Feedback, through the monitoring programme, of any unexpected impacts of groundwater abstraction will be used to update EWPs and water allocations if necessary. Any update will involve consultation with the EPA and incorporate public involvement.
6. The proponent will, after receiving environmental approvals, implement and undertake the following monitoring programme to the satisfaction of the EPA and report results in annual and triennial reports to the EPA:
 - 6.1 Continue monitoring the network of wells on the East Gngangara Mound, at the frequency of 1 - 3 monthly depending on the well.
 - 6.2 Monitor water levels in terrestrial vegetation monitoring wells with EWPs monthly.
 - 6.3 Develop three new terrestrial vegetation transects on the East Gngangara Mound: one in Melaleuca Park and two in the Ellenbrook bushland near the Lexia wetlands. The transects will be monitored every three years.
 - 6.4 On a shared cost basis with the Whiteman Park Board of Management, recommence monitoring the terrestrial vegetation transect established in 1991 by WAWA in Whiteman Park.
 - 6.5 Continue monitoring the terrestrial vegetation transect in Melaleuca Park established in 1966, on a triennial basis.
 - 6.6 At each of the terrestrial vegetation transects, select a range of species which provide an indication of vegetation composition. The indicator species will be monitored in Spring every three years to assess any change towards a drier community. Parameters that will be assessed are; age (size), class distribution, vigour and recruitment.
 - 6.7 Calculate a similarity index for each transect at each monitoring period with the aim of summarising spatial and temporal changes in vegetation composition.
 - 6.8 For each terrestrial vegetation transect on the Eastern Gngangara Mound determine an 'acceptable' rate of change in vegetation composition. Rates of change will be measured using indicator species and similarity indices.

- 6.9** Monitor water levels once a month in wetlands and/or in nearby monitoring wells for the following wetlands:
- Lexia wetland 94;
 - Lexia wetland 186;
 - Lexia wetland 86;
 - Melaleuca Park Dampland 78;
 - EPP wetland 173; and
 - Lake Yakine.
- 6.10** Develop vegetation transects in each of the wetlands listed in Commitment 6.9 (with the exception of Lake Yakine). Monitoring will be undertaken yearly in Spring for the first three years then reviewed in the first triennial report.
- 6.11** Conduct baseline monitoring on aquatic invertebrates, frogs and water quality in the Lexia wetlands. Findings will be published in the first annual report.
- 6.12** Monitor aquatic invertebrate fauna, frogs and water quality in the wetlands listed in Commitment 6.9 which contain open water, annually in Spring.
- 6.13** Map wetland habitats along a regional transect in Melaleuca Park in Spring using large scale aerial photography every year for the first three years, then every three years.
- 6.14** Monitor water levels in the Egerton and Edgecombe seepages and upstream of the seepages on a monthly basis (once access is granted).
- 6.15** As long as access is granted, conduct baseline monitoring of aquatic invertebrate fauna and water quality in the Egerton seepage. Results will be provided in the first triennial report.
- 6.16** Monitor aquatic invertebrate fauna and water quality in the Egerton and Edgecombe seepages annually in Spring (once access is granted).
- 6.17** Monitor water levels in wells with EWP's more frequently than once a month where necessary to determine compliance with provisions.
- 7.** The proponent will consult with CALM to endeavour to develop a Memorandum of Understanding (MOU) on pine management regimes in State Forest 65 which recognises the dual use of forests and optimises water and timber production, while minimising environmental impacts. The MOU will include agreements associated with the removal of the pine plantation over the next 20 years and the proposed establishment of Gngangara Park. In the process of developing the MOU, further modelling studies will investigate the impact of the various scenarios of pine removal on water tables. This will include consideration of how the 'extra water' could be 'allocated' between consumptive and ecosystem protection uses.
- 8.** The proponent will provide advice on the impact of land-uses on groundwater resources of the Gngangara Mound to relevant agencies.
- 9.** The proponent will determine EWP's for new wells in the native vegetation corridor which have been installed at more appropriate places to replace wells MM12, L30C, L110C and L220C once sufficient monitoring data is available from the new wells.
- 10.** The proponent will continue to chair and provide support for a Consultative Committee as a forum of information exchange and to provide advice to the Water and Rivers Commission in relation to management of water on the Gngangara Mound. A reduced number of members representing each of the East Gngangara and Gngangara Committees will be combined to form one Consultative Committee for the Gngangara Mound.
- 11.** The proponent will require the Water Corporation, through licence conditions, to phase in the production wells closest to phreatophytic vegetation to allow the vegetation to adapt slowly to the drawdown and minimise the overall impacts of drawdown.

12. The proponent will require the Water Corporation to develop and implement a mitigation strategy to:

- identify actions to minimise 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

for the conservation category wetlands 132, 156, 158 and 164 and the *Melaleuca raphiophylla* wetland (104) in the pine plantation, on the advice of the WRC and the DEP.

13. The proponent will within six months of receiving environmental approval, require the Water Corporation, through their licence conditions to update their operations plan to include the Lexia and East Mirrabooka groundwater schemes. This will include environmental management of the schemes including details of how abstraction will be managed to meet EWPs. As part of the operating strategy the Water Corporation will be required to submit yearly production plans.

14. To assist with future groundwater management and water supply planning the proponent will map vegetation communities on the Gngangara Mound. This will be done through the following process in consultation with the Department of Environmental Protection.

- 1 Determine the procedures required to undertake mapping of vegetation communities on the Mound;
- 2 Use the procedures to develop a programme for mapping communities; and
- 3 Undertake mapping to the satisfaction of the Department of Environmental Protection.

15. The proponent will monitor water levels monthly and establish a vegetation transect in wetland 132 in the vegetation corridor. The vegetation transect will be monitored in Spring of the first three years to gain information on the impacts of drawdown on the vegetation. The monitoring will then be reviewed in the first triennial report. The monitoring will be undertaken to gain information on early indicators of drawdown impacts.

16. The proponent will liaise directly with the Swan Valley Nyungah Community regarding the proposal.

17. The proponent will survey the occurrence of dieback disease at monitoring sites and prepare and implement dieback management procedures to prevent its spread by accessing these sites. Management procedures will be determined in conjunction with CALM.

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)**

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

Proposal: 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: Water and Rivers Commission

Proponent Address: Level 2, 3 Plain Street, PERTH WA 6000

Assessment Number: 1540

Previous Assessment Numbers: 041/ 697/ 932

Previous Statement Numbers: 21 (Published 8/03/1988)/ 438 (Published 8/02/1997)/ 496 (Published 17/02/1999)

Report of the Environmental Protection Authority: Bulletin 1155

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

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:

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 EPA 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 November 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 proposal 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 Department of Environment 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 6 February 1997 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 implementation of the proposals as defined in schedule 1 of this statement;
 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 addresses:

1. compliance with the conditions;
2. the achievement of environmental objectives set out in the statement;
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 in the statement.

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 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 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).

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.

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 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 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.

Proponent's Environmental Management Commitments

19 November 2004

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

(Assessment No. 1540)

Gnangara Mound Groundwater Resources [Including Groundwater Resource Allocation, East Gnangara] (Assessment No. 1540)

| No. | Topic | Objective | Action | Timing | Advice |
|-----|------------------------------------|---|--|--|--------|
| 1 | Gnangara Mound allocations | | Manage public and private groundwater abstraction to meet objectives and Environmental Water Provisions (EWPs) presented in EPA Bulletin 1155. | 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 Lake 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 2. Implement the research and investigation program 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 |
| 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 City of Wanneroo, Department of 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 100m radius for normal (average) climate conditions and within 200m in extreme conditions. | Ongoing | |
| 14 | Lake Nowergup supplementation | | <ol style="list-style-type: none"> 1 Upgrade the artificial maintenance facility for Lake Nowergup to provide more rapid recharge when it becomes necessary to meet EWPs. 2 Should EWPs in Lake Nowergup not be met by November 1, artificial supplementation shall 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 200m 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 | |

Notes: CALM means Department of Conservation and Land Management
FPC means Forest Products Commission

Gnangara Mound Revised Section 46 Criteria

| 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 |

| Wetlands | | End of Summer (mAHD) | | Spring (mAHD) | |
|---|--|----------------------|------------------|---------------------|--------------------|
| | | Preferred Minimum | Absolute minimum | Preferred Min. peak | Absolute Min. peak |
| Lake Goollelal | Q6162517 | * 26.2 | 26 | | |
| Lake Gngangara | (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.

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

**JANDAKOT MOUND GROUNDWATER RESOURCES
[INCLUDING JANDAKOT GROUNDWATER SCHEME, STAGE 2]**

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

Proponent: Water and Rivers Commission

Proponent Address: Level 2, 3 Plain Street, PERTH WA 6000

Assessment Number: 1540

Previous Assessment Number: 196

Previous Statement Number: 253 (Published 29 April 1992)

Report of the Environmental Protection Authority: Bulletin 1155

Previous Report of the Environmental Protection Authority: Bulletin 587

The implementation and management of groundwater and groundwater allocations for the Jandakot mound Groundwater Resources is subject to the following conditions and procedures, which replace all previous conditions and procedures:

1 Implementation

1-1 The proponent shall implement the proposal 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 EPA Bulletin 1155, which revised the Public Environmental Review (1991), published in Environmental Protection Authority Bulletin 587 as Appendices 1 and 2.

2 Proponent Commitments

2-1 The proponent shall implement the environmental management commitments, as revised in November 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 proposal 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 proposal.
- 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 proposal 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 proposal shall also be provided.
- 3-3 The nominated proponent shall notify the Department of Environment 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 proposal has been substantially commenced or the approval granted in the statement of 29 April 1992 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 implementation of the proposal;
 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 addresses:
1. compliance with the conditions;
 2. the achievement of environmental objectives set out in the statement;

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 in the statement.

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 or environmental objectives to the Environmental Protection Authority immediately it becomes evident to the proponent.

6 Management Plan

6-1 The proponent shall implement the Environmental Management Plan prepared by the Water Authority of Western Australia (1992) to the requirements of the Environmental Protection Authority.

7 Groundwater allocations

7-1 The proponent shall inform the Environmental Protection Authority immediately of any proposed changes to allocations, abstraction limits and licence or allocation periods.

8 Water Conservation

8-1 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.

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.

Proponent's Environmental Management Commitments

19 November 2004

**JANDAKOT MOUND GROUNDWATER RESOURCES
[INCLUDING JANDAKOT GROUNDWATER SCHEME, STAGE 2]**

(Assessment No. 1540)

Water and Rivers Commission

Jandakot Mound Groundwater Resources [including Jandakot Groundwater Scheme, Stage 2] (Assessment No. 1540)

| No. | Topic | Objective | Action | Timing | Responsibility |
|-----|---|--|--|-----------|----------------|
| 1 | Groundwater-dependent ecosystems | To protect significant environmental values | Ensure that groundwater abstraction satisfies the environmental criteria presented in schedule 1 of EPA Bulletin 1155. | Operation | WRC |
| 2 | Environmental management and monitoring | To minimise environmental and/or significant impact | <p>In the event that monitoring indicates that there will be significant impacts of a nature not predicted or indicates that a breach of the specified criteria has occurred or is likely to occur, then one or more of the following actions will be undertaken:</p> <ul style="list-style-type: none"> (1) demonstrate to the satisfaction of the EPA that the breach of criteria is not a result of groundwater abstraction; or (2) satisfy the EPA that the breach of criterion is transient and not of permanent significance; or (3) take the following actions: <ul style="list-style-type: none"> (a) modify pumping from any bore where such changes can have a measurable effect (say raise water levels 1 centimetre or more), except in extenuating circumstances such as where significant economic hardship would occur, or CALM declare that the low water levels would be beneficial (b) in the case of a wetland, artificially maintain the "action minima" water level; and (c) implement a short-term detailed monitoring program to establish the condition of agreed species in the affected area. | Operation | WRC |
| 3 | Water allocation | To minimise environmental and/or significant impact and manage the resource sustainability | Regularly review the bulk allocations for private abstraction, as part of the total water abstraction allocation for the Jandakot PWSA, with regard to the sustainable yield of the superficial aquifer, including consideration of the environmental impacts of that abstraction | Operation | WRC |
| 4 | Water allocation | To minimise environmental and/or significant impact and manage the resource sustainability | Restrict the issuing of licences for private water abstraction to the limits set by the bulk allocations for both the Jandakot PWSA in its entirety and the licensing subareas. | Operation | WRC |
| 5 | Water allocation | | Investigate and implement efficient mechanisms for groundwater allocation | Operation | WRC |
| 6 | Groundwater protection | | Assist the EPA in the development of Environmental Protection Policies to protect groundwater | Ongoing | WRC |

| | | | | | |
|----|---|--|--|---|-----|
| 7 | Groundwater protection | To minimise environmental and/or significant impact | Participate in the review of Regional Plans proposed by the Department for Planning and Infrastructure, Local Government Town Planning Schemes, and re-zoning and development applications. | Ongoing | WRC |
| 8 | Groundwater protection | | Participate in the review of development submissions to EPA | Ongoing | WRC |
| 9 | Groundwater protection | | Work with the Department for Planning and Infrastructure to prepare an integrated Land Use and Water Management Strategy for the Jandakot Mound. | | WRC |
| 10 | Water conservation | | Actively pursue programs in both supply and demand management. This includes ongoing public information programs and, where appropriate, regulation for design changes and regular reviews of pricing to conserve water. Improvements in the Water Corporation's supply system will also be pursued. | | WRC |
| 11 | Groundwater protection | | Actively participate in integrated management of the Jandakot catchment | Ongoing | WRC |
| 12 | Environmental management and monitoring | | Review and revise the management criteria and strategies, with the agreement of the EPA, as knowledge of the Jandakot environment and its interaction with groundwater improves. | Ongoing | WRC |
| 13 | Environmental management and monitoring | | Monitor water levels in groundwater monitoring bores and North, Bibra, Yangebup, Kogolup, Thomsons, Forrestdale Lakes. The Spectacles and Twin Bartram Swamp as well as some other small wetlands | | WRC |
| 14 | Environmental management and monitoring | To minimise environmental and/or significant impact or amenity | <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 2. Implement the approved environmental monitoring plan 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 | WRC |
| 15 | Environmental management and monitoring | | Use aerial photographs or equivalent on a triennial basis to detect habitat shifts in North, Bibra, Yangebup, Kogolup, Thomsons and Forrestdale Lakes. | | WRC |
| 16 | Community consultation | | Hold meetings at least annually with the Jandakot Consultative Committee established in consultation with the EPA. This Committee will be informed on the groundwater scheme's operation and will provide feed-back to the proponent. | | WRC |
| 17 | Community information | | Continue to monitor community response to relevant water resource issues as reported by the media and maintain the current practice of public accessibility | | WRC |

| | | | | | |
|----|---|--|--|--|-------------------|
| | | | of WRC staff. Upon request and adequate notice, staff will address community groups on issues associated with groundwater management | | |
| 18 | Environmental management and monitoring | | Install monitoring wells and improved wetland water level monitoring facilities for Forrestdale Lake, and evaluate the monitoring data to determine the groundwater-wetland water level relationship. Subject to CALM/ WRC installing a permanent vegetation monitoring transect and undertaking flora and fauna studies to establish environmental values, the WRC will review the available information to propose revised management criteria, if appropriate | | WRC |
| 19 | Environmental management and monitoring | To minimise environmental and/or significant impact or amenity | <ol style="list-style-type: none"> 1. Prepare a Management and Monitoring Program 2. Implement the Management and Monitoring Program | Prior to commissioning of Stage 2 scheme | Water Corporation |
| 20 | Clearing of vegetation | To minimise environmental and/or significant impact | Clearing of vegetation at bore sites will be restricted to the area of the enclosure (approximately 25 metres square) in non-urban areas, and the immediate area of the bore head in the case of bores located in public open space in urban areas. | Construction | Water Corporation |
| 21 | | | Where practical, the collector main will be located within existing road reserves. | Construction | Water Corporation |
| 22 | | | On Crown Land, top-soil from the collector main trench will be separately stripped, stock-piled and re-spread on completion of pipe laying. | Construction | Water Corporation |
| 23 | | | On private land, the collector main route will be left in a state agreed to by the land owner/occupier | Construction | Water Corporation |
| 24 | | | Where feasible, bore site compounds will be used for the storage of materials and for contractors' facilities, in preference to the establishment of separate short-term sites. | Construction | Water Corporation |
| 25 | | | Where temporary construction sites are established, the area will be returned either to its original state, in the case of Crown Land, or to a state agreed to by the land owner/occupier | Construction | Water Corporation |
| 26 | Clearing of vegetation | To minimise environmental and/or significant impact | All work on extensions to and modifications of the Jandakot Treatment Plant will be undertaken on existing cleared areas within the boundary of the Plant site | Construction | Water Corporation |
| 27 | Environmental management | To minimise environmental and/or significant impact | All workers involved in project construction in natural areas will be instructed on environmental protection procedures before work proceeds | Construction | Water Corporation |
| 28 | Risk | To meet acceptable risk criteria | <p>Design and manage water treatment facilities to</p> <ol style="list-style-type: none"> 1. Modify the chlorine withdrawal system to a liquid process prior to commissioning of the Stage 2 line of bores 2. Operate the treatment plant within established buffer zones | Construction and operation | Water Corporation |

| | | | | | |
|----|--|--|--|----------------------------|-------------------|
| | | | <p>3. Ensure personal risk hazard of fatality associated with chlorine release is less than one in a million in any year; and</p> <p>4. Ensure hydrogen sulphide levels attributable to plant operation will be below noticeable levels of 5 parts per billion</p> | | |
| 29 | | | Continue to fund the research projects 10.6.3 listed in Appendix 2 of the EPA Bulletin 587 for the duration of the studies | | Water Corporation |
| 30 | | | <p>Develop a fauna monitoring program which will focus on:</p> <p>(1) waterbird species diversity and breeding success, and</p> <p>(2) number of families of aquatic invertebrate and at infrequent intervals, species richness.</p> | Prior to the commissioning | Water Corporation |
| 31 | | | Conduct pump tests on Stage 2 bores and liaise with nearby private users of groundwater prior to commissioning to assess the impact of Stage 2 bores on private bores | Construction | Water Corporation |
| 32 | | | Undertake a study of Banganup Lake, in conjunction with CALM and the University of WA to establish management criteria and consider the effectiveness of artificial maintenance of water levels | | Water Corporation |
| 33 | | | Undertake a study of Twin Bartram Swamp to consider the feasibility and effectiveness of artificial maintenance of water levels. | | Water Corporation |

Jandakot Mound Revised Section 46 Criteria

| Groundwater Monitoring Well | | End of Summer | |
|-----------------------------|-----------|-----------------------------|----------------------------|
| | | Preferred Minimum (mAHD) | Absolute Minimum (mAHD) |
| Vegetation Wells | | | |
| JM14 | 61610247 | 24.39 | 23.89 |
| JM16 | 61610445 | 23.90 | 23.40 |
| JM19 | G61610177 | 25.26 | 24.76 |
| JM35 | 61610333 | 21.25 | 20.75 |
| JM39 | 61410142 | 21.20 | 20.70 |
| JM49 | 61410111 | 22.34 | 21.84 |
| 8284 | 61610178 | 24.82 | 24.32 |
| JE4C | 61610234 | 24.00 | 23.50 |
| JE10C | 61410250 | 21.80 | 21.30 |
| Rare Flora Wells | | | |
| JM7 | 61610180 | | 22.06* |
| JM8 | 61610248 | | 23.38* |
| JM45 | 61610179 | | 22.71* |
| JE17C | 61419703 | | 16.35* |

Notes: Water levels are permitted to fall between the preferred and absolute criterion levels. Objectives are considered as not being met each time groundwater levels fall below the absolute minimum criterion.

* water levels should not decline at rates greater than 0.1 m/yr.

| Wetland | SWRIS ID No. | Current Water level criterion (m AHD) | | Other criterion |
|-----------------------|---|---------------------------------------|--|---|
| | | Preferred | Absolute | |
| North Lake | Staff Q6142521 Bore 424 G61410726 | 13.29 | 12.68 | Water levels should not decline at rate greater than 0.1 m/year. Monitor staff gauge. |
| Bibra Lake | Staff Q6142520 Bore BM7C G61410177B | 13.6 - 14.2 <15.0 peak | 13.6 | Not to dry more than 2 in 3 years, and preferably less than 1 in 3 years |
| Kogolup Lake (South)* | Staff Q6142522 Bore 61410727 | 13.1 - 14.0 <14.8 peak | 13.1 | |
| Thomsons Lake | Staff Q6142517 Bore TM14A G61410367 | 11.3-11.8 | 10.8 | For 30% of time, water levels > 11.8. (wet year –10%), or 11.3-11.8 m (medium year 80%), or 10.8 – 11.3 m (dry years 10%) |
| Lake Forrestdale | Staff Q6162557 Bore 602 G61410714 | 21.2 – 21.6 | 21.1 | Preferred earliest drying by April (wet year), Feb-March (medium year) or January (in a dry year); at least 0.9 m water at peak levels (22.6 m AHD) |
| Yangebup Lake | Staff Q6142523 Bore JE21C G61419614 | 13.9-15.5 < 16.5 peak | 13.8 | Either Bibra or Yangebup Lake must contain 0.3 m water, preferably 0.5 m |
| Banganup Lake | Staff Q6142516 Bore LB14 G61419614 | - | 11.5 | |
| Twin Bartram Swamp | Staff Q6142544 Bore G61410715 | 22.8 | 22.5 | Not to dry before end of January; Must be above preferred min. 4 in every 6 years |
| Shirley Balla Swamp | Staff Q6142576 Bore G61410713 | | 23.1 or 0.5 m below lake base, whichever is the higher | Not to dry before end of January; Must be above preferred min. 4 in every 6 years Water levels should not decline at rate greater than 0.1 m/year. Monitor staff gauge. |
| Beenyup Road Swamp | Staff Q6142547 Bore G61410711 | 24.0 | 23.6 | Must be above preferred min. 4 in every 6 years |

Notes: Water levels are permitted to fall between the preferred and absolute criterion levels at any time, except for Beenyup, Shirley Balla and Twin Bartram Swamps. For Beenyup, Shirley Balla and Twin Bartram Swamps, non-compliances also occur where water levels fall between the preferred and absolute criterion levels for more than 2 in 6 years.

Levels for North Lake are represented by groundwater levels that reflect wetland water levels of 13.5 mAHd (preferred) and 12.7 mAHd absolute) through application of a groundwater-wetland water level relationship formula. Some level of non-achievement of criteria can be expected because of reduced drainage inflows to lake.

Maximum allowable habitat reductions (excluding Thomsons Lake) are: Type I habitat is 5% (in a wet year), 10% (medium year), 15% (dry year); Type II is 8% (wet), 13% (medium), and 18% (dry); Type III is 12% (wet), 17% (medium), 22% (dry); and Type IV habitat is 15% (wet), 20% (medium), and 25% habitat reduction during a dry year.

* indicates that the Water Corporation pumps excess water out of these wetlands if spring peak levels are exceeded.

Appendix 5

Summary of Public Submissions and Proponent's Response

SECTION 46 REVIEW OF ENVIRONMENTAL CONDITIONS ON MANAGEMENT OF THE GNANGARA AND JANDAKOT MOUNDS

SUMMARY OF SUBMISSIONS ON STAGE 1 PROPOSAL FOR CHANGES TO CONDITIONS

| Submission Proponent | Summary of Submission | Response to Submission |
|---|--|--|
| Conservation Council of Western Australia Inc. | <p>Overall, the CCWA is extremely concerned that the measures proposed under the review and their implementation amount to <i>“too little too late”</i>.</p> <p>Inherent contradictions between EPA/DoE policy, and the policies and practices of other State agencies (such as for land use planning).</p> <p>Proposal, as a matter of urgency, to set up a dedicated taskforce to fast track a whole of Government reform to the policies and practices of agencies (which contradict application of the precautionary principle to maintain groundwater dependent ecosystems on the Gnangara and Jandakot Mounds.</p> <p>The CCWA noted that, if applied correctly, pine harvesting could be the single most important management actions to restore and maintain groundwater levels on the Gnangara Mound.</p> | <p>No specific response required. Discussions to be held with Conservation Council.</p> |
| City of Wanneroo | <p>Questioned that the loss of conservation values at sites such as Coogee Springs is more a factor of the decline in water levels due to climate change and abstraction rather than land use pressures.</p> <p>The comprehensive management plan needs to be closely integrated with land use planning for the region.</p> <p>Greater opportunity for public involvement in this matter would seem preferable.</p> | <p>No specific response required. Ongoing discussions with Council via East Wanneroo Land Use and Water Management Strategy project.</p> |

| | | |
|---|--|--|
| <p>Wetlands Conservation Society (Inc)</p> | <p>WCS does not support the removal of environmental criteria for the wetlands and monitoring wells until Stage 2 has been completed.</p> <p>DoE should not be released from its (required) compliance with these criteria until they put in place an integrated water management strategy.</p> <p>WCS has major concerns over the condition of Thomson's and Forrestdale Lakes and that they could lose their RAMSAR status.</p> <p>WCS will agree to the purely administrative changes to the Ministerial Conditions but not to the changes in monitoring and minimum water levels. These issues should be reassessed in the context of the Stage 2 management plan (for the Jandakot Mound)</p> | <p>No specific response required. Discussions with Wetlands Conservation Society via Jandakot Community consultative Committee.</p> |
| <p>Water Corporation</p> | <p>The WC is in general agreement with the proposed changes to environmental conditions. This is particularly the case for the proposed removal of 15 conditions for Jandakot Mound, the primary reasons for which are loss of ecological value because of land use change (eg. Clearing for housing).</p> <p>WC consider the interchange between WRC and DoE to be somewhat confusing. Suggested that some clarification of the institutional arrangements between WRC/DoE as proponent and the Water corporation (as one of may users) and the EPA might be helpful.</p> <p>WC consider the critical issue now is the sustainability of ecological values under a scenario of a continuation of climate conditions of the past eight years which has accelerated and highlighted the general decline in water levels and ecological values since the mid 1970's.</p> | <p>No specific response required. Ongoing discussions with Water Corporation via Water Resource Management Committee, Gnaragara Alliance Program and Allocation Process.</p> |

| | | |
|---------------------------|--|---|
| | <p>The Gngangara Coordinating Committee (GCC), under the direction of the State Water Task Force, is working to improve cross-agency management of land and water on the Mound. The challenge is to obtain the commitment of agencies other than the DoE who have responsibility for land management on Gngangara Mound in a way that complements the current statutory conditions on the DoE.</p> <p>WC consider that a sustainability assessment of the Gngangara Mound (and Jandakot Mound) which includes consideration of the ecological values with the social and economic values, and involves consultation with stakeholders and the community, cannot be achieved by March 2005.</p> <p>While this may be disappointing (to the EPA), the WC believes that the importance on the Gngangara Mound to the future security of the Integrated Water Supply System and potential financial costs to the community warrants a considered and cross-agency approach to develop sustainable solutions to the land and water management issues.</p> | |
| Private Submission | Vegetation clearing and loss of biodiversity. | No response from DOE as land use planning and clearing for land development (eg. Jandakot) are outside the control of the Department. |

General Comments:

- Very short period for public review and comment.
- Should have been sent out to wide range of stakeholders rather than relying on advertising in the various papers.