

**Route alignment for Perth to Darwin National
Highway and Fast Transit Route, and excision of
land from State Forest No. 65 and Priority 1 Source
Protection Area for urban development**

**Main Roads Western Australia and Ellenbrook Management
Pty Ltd**

**Report and recommendations
of the Environmental Protection Authority**

**Environmental Protection Authority
Perth, Western Australia
Bulletin 753
August 1994**

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's report.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

APPEALS

If you disagree with any of the contents of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of \$10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WESTPERTH WA 6005

CLOSING DATE

Your appeal (with the \$10 fee) must reach the Minister's office no later than 5.00 pm on 2 September, 1994.

Environmental Impact Assessment (EIA) Process Timelines in weeks

Date	Timeline commences from receipt of full details of proposal by proponent	Time (weeks)
21/3/94	Proponent Document Released for Public Comment	8
16/5/94	Public Comment Period Closed	
26/5/94	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	2
16/6/94	Proponent response to the issues raised received	3
18/8/94	EPA reported to the Minister for the Environment	9

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Summary and recommendations

The purpose of this report

An alignment for the Perth-Darwin National Highway from Reid Highway to Muchea and a future public transport corridor have been included by the State Planning Commission in a major amendment to the Metropolitan Region Scheme for the North East Metropolitan Corridor (Amendment No. 950/33). The amendment proposes to reserve land necessary to accommodate the future highway and an adjacent public transit corridor.

In view of the environmental issues associated with the highway proposal, the Environmental Protection Authority requested the proponents, Main Roads Western Australia and Ellenbrook Management Pty Ltd, to undertake a Public Environmental Review to investigate the environmental effects of the proposal.

This Bulletin is the Environmental Protection Authority's report and recommendations to the Minister for the Environment on the proposed alignment for the Perth-Darwin National Highway, the associated alignment for the rapid transport route and severance of land from the Priority 1 groundwater protection area and its proposed use for urban and rural development.

The Environmental Protection Authority is also providing informal advice to the State Planning Commission on the North East Corridor Amendment in Bulletin 754 which is currently in preparation.

Perth-Darwin National Highway

The Public Environmental Review examined a number of alternative highway options investigated over the years, including the preferred option put forward by the proponents. Ninety three (93) submissions were received by the Environmental Protection Authority on the proposals. An alternative highway option was suggested by some members of the community.

The main environmental issues include potential impacts on:

- important groundwater resources;
- Ellen Brook and the Swan River systems;
- areas of regional conservation value, including System 6 Areas;
- Swan Coastal Plain wetlands;
- flora and fauna; and
- residents from noise associated with major transport routes.

In undertaking its assessment, the Environmental Protection Authority has concluded that while some of these environmental issues can be managed, others pose environmental risks leading to concerns that potential impacts may prove unacceptable.

These latter impacts fall into two main groups. The first includes the direct physical impacts from the construction of the Highway along its alignment on the landform, flora and fauna. The second includes the potential indirect impacts from pollutants associated with road construction, vehicular usage and spillages on water bodies, air quality and people.

Groundwater protection

In particular, the Environmental Protection Authority is concerned about the potential impacts of development on groundwater resources. Groundwater comprises about 40 percent of Perth's public water supply and about 65% of all water used in the metropolitan area. The Environmental Protection Authority is concerned that potential impacts from the proposed alignments of the Perth — Darwin Highway located over the groundwater could be associated with a risk to the environment with significant consequences. However, more information is needed to properly guide decision making.

The Swan and Canning River Systems, the wetland systems and areas of remnant vegetation

The Environmental Protection Authority is concerned that implementation of the proposal should not adversely affect the water levels in wetland systems which are to be conserved or the water quality in such wetlands and the Swan and Canning River system. The Environmental Protection Authority is also concerned that areas of remnant vegetation with high conservation value or which have been identified in the System 6 studies should be protected. The location of the final alignment of the proposed highway and the drainage management systems put in place should ensure that the impacts are minimised.

Noise management

Main Roads has committed to designing the road so that the L10 (18 hour) noise level 63 dB(A) used by Australian Regulatory Authorities when considering traffic noise is not predicted to be exceeded at any residence adjacent to the route. It is recognised, however, that the impact of traffic noise during operation is likely to be significant along sections of the proposed route that are close to existing and proposed residential areas. The level of impact is likely to be most significant for residences in a rural setting where the noise levels from traffic would generally be significantly above the existing background levels, especially at night. The community, especially the existing rural community in the North East corridor, is concerned about this issue.

The Environmental Protection Authority's evaluation

Based on the current level of knowledge, the Environmental Protection Authority has ranked the road proposals considered in the Public Environmental Review and considers that the highway options east of the Swan River are associated with a low risk to the environment and that the options west of the Swan River are associated with a high risk to the environment.

In the absence of detailed information, the Environmental Protection Authority has adopted a precautionary approach in relation to its evaluation of some Highway options.

Nevertheless, in order to minimise the potential impacts associated with the final alignment, construction and management of the selected road, the measures outlined in the following table are recommended by the Environmental Protection Authority. The recommendations of the Environmental Protection Authority have also been drafted into Recommended Environmental Conditions (see Section 7), for consideration by the Minister for the Environment in his negotiations with the decision making authorities for this proposal (the Minister for Planning, the Minister for Water Resources, the Minister for the Environment (Conservation and Land Management) and the Minister for Transport).

Table 1. Summary of views and recommendations of the Environmental Protection Authority.

Recommendation Number	Summary of views and recommendations of the Environmental Protection Authority
	Perth — Darwin National Highway — Options 1, 2, 3 and the Community Groups Consensus Route
1	<p>In the absence of detailed information the Environmental Protection Authority believes that the Perth — Darwin National Highway Options 1, 2, 3 and the Community Groups Consensus Route which originate at the Tonkin Highway could be associated with risk for irreversible impacts to strategic groundwater resources and impacts to important conservation areas and habitat linkages.</p> <p>The Environmental Protection Authority therefore considers that a precautionary approach is warranted and that these alignments are unacceptable and should be discounted in favour of options which by virtue of their improved location have less environmental risk.</p>

Recommendation Number	Summary of views and recommendations of the Environmental Protection Authority
	Perth — Darwin National Highway — PER preferred route, fast transit route and associated excision of the Priority 1 area for rural and urban development
2	<p>Perth — Darwin National Highway (preferred route) alignment and the associated excision of land from the Priority 1 Source Protection ground water area for urban development (State Forest No. 65) and rural development (Whiteman Park) could be associated with risk for irreversible impacts to strategic groundwater resources and is undesirable.</p> <p>However, because of the social and economic issues which will also need to be considered, it is recognised that this route may be selected, either for the highway or for a regional road to service the urban development in the area. Should this be the case, the potential environmental impacts should be mitigated as outlined through recommendations 3 to 11 and recommendations 15 to 16 below.</p>
3	Between Reid Highway and Maralla Road a risk assessment study for both episodic spillages of pollutants (large discrete events), and cumulative impacts from long term road use (eg: hydrocarbons) should be undertaken to provide the basis for a management plan to be prepared and implemented.
4	There should be no net loss of Priority 1 Source Protection Area of the Gngangara Mound, or any loss of water quality or quantity associated with the alignment and proposed excisions of land.
5	Water quality and quantity criteria should be established to protect groundwater, wetlands, Ellen Brook and the Swan River.
6	A detailed Environmental Management Program (EMP) for nutrient and drainage management which complies with the environmental criteria and objectives established by recommendation 5 should be prepared and implemented.
7	The alignment of the preferred route, including all interchange, drainage and other design requirements should be modified as far as possible, to avoid or reduce the impact on the land reserved as Parks and Recreation containing the Lexia Wetlands.
8	The requirement for a proposed access from the highway to the Lexia Wetlands conservation area should be considered within the context of an overall management plan for the conservation area.
9	The need for a wildlife underpass between the Caversham Air Base and Whiteman Park should be determined as part of the proposed fauna and habitat survey along the route corridor.
10	A wildlife underpass between the Lexia Wetland conservation area and the Sawpit Gully area should be incorporated into the highway design.
11	A drainage management strategy should be prepared for the Twin Swamps Nature Reserve which ensures the habitat, including water quality, of the western swamp tortoise and its catchment are protected.

Recommendation Number	Summary of views and recommendations of the Environmental Protection Authority
	Perth — Darwin National Highway — Options 4, 5 and 6
12	The Environmental Protection Authority concludes that Options 4, 5 and 6 have no impact on strategic groundwater resources and that other potential impacts can be managed through the final design, construction and management phases subject to recommendations 13 to 16 below.
13	A detailed Environmental Management Program (EMP) for crossings of the Swan River and Jane Brook should be prepared and implemented.
14	A drainage management strategy should be prepared for the Ellen Brook Nature Reserve which ensures the habitat, including water quality, of the western swamp tortoise and its catchment are protected.
	General — management requirements applying to all options
15	A strategy for the protection of wetlands should be prepared and implemented.
16	Potential impacts from noise from the Highway should be managed as committed in the PER.

Conclusion

The Environmental Protection Authority concludes that the Perth — Darwin National Highway Options 4, 5, 6 could proceed subject to the above recommendations as reflected in the Environmental Protection Authority's Recommended Environmental Conditions.

Options 1, 2, 3 and the community option could be associated with risk for irreversible impacts to public groundwater supply, and impacts to important conservation areas and habitat linkages, and on environmental grounds are unacceptable.

The preferred option could be associated with risk for irreversible impacts to strategic groundwater resources and on environmental grounds is undesirable. However, should the preferred route, including the excision of land from the Priority 1 Source Protection Area in State Forest No. 65 and Whiteman Park, be selected for a highway or urban transport, this should only proceed subject to the above recommendations as reflected in the Environmental Protection Authority's Recommended Environmental Conditions.

Overview

An important view of the Environmental Protection Authority, is the need for further studies to provide greater surety in understanding the environmental impacts of development proposals and in order to properly guide planning decisions. The Environmental Protection Authority believes that studies should be undertaken to ensure an appropriate level of environmental protection and management.

1. Introduction and background

1.1 The purpose of this report

This report and recommendations provides the Environmental Protection Authority's formal advice to the Minister for the Environment on the proposed alignment for the Perth — Darwin National Highway, the associated proposals for the rapid transport route and severance of land from the Priority 1 groundwater protection area for urban and rural development.

In March 1994, the State Planning Commission released the final North East Corridor Structure Plan and released for comment, the proposed North East Corridor Metropolitan Region Scheme Amendment Number 950/33. This Amendment, together with previously assessed proposals for the North East Corridor, Ellenbrook (Bulletin 642) and Egerton (Bulletin 743), largely put into effect the zoning to implement the proposals in the North East Corridor Structure Plan.

The Amendment contains a number of proposals, including zoning for urban development and the Perth to Darwin Highway, many of which have the potential to impact upon groundwater resources, the Swan River, wetlands, conservation areas, air pollution, water quantity and quality management and to cause conflict with existing and proposed industrial development.

As the levels of impact from the proposals varied and as the planning documents concerned had a different legal framework (statutory and non statutory), the Environmental Protection Authority resolved to assess and provide its advice on the various components of the Structure Plan and the Amendment in the following forms.

North East Corridor Structure Plan

A level of assessment was not set on the North East Structure Plan because this Plan is finalised. The Plan is not a statutory document but has been endorsed by the State Planning Commission and released by the Minister for Planning and is intended to provide the guide for the future development for the Corridor. However, the Environmental Protection Authority is concerned because the Plan contains a number of proposals which could impact on the environmental issues identified above. Accordingly, the Environmental Protection Authority has decided to provide advice on those proposals.

Perth to Darwin Highway and associated development

The Environmental Protection Authority is particularly concerned about the potential impacts on the Priority 1 area of the Gnangara and Mirrabooka groundwater areas resulting from the alignment of the Perth — Darwin Highway and fast transit route proposed in the Amendment and the associated excisions from the Priority 1 area for rural and urban development. In view of these and other environmental issues associated with these proposals, the Environmental Protection Authority required a Public Environmental Review to investigate the environmental impacts. The Public Environmental Review examined a number of alternative options for the Highway looked at over the years, including the preferred option put forward by the Amendment.

Amendment 950/33 to the Metropolitan Region Scheme for the North East Corridor

While some of the proposals in the balance of the Amendment are of concern, these were not considered to be so significant as to require a formal review and the Amendment was assessed at the level of Informal Review with Public Advice and the advice will be provided as a submission to the State Planning Commission.

This report contains the Environmental Protection Authority's report and recommendations on the Public Environmental Review for the Perth — Darwin Highway, rapid transit route and the associated development impacting on the priority 1 groundwater area.

A further Bulletin (754), will contain the Environmental Protection Authority's informal advice on the Amendment and its advice on the North East Corridor Structure Plan.

1.2 The Perth — Darwin Highway

The Perth — Darwin National Highway provides the major transport link between Perth and Darwin and is therefore of significant strategic and economic importance to the State and nation. The existing Perth — Darwin National Highway follows the Great Northern Highway and Victoria Highway from Perth to the border between Western Australia and the Northern Territory (Dames & Moore 1994).

The southern section of the existing Perth — Darwin National Highway follows the Great Northern Highway and passes through the Swan Valley and the town sites of Upper Swan, Bullsbrook (East) and Muchea. The Great Northern Highway south of Muchea is a two lane road and built to rural highway standards.

In general terms the safety and amenity of the existing Great Northern Highway is expected to deteriorate as urban development and traffic volumes increase in the North East Metropolitan Corridor and this will impact on the strategic functions of the national highway route. Consequently, a need exists to plan for either the upgrading of the Great Northern Highway or for the development of a different route for the Perth — Darwin National Highway (Dames & Moore 1994).

As a result, Main Roads Western Australia and Ellenbrook Management Pty Ltd have proposed:

- a new route for the Perth Darwin National Highway from Reid Highway to Muchea ;
and
- the excision and rezoning (to allow urban development), of a 63 hectare portion of State Forest No. 65 which is separated from the remaining State Forest land by the proposed new Highway route.

Both proposals are shown in Figure 1 in this report.

Most recently, the preferred alignment for the Perth — Darwin National Highway from Reid Highway to Muchea and a future public transport corridor have been included by the State Planning Commission in a major amendment to the Metropolitan Region Scheme for the North East Metropolitan Corridor (Amendment No. 950/33). The amendment proposes to reserve land necessary to accommodate the future highway and public transit corridor.

The objective of the proposed new Perth — Darwin National Highway route from Reid Highway to Muchea is to safeguard the future strategic functions of the national highway route, while accommodating increased traffic requirements as urban development of the North East Corridor proceeds (Dames & Moore 1994). In assessing this option, the Environmental Protection Authority acknowledges that even if this alignment is not selected for the Perth-Darwin National Highway, a road in this locality may be needed to service the urban development already approved in the area.

However, construction of the preferred new highway route would have an effect on Whiteman Park, and an area reserved for Parks and Recreation in the Metropolitan Region Scheme to protect the Lexia Wetlands and surrounding vegetation. The proposed highway also affects gazetted lakes protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 and other Swan Coastal Plain wetlands. Both the Highway and the excision of State Forest No. 65 for urban development would impact upon important underground water supply areas.

In view of these and other environmental issues associated with the proposal, the Environmental Protection Authority decided that the potential environmental impacts would be sufficient to warrant formal environmental impact assessment at the level of Public Environmental Review (PER). The objective for undertaking assessment of the proposal is to ensure protection and proper management of the following:

- Crown land set aside for conservation, and System Six Recommendation Areas;
- important groundwater resources;
- the Swan River;
- Swan Coastal Plain wetlands;
- areas of regional conservation value; and
- rare flora and fauna.

Because the boundary of the State forest land proposed for urbanisation is dependent on the final alignment of the proposed Perth — Darwin National Highway, both proposals are jointly presented in the PER. The proponent for the Perth — Darwin National Highway proposal is Main Roads Western Australia and the proponent for the land severance and rezoning proposal is Ellenbrook Management Pty Ltd.

1.3 The planning framework

The process of planning the future shape and form of development within the North East Metropolitan Corridor has progressively evolved since the 1970's Corridor Plan for Perth which identified four corridors for future growth. At that time the area north of Midland was expected to remain predominantly rural. Until 1987, when the original Corridor Plan for Perth was reviewed, there had been no provision for significant urbanisation up a new North East Corridor.

However, in 1990 Metroplan, the Government's long term planning strategy for the Metropolitan Region was published. Metroplan, and the Urban Expansion Policy which accompanies Metroplan indicated that areas west of the Swan Valley (West Swan) and east of the Swan Valley (Middle Swan) within the North East Corridor were considered suitable for urban development.

In 1994, the State Planning Commission published a Structure Plan for the North East Corridor.

Prior to the preparation of the Structure Plan for the North East Corridor to guide development in this area for the next 30 years or more, the Department of Planning and Urban Development released an issues and options paper for public discussion and comment. A major objective of the discussion paper prepared by the Department of Planning and Urban Development was to indicate the possible extent of future urban development in the North East Corridor. The land identified as suitable for future urban development was generally consistent with Metroplan and the Urban Expansion Policy and included land west and east of the Swan Valley.

Also introduced within the Department of Planning and Urban Development's discussion paper were two options for the Perth Darwin National Highway recommended by consultants in a 1991 Stage One Study of the termination of the Perth Darwin National Highway.

The two options shown were:

- Great Northern Highway which is the existing National Highway route; and
- a route immediately east of the railway.

A large number of submissions were received by the Department of Planning and Urban Development from the public and other interested parties, many of which strongly opposed the recommended route and suggested that the future Perth Darwin National Highway should not affect the Swan Valley due to social and heritage constraints (Dames and Moore 1994). It was also suggested that the National Highway route should be located on the west side of the Swan River and follow Tonkin Highway.

As indicated by the Department of Planning and Urban Development (1992) in its report, Summary of Submissions (on public discussion paper, the Perth — Darwin National Highway options generated unusually high coverage in the media, much of which was critical of the proposal. Furthermore, the above report indicates that as a result of this reaction the Minister for Planning deleted the option immediately east of the railway line as outlined in a press release dated 10th December 1991.

A corollary of the above is that the land to the east of the Swan Valley, which physically has a high capability to accept urban development, has also been removed from consideration for urban development.

Following the Minister for Planning's decision, Main Roads initiated a preliminary engineering appraisal of the Tonkin Highway extension option(s).

As indicated by the Main Roads Department (1992), the engineering appraisal concluded that the route options between Tonkin Highway and Muchea were feasible, and that the impacts on the Gngangara water mound could be managed, although at significant cost. According to Dames and Moore 1994, the engineering study did not necessarily imply that there would be no risk to the groundwater, but rather that the risks could be managed at a cost to within acceptable levels.

A Stage 2 Study was then initiated to examine the alternatives for the national highway route and to select an option which was considered to be acceptable to the community and Government (Dames and Moore 1994). The overall Stage 2 route selection process indicated that the Lord Street extension to Muchea was the most desirable option.

However, following completion of this report the highway route was modified to divert to the east side of the Lexia wetlands and was ultimately adopted as the preferred route.

It is the opinion of the Environmental Protection Authority that the proposals for urban development and the alignment of the Perth Darwin National Highway east of the Swan Valley presented in the discussion paper are associated with significantly lower levels of environmental risk to strategic groundwater resources and other environmental values than current proposals for urbanisation and the Perth Darwin National Highway west of the Swan Valley.

As a result of previous decisions development proposals must now be considered in areas where environmental constraints are high and the land's capability to accept housing is difficult.

2. Summary description of proposal

2.1 Perth — Darwin National Highway

Alternative route options

Studies commissioned by Main Roads have investigated a number of options for the future Perth — Darwin National Highway between Reid Highway and Muchea (Dames & Moore 1994).

Whilst there are a number of potential deviations to each of the identified options Dames and Moore (1994) has classified the base options into two major transport corridors, on either side of the Swan River as follows :

Western options

- Option 1. Tonkin Highway — a route generally north across the Gnangara Mound.
- Option 2. Tonkin Highway — a north east route across the southern-central part of the Gnangara Mound.
- Option 3. Lord Street — a route following the eastern side of the Priority One Source Protection Area.

Eastern options

- Option 4. Great Northern Highway — upgrade of the existing Great Northern Highway.
- Option 5. A route east of Great Northern Highway following the eastern side of the railway from the Reid/Roe Highway interchange to Upper Swan. The route then follows Great Northern Highway to Muchea.
- Option 6. A Darling Scarp foothills route. This route would pass about 1.5km east of the railway from Toodyay Road, generally following the alignment of Moore Road, to Upper Swan. The route then follows Great Northern Highway to Muchea.

Most of these options, are shown in Figure 2.

The PER report states that in terms of impact on the natural environment, the three eastern routes (ie: east of the Swan River) are considered to have fewer environmental impacts than the three western routes. Of the western routes, the Lord Street extension option is considered to have less environmental impact than either of the Tonkin Highway routes (Dames & Moore 1994).

Preferred route

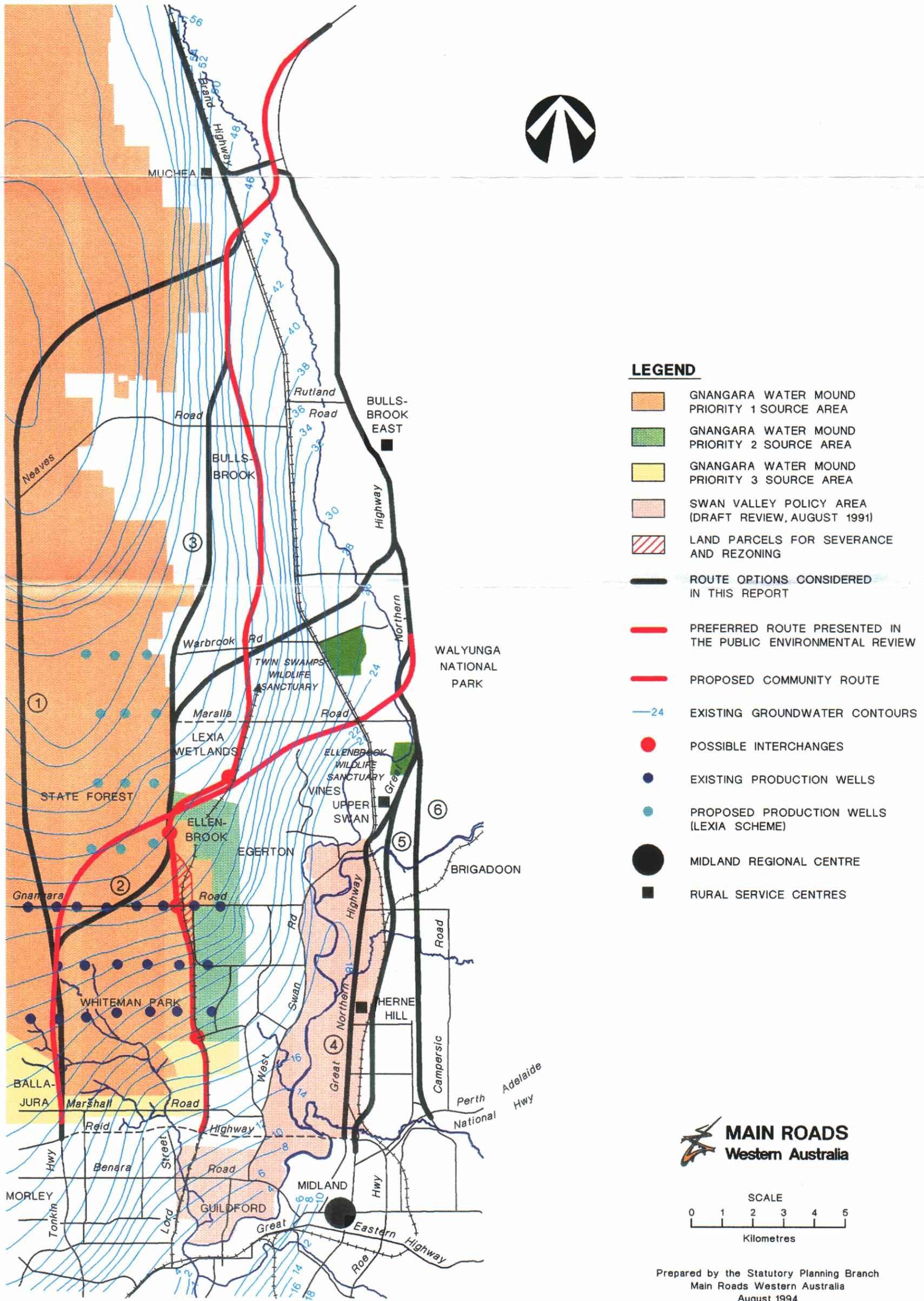
In addition to the above route options, Section 4 in part B of the PER report outlines the series of studies and other processes which have culminated in the selection of the preferred alignment for the Perth — Darwin National Highway identified in the PER report as the consensus route (Figure 2). As this is the preferred alignment for the national highway advocated in the PER it is hereinafter referred to in this report as the **preferred route**. The preferred route is essentially a refinement of Option 3 with changes at Gnangara Road and the Lexia Wetlands. Running parallel with the preferred route for much of its length is a proposed public transit alignment which is discussed below.

Community consensus route

Also in addition to the above route options, a large number of public submissions put forward another option known as the **Community Groups Consensus Route**, (Figure 2).

An evaluation of the environmental acceptability of each of the major options indicated above, including the Community Groups Consensus Route is considered appropriate by the Environmental Protection Authority and is included as part of this report.

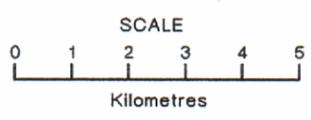
PERTH DARWIN NATIONAL HIGHWAY ROUTE OPTIONS



LEGEND

-  GNANGARA WATER MOUND PRIORITY 1 SOURCE AREA
-  GNANGARA WATER MOUND PRIORITY 2 SOURCE AREA
-  GNANGARA WATER MOUND PRIORITY 3 SOURCE AREA
-  SWAN VALLEY POLICY AREA (DRAFT REVIEW, AUGUST 1991)
-  LAND PARCELS FOR SEVERANCE AND REZONING
-  ROUTE OPTIONS CONSIDERED IN THIS REPORT
-  PREFERRED ROUTE PRESENTED IN THE PUBLIC ENVIRONMENTAL REVIEW
-  PROPOSED COMMUNITY ROUTE
-  EXISTING GROUNDWATER CONTOURS
-  POSSIBLE INTERCHANGES
-  EXISTING PRODUCTION WELLS
-  PROPOSED PRODUCTION WELLS (LEXIA SCHEME)
-  MIDLAND REGIONAL CENTRE
-  RURAL SERVICE CENTRES

 **MAIN ROADS
Western Australia**



Prepared by the Statutory Planning Branch
Main Roads Western Australia
August 1994

FIGURE 2

2.2 Excision of a portion of State Forest No. 65 for urban development

As a direct consequence of preferred route for the Perth — Darwin National Highway proposed by Main Roads in the PER, 63 hectares of State Forest No. 65 is separated from the remainder of the forest estate and is proposed to be excised for urbanisation. This 63ha of State forest land is additional to the 185ha of State forest land proposed for urbanisation through the Ellenbrook urban rezoning, subdivision and development proposal, assessed by the Environmental Protection Authority and reported in Bulletin 642. Urbanisation of the 185ha portion of State forest proposed through the Ellenbrook development was approved by the Minister for the Environment subject to environmental conditions and procedures being met. Conditions and procedures concerning the Ellenbrook proposal are published in the Minister's Statement of 13 October 1992.

The PER report states that agreement in principle has been reached between the State Government and Ellenbrook Management Pty Ltd to extend the Ellenbrook project area to the new boundary created by the location of the proposed highway (Dames & Moore 1994).

2.3 Excision of a portion of Whiteman Park for special rural development

As a direct consequence of the preferred route for the Perth — Darwin National Highway proposed by Main Roads and Ellenbrook Management Pty Ltd in their PER, a 28 hectare portion of Whiteman Park would be separated from the remainder of the Whiteman Park estate. This land is proposed to be rezoned in the North-East Corridor Metropolitan Region Scheme Amendment (Amendment No. 950/33) from existing Parks and Recreation Reservation to Rural to enable its development for special rural purposes (State Planning Commission 1994).

2.4 Public transport route

The Department of Planning and Urban Development (1994), has made provision in the North East Corridor Structure Plan for a public transport reservation through the North-East Corridor from Bassendean in the south to the northern end of Ellenbrook in the north, with provision that it be extended as far north as will be required to service any future urbanisation that may occur. A reservation for the public transport route has been proposed by the State Planning Commission between the Reid Highway and Maralla Road, in the Metropolitan Region Scheme Amendment No. 950/33.

From Reid Highway to Gnangara Road and from south of Maralla Road northwards, the public transport route runs parallel with the preferred route for the Perth-Darwin National Highway. In view of the juxtaposition of the proposed public transport route to the preferred national highway, it is expected that the environmental issues associated with its implementation will be the same. Therefore, although the public transport route was not specifically examined in the Public Environmental Review, the recommendations of the Environmental Protection Authority for the preferred highway route are considered to be relevant for the public transport route reservation where it traverses important groundwater areas.

It is considered that prior to the construction phase of the rapid transport route, more detailed environmental investigation will be required to ensure proper management of impacts.

3. Environmental impact assessment method

3.1 General

The environmental impact assessment for this proposal followed the *Environmental impact assessment administrative procedures 1993*, as shown in the flow chart in Appendix 1. The summary of submissions and the proponents response to those submissions appears in Appendix 2, and a list of submitters appears in Appendix 3. Additional information concerning public submissions is provided below.

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent through preparation of the Environmental Review document (in response to guidelines issued by the Department of Environmental Protection), by Department of Environmental Protection officers utilising their own expertise and reference material, by utilising expertise and information from other State government agencies, and by contributions from Environmental Protection Authority members.

The Environmental Protection Authority recognises that further studies and research may affect the conclusions. Accordingly, the Environmental Protection Authority considers that if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Environmental Protection Authority

3.2 Public submissions

Comments were sought on the proposal from the public, community groups and local and State Government Authorities. The proponents Public Environmental Review document was available for public comment for a period of eight weeks between 21 March 1994 and 16 May 1994.

There were 93 submissions received, within the following categories:

- 78 individual letter submissions including 1 petition letter with 34 signatures;
- 8 submissions from groups and organisations; and
- 7 submissions from state, local and other government agencies.

The principle issues of concern in the submissions include:

- conservation, including Whiteman Park and National Estate issues;
- hydrological issues, including wetlands, groundwater and drainage;
- State Forest and mineral resource development issues;
- construction and operational impacts;
- regional effects of the proposal;
- social issues;
- consideration of alternative route options;
- length of public review period; and
- other general issues.

The Environmental Protection Authority has included consideration of the submissions received and the proponents response as part of the assessment of the proposal.

3.2.1 Synopsis of public submissions

The emphasis throughout the majority of submissions was to highlight apparent inadequacies in the assessment of specific issues, by the proponents. In particular, the submissions were primarily concerned with the lack of community consultation and social impact assessment and the lack of detailed information in the PER. Aboriginal communities and individuals indicated concern at the lack of consultation and the potential impact of the proposal upon matters of profound interest to them.

Many of the submissions expressed concern with the process of selection of the Perth — Darwin National Highway and the inability to properly research the project's convoluted history. The Environmental Protection Authority understands that the selection of the preferred Perth — Darwin National Highway route identified in the PER report has been made after consideration of a broad range of environmental, social, technical, economic and political issues (Dames & Moore 1994). The submissions suggest that inadequate consultation with the community has resulted in uncertainty and lack of confidence in the government decision making process.

A number of submissions put forward alternative alignment options for the Perth — Darwin National Highway.

3.2.2 Social, economic and other issues raised in submissions

In considering the issues raised in public submissions for the Eastern Corridor Major Roads Study, the Environmental Protection Authority (1989) concluded that many issues were principally an expression of social concerns (eg: impact on rural lifestyle, disturbance to a community). Notwithstanding that there may be a physical aspect to many social issues (eg: property severance), the Environmental Protection Authority considered that issues of an essentially social or community orientated nature should be resolved through the planning process rather than the environmental assessment process.

The Environmental Protection Authority (1994) also indicated in its assessment of the Reid Highway — Beechboro Road to Great Northern Highway, that concerns raised over archaeology, ethnology and transport planning and management are the responsibility of other agencies and would be considered by other decision makers for the project.

In adopting this same approach for the Perth Darwin National Highway the Environmental Protection Authority is aware of the largely concurrent advertising for public comment of the State Planning Commission's proposed major amendment to the Metropolitan Region Scheme for the North East Corridor. This Amendment, which includes the proposed reservation of the alignment for the Perth — Darwin National Highway was open for public comment until the 24 June 1994. It is the Environmental Protection Authority's view that local and regional planning issues and concerns associated with the proposed alignment of the Perth — Darwin National Highway, are appropriately resolved by the planning agencies through the planning process.

This includes those social, economic and planning issues raised in submissions which are primarily concerned with areas south of the Reid Highway.

A number of submissions and other letters received by the Environmental Protection Authority expressed concern over the 8 week public review period. The Environmental Protection Authority believed that an extension to the public review period was not considered appropriate and a copy of the letter advising this is included in this report as Appendix 4.

A number of submissions also requested the opportunity to provide a verbal presentation to the Environmental Protection Authority. Accordingly, the Environmental Protection Authority's Environmental Assessments Committee heard presentations from representatives of a number of concerned community groups.

4. Evaluation

The Environmental Protection Authority has evaluated all the options for the Perth — Darwin National Highway identified in Section 2.1 of this report, based on existing information.

In undertaking this evaluation, the Environmental Protection Authority's overall objective is that development should be environmentally sustainable in the long term over a period of 10, 20, 50, 100 years and beyond.

4.1 Groundwater protection

The Western Australian Government's State of the Environment Report (1992), indicated that in 1990, groundwater comprised about 40 percent of Perth's public water supply, and about 65 percent of all water used in the metropolitan area. Groundwater is a natural resource that is fully renewable, provided that its quality and quantity are not changed. This does not mean that some forms of development over the resource cannot take place, but there are significant constraints to the form of development so that the attributes of the groundwater are not jeopardised.

Objective

The Environmental Protection Authority's objective is to protect prime groundwater reserves essential for Perth's public water supply now and in the future.

Evaluation framework

Technical information

The Gnangara mound is an unconfined superficial aquifer with water slowly flowing radially from its central point to Ellen Brook, the Swan River and the coast.

Urban development is known to be associated with a high risk for contaminating such groundwater aquifers from pesticides and other toxic substances used for construction and maintenance of houses, garden fertilisers and pesticides, hydrocarbons and chemical spills from roads, industrial areas and stormwater runoff which is known to be highly contaminated with a wide range of substances.

Transport routes are especially associated with high risks of groundwater contamination from construction materials (notably bitumen and fuel), spillages from freight traffic carrying toxic substances and cumulative hydrocarbons, lead and heavy metal runoff from normal use of the road.

Main Roads Department contracted a preliminary study to determine the costs associated with managing the risks of contamination from use of the road if constructed across the water mound (Cossill and Webley, 1992). This study determined that a detailed risk analysis and cost benefit assessment would be needed if a highway across the mound were to be seriously entertained.

However, the study did look at the preliminary costs associated with containing the drainage system for a 1 in 100 year storm event to protect the mound. The main features included a fully sealed drainage system, barriers to ensure that vehicles could not leave the sealed area in the event of an accident and a system to pump contaminated drainage water from the priority 1 area through sealed drains and retention basins. The additional construction costs for this system were determined to be in the order of \$1 million to \$1.25 million / kilometre. It was noted that this would not entirely eliminate the risks of contamination.

Main Roads was subsequently requested to provide information on risk assessment and the management strategies proposed for the preferred option. Main Roads letter is contained in Appendix 5. Main Roads have concluded that preliminary studies show that the risk of spillage on a road of this nature would be very low. In view of this and the random nature of road accidents, the proposed strategy is to implement management measures to deal with spillages

when and where they may occur. Detailed discussion of the differences in risk at different sectors of the road, such as intersections, are not given. Nor are the problems with dealing with different substances or where spillages occur without the knowledge of the Water Authority.

The Water Authority has advised that the contaminants of most concern are from spillages from freight traffic using the Highway. In particular, dense organic liquids with low solubility are a problem. Spillages of such liquids would sink to the bottom of the aquifer, stratify and provide a continuous source of low level toxicity within the groundwater over decades. The removal of these substances from the groundwater is very difficult, if not impossible.

In addition, there is concern regarding the constant low level pollution associated with the normal use of the road. These include metals, greases and oils from the wear and tear of vehicles. A study in Perth in 1990 found that infiltration basins adjacent to a major road contained very high levels of lead and heavy metals. These substances were found to be confined to the surface soils of the basins in the short to medium term. It is not known if they could break through in the long term.

Finally, construction and repair materials such as bitumen will provide some risk of contaminating the groundwater.

Figure 2 shows that the Highway is proposed to run between the existing line of the Water Authority extraction bores north of Lord Street and adjacent to a bore for the proposed Lexia Scheme. The proposed major interchange with the Gngangara Road lies directly between two proposed bores within the 500 metre buffer distance. Although the regional water flow for the area is to the south east, local flows will be determined by the pumps and flow towards the bores. In spite of the lack of information provided by Main Roads on the risks of accidents, interchanges and intersections are road sectors in which there is known to be a significant increase in accident risk.

In conclusion, the Environmental Protection Authority has noted that the risks of contamination from urban development and transport routes to the groundwater are high. It is also noted that options which cross a significant portion of the priority 1 area have been eliminated from further assessment by the proponent because preliminary studies have shown that the additional construction costs for protecting the groundwater are too high. This high level of protection is not proposed for the preferred route. The proponent's assessment has not included a detailed risks analysis for any option, including the preferred option, nor has it provided the management details for prevention and clean up from contamination.

Existing policy framework

Environmental Protection Authority — policy framework

Three Environmental Protection Policies have been prepared for the groundwater mounds. These are:

- Environmental Protection (Gngangara Mound Crown Land) Policy 1992;
- Draft Environmental Protection (Gngangara Mound Private Land) Policy 1992; and
- Draft Environmental Protection (Jandakot Mound) Policy 1992.

The purpose of these policies is to protect the recharge areas of the groundwater mounds for public water supply and the surrounding environment which depends on the groundwater for its continued existence.

The Environmental Protection Authority is concerned because some of these policies are not finalised. It is also concerned because, in some instances, they are not based upon sound hydrological principles but on planning cadastral boundaries and that there is some inconsistency with the policies of the Water Authority. Accordingly, the Environmental

Protection Authority has requested the Water Authority to assist with review and completion of policies within both agencies.

Water Authority of Western Australia — policy framework

The Water Authority operates under the Metropolitan Water supply Sewerage and Drainage Act (1909), and the Country Areas Water Supply Act (1947). Metropolitan catchments are subject to the Metropolitan Water Supply, Sewerage and Drainage By-laws (1981) as amended.

Under the legislation available to it, the Water Authority declares Public Water Supply Areas, Water Reserves and Underground Water Pollution Control Areas. These allow the Water Authority to take water from the groundwater sources, and allow for the protection of the quality of the groundwater. Sites up to 500 metres from production bores are most at risk and special restrictions apply within those areas, known as well-head protection zones.

The levels of protection applied to Underground Water Pollution Control Areas are prioritised and vary according to:

- land ownership and zoning;
- proximity to established or proposed water bores;
- position relative to groundwater flow paths; and
- level of threat posed by present or past land use.

Priority 1 is the highest level of protection and normally applies to land owned by the State, with low-intensity, low-risk land use such as forestry and parks. Use of that land for protection of the public water supply outweighs virtually all other considerations. The objective for management of these areas is to ensure that there is no degradation of water resources in those areas.

Priority 2 applies to normally private rural land with few buildings, with low-risk, low-intensity land use. These areas have a high priority for public water supply use. Restricted development may take place within Water Authority policy guidelines. The objective for management of these areas is to prevent increase in the risk of pollution.

Priority 3 areas are where water supply needs to co-exist with other land uses such as housing, commercial sites and light industry. Management controls, rather than land use restrictions dominate the Water Authority's protection policy for these areas. The management objective is to minimise the risk to the water source (Water Authority of WA, 1993).

Comments from key government agencies

The Water Authority of Western Australia in its submission provided the following comments in regard to the PERs preferred route for the Perth — Darwin National Highway.

The Water Authority indicated concern about "...any major road alignment that is proposed in the Priority 1 Source Protection Area of the Gngangara Mound. This is because the objective of Priority 1 areas, is that no degradation of the resource should occur. Essentially, this objective limits land uses on Priority 1 areas to very low pollution risk activities. Major roads which carry heavy transport are considered to pose a high pollution risk which is contrary to the objective of Priority 1 protection."

The Water Authority is "...strongly opposed to the adoption of either the Central or the Western Route..." indicated in figure 4.2 of the PER. The Water Authority prefers the Eastern Route shown in figure 4.2 of the PER because it infringes the least on the Priority 1 Source Protection Areas.

If the highway alignment through the declared Priority 1 Area is adopted, the Water Authority of Western Australia has indicated that the boundary of the Priority 1 area will need to be changed. The Water Authority would agree to a minor change in the boundary of the Priority 1 Source Protection Area, if an equivalent area of land on the Gngangara Mound was included in the exchange. This strategy is based on the desire to consolidate the Crown Land on the Gngangara Mound with the purpose of increasing the protection of the groundwater resources.

Public submissions

A summarised list of issues raised through the public submissions is included in Appendix 2. A large number of submissions indicated an understanding of the importance of protecting the Gnangara Water Mound resource. However, many submissions also indicated a preference for the Perth — Darwin National Highway to be located over the Gnangara Mound, on the western side of Whiteman Park as an extension of Tonkin Highway. (see Community Groups Consensus Route, Figure 2) In support of this proposal was the opinion that:

- high standard drainage management techniques could avoid or minimise the risk of pollution to the groundwater; and
- existing roads, such as Gnangara and Neaves roads, and other potentially polluting activities are already located on the Gnangara Water Mound.

Comments from the proponent

In relation to the preferred route for the Perth — Darwin National Highway, Main Roads has given the following specific commitment:

- Main Roads will undertake to minimise the risk of contamination of Priority 1 Source Protection Areas. Processes to achieve this objective will be described in an Environmental Management Programme.

In relation to the portion of State Forest land alienated by the highway proposal and proposed for rezoning and urban development, Ellenbrook Management Pty Ltd has given the following specific commitment:

- Ellenbrook Management will undertake to manage groundwater quality in the area of State forest proposed for rezoning in a manner consistent with the environmental criteria, nutrient and drainage management plans approved for the Ellenbrook development, and environmental management commitments made subsequent to these approvals.

The proponent's response to groundwater issues raised during the public submission period is provided in Appendix 2.

4.2 Urban conservation

Evaluation framework

The Environmental Protection Authority's objective for urban conservation is to protect areas of greatest conservation value through proper management.

Existing policy framework

The main points of the Environmental Protection Authority's strategy for urban conservation are:

- an adequate and representative system of reserves should be set aside for the conservation of flora, fauna and landscape;
- such reserves should be properly managed and given security of tenure which recognises their conservation value;
- the integrity of such reserves should be maintained;
- the System Six Report (endorsed by Government in 1983 (EPA 1983)) established through the Conservation Through Reserves studies has formed a principle focus for the Environmental Protection Authority's conservation efforts on the Swan Coastal Plain;

- decisions to look at areas outside the Systems' areas are the exception but any proposal which may impact on areas of high conservation value outside the Systems areas should be referred to the Environmental Protection Authority;
- decisions on managing impacts on individual species which are endangered have generally been the responsibility of the Department of Conservation and Land Management under the *Wildlife Protection Act*.; and
- decisions on protecting areas of remnant vegetation outside the above framework for local conservation, linkages, buffers or local community use should be the responsibility of the planning agencies.

This strategy is not intended to diminish the importance of the issues associated with local areas which do not have high conservation value or to discourage community concerns, but rather to indicate the role of the planning process in making decisions regarding the use of the land.

Technical information on impacts associated with the different options

OPTION 1

- West of Whiteman Park, Option 1 has the potential to impact upon vegetation of the Southern River Complex and Bassendean Complex — Central and South. It is considered that the regional conservation value of these 2 vegetation complexes is high.
- Option 1 crosses through System 6 Area M9 (Melaleuca Management Priority Area).

OPTION 2

- West of Whiteman Park, Option 2 has the potential to impact upon vegetation of the Southern River Complex and Bassendean Complex — Central and South. It is considered that the regional conservation value of these 2 vegetation complexes is high.
- Option 2 crosses through the north west corner of System 6 Area M13 [Whiteman Park (Mussell Pool)], and impacts upon remnant vegetation in this area.
- Option 2 separates the Lexia Wetland complex along its western edge from *Banksia* woodland in State Forest No 65.
- This option could require the crossing of the Ellen Brook watercourse if the more easterly alignment is selected.

COMMUNITY OPTION

- West of Whiteman Park, the Community option has the potential to impact upon vegetation of the Southern River Complex and Bassendean Complex — Central and South. It is considered that the regional conservation value of these 2 vegetation complexes is high.
- South of Maralla Road the Community option crosses the Sawpit Gully watercourse which is intended to be reserved for conservation.
- The Community option requires the crossing of the Ellen Brook before joining the Great Northern Highway.

OPTION 3

- Option 3 (Lord Street North) severs a portion of Whiteman Park but this section is not affected by the System 6 recommendations.
- Option 3 impacts on remnant vegetation in Whiteman Park and the State Forest and separates the Lexia Wetland complex along its western edge from *Banksia* woodland in State Forest No 65.

The State Forest to the west of the Lexia Wetlands provides a large tract of *Banksia* woodland (not cleared during the development of the pine plantations) that is continuous

in a northerly direction through Melaleuca Park and then through the bombing range (Bowman, Bishaw and Gorham, 1993).

The conservation opportunities for fauna in the Lexia Wetlands area are considerably enhanced by its connection to the State forest woodland. The availability of this extensive habitat area with secure long-term tenure suggests that the viability of most elements of existing fauna populations can be assured (Bowman, Bishaw and Gorham, 1993b). The Department of Conservation and Land Management has also given a similar view in its submission.

- Option 3 requires the crossing of Ellen Brook before joining Great Northern Highway.

PREFERRED OPTION

- A major portion of Whiteman Park (Mussell Pool) is included in the System 6 Report as System 6 Recommendation Area M13. However, the area of Whiteman Park affected by the preferred highway route and the adjacent public transport route is not within the area affected by the System 6 recommendations.
- The PER preferred route impacts upon the area reserved for 'Parks and Recreation' in the Metropolitan Region Scheme following environmental assessment of the Ellenbrook urban rezoning, subdivision and development proposal (Bulletin 642) and intrudes into wetland buffer areas within this reserve. In addition, provision for an intersection which provides the potential for a future road alignment through the 'Parks and Recreation' area has been proposed.

Approval for the Ellenbrook proposal was given by the Minister for the Environment only after an extensive investigation of the site, preparation of a Public Environmental Review (PER), receipt of public and government agency submissions, release of the Environmental Protection Authority's Report and Recommendations on the proposal (EPA Bulletin 642) and following consultation with other Ministers and agencies. The environmental conditions set on the proposal were published only after a process of consultation, where agreement on the conditions and procedures under which the proposal may proceed was reached, between the Minister for the Environment and the Ministers for Planning and Water Resources.

Compliance with the environmental conditions and procedures set on the proposal needed to be completed to the requirements of the Minister for the Environment.

The Minister for the Environment's subsequent clearance of conditions affecting the Lexia Wetlands area was subject to a modification of the conservation boundary around the Lexia wetlands. In order to properly protect the policy lakes and other wetlands from future development an adequate buffer was needed. The Minister for the Environment determined on advice from the Environmental Protection Authority that the conservation boundary for the Lexia Wetlands area should be located behind dune ridges so that future development would be located outside the catchment of the wetlands.

- The alternative route to the proposed northern section of the Perth — Darwin National Highway (preferred route) passes through the north west section of a proposed Environmental Protection (Western Swamp Tortoise Habitat) Policy area around Twin Swamps Wildlife Sanctuary. The purpose of the Environmental Protection Policy (EPP) is to enable the western swamp tortoise to survive by protecting the tortoise's remnant habitat (the swamps) and the catchments.

At the time of publishing this report a Draft EPP has recently been released for public comment by the Minister for the Environment. The Environmental Protection Authority considers that, should this alignment be selected for the Perth — Darwin National Highway Route management of drainage will be required which achieves disposal outside of the proposed policy area.

OPTION 4

- The crossing of the Swan River (System 6 Recommendation Area M19).
- The road alignment skirts the eastern edge of the Ellen Brook Wildlife Sanctuary (System 6 Recommendation Area M17).

The Ellen Brook Wildlife Sanctuary and Twin Swamps Wildlife Sanctuary have high conservation value for protection of the short necked tortoise, *Pseudemydura umbrina*. The proximity of the existing Great Northern Highway to the Ellen Brook Wildlife Sanctuary and the potential for pollution events arising from existing roadside drainage and other transport related uses, impacting upon the reserve is of concern. However, through the environmental assessment of nearby clay excavation proposals, the Minister for the Environment has set environmental conditions requiring a drainage management plan to be prepared to protect the Ellen Brook reserve. The Department of Conservation and Land Management, the Department of Environmental Protection, Main Roads Western Australia and other relevant agencies are assisting in this process.

- The crossing of numerous creeks and drainage lines is required.

Main Roads has shown through previous assessments assessment of other major road proposals involving river and watercourse crossings including, Roe Highway Stages 3 to 5, Welshpool Road to South Street (EPA Bulletin 709) and Reid Highway from Beechboro Road to Great Northern Highway (EPA Bulletin 735), that highway design, construction and operation can be implemented by Main Roads in a manner which protects the environmental and recreational values of such systems.

OPTION 5

- The road alignment skirts the eastern edge of the Ellen Brook Wildlife Sanctuary (System 6 Recommendation Area M17).
- There will be a need for a new bridge to cross the Swan River (System 6 Recommendation Area M19) in the Upper Swan area.
- The road will cross Jane Brook (System 6 Recommendation M20).
- The road will cross Susannah Brook and minor creek and drainage lines not affected by System 6 Recommendations.

OPTION 6

- The road alignment skirts the eastern edge of the Ellen Brook Wildlife Sanctuary (System 6 Recommendation Area M17).
- The requirement for a new bridge over the Swan River 9 (System 6 Recommendation Area M19).
- Crossings of creeks and minor drainage lines.

Technical information on potential for management

Location of alignments through conservation areas which do not accord with management plans.

Where such proposals are proposed to be located within established or proposed conservation areas it is essential that the actual location of the road, its construction, operation and on-going maintenance are undertaken in accordance with provisions contained in management plans for those areas in close liaison with the relevant management agency. This is particularly important where, regionally significant conservation values are conserved, rare flora or fauna species occur or where management is aimed at preventing the spread of dieback. The impacts associated with the proposals in this report have not been presented within the framework of a management plan. In particular, the proposed reservation of an intersection south of Maralla

Road, intended to provide for road access through the Lexia Wetlands conservation area should be considered within the context of an overall plan of management for the area. Road access at this juncture may not be consistent with the conservation aims of the Lexia Wetlands.

Fauna linkages where they do sever areas

According to De Santo and Smith (1993) the potential environmental impacts on habitat and wildlife generated by a particular transportation project can be considered in terms of short-term and long-term impacts.

“Short term impacts are those that relate to effects of construction activities on wildlife. These include, but are not necessarily limited to, the presence and activities of construction workers and the presence and operation of machinery involved in construction. These considerations include noise and vibration; runoff of sediment and pollutants such as oils, grease, and gasoline; and the impacts of a decrease in overall habitat size and available foraging habitat and its quality for wildlife.” (De Santo and Smith 1993)

Long term impacts on habitat and wildlife are two fold. Firstly, “...the amount of habitat loss and its associated direct impact on wildlife is a function of the width and length of the [transportation] corridor” (De Santo and Smith, 1993).

The second long term impact concerns habitat fragmentation. The above mentioned studies indicate that a reduction in habitat size results in a decrease in species diversity and richness and increases the margin or length of habitat edge.

“In both the short and long term, transportation corridors disrupt wildlife movement by imposing physical barriers to normal diurnal or nocturnal movement patterns. Migration corridors and dispersal orientation are altered or destroyed. This disruption fragments and thus isolates populations and their gene pools.” (De Santo and Smith 1993)

Transport corridors have the potential to minimise the impact to adjacent habitats and maintain linkages which provide for fauna movement by incorporating an appropriately designed highway underpass.

Minor adjustment of alignments around areas.

The Environmental Protection Authority believes that the existing Parks and Recreation boundary represents the minimum acceptable buffer for the Lexia Wetlands conservation area. Encroachment by the preferred highway route within the area zoned Parks and Recreation reservation does not conform with the intention to provide a suitable buffer to these regionally important wetlands and surrounding vegetation, established by the Minister for the Environment through his clearance of environmental conditions set on the Ellenbrook proposal. The clearance of environmental conditions for the Ellenbrook proposal is undertaken by the Minister for the Environment in consultation with other decision making authorities including, the Department of Planning and Urban Development and the Water Authority of Western Australia.

The Environmental Protection Authority’s fundamental principles of the strategy for urban conservation are that:

- an adequate and representative system of reserves should be set aside for the conservation of flora and fauna and landscapes; and
- such reserves should be properly managed and given security of tenure which recognises their conservation value.

Accordingly, the EPA does not support road or development proposals which impact on such reserves.

It is recognised, however, that in some instances, development within such reserves is consistent with use of the reserve for conservation or recreation. In other instances, modification of a reserve’s purpose or boundary may be appropriate.

The Environmental Protection Authority understands that some areas of land owned by Ellenbrook Management Pty Ltd and currently zoned urban could be affected due the requirement to achieve national highway standards for highway design and construction arising from the above requirement.

Water issues

The most common hydrological response to urban development on the Swan Coastal Plain is a rise in the water table. Native vegetation is often adapted to waterlogged soils or flooding but an increase in the depth and frequency of inundation may reduce plant vigour and in some cases cause death (Bowman Bishaw Gorham 1993). Management, based on proper studies and through appropriate drainage planning and design, and use of best management practices which protect native vegetation and commercial pine plantations is essential.

Comments from and negotiations with key government agencies

In its letter of 18 May 1994, the Department of Conservation and Land Management indicated support for the preferred route, as the alignment will maintain the contiguous linkage that exists between the Lexia wetlands and the State forest to the west, and it also allows the establishment of habitat linkages to other conservation areas within the Ellenbrook project land.

Public submissions

A summarised list of issues raised through the public submissions is included in Appendix 2. A large number of submissions indicated concern at the impact of the preferred Perth — Darwin National Highway route on the following:

- the conservation and recreational values of Whiteman Park;
- severance of habitat linkages between Whiteman Park and the Caversham Air Base;
- severance of habitat linkages between the Lexia Wetlands and the Sawpit Gully conservation area;
- the conservation values of the Lexia Wetlands Parks and Recreation area;
- proposed National Estate listing of the Lexia Wetlands and surrounding areas (see attachment 1a in Appendix 2); and
- impacts to flora and fauna.

Comments from the proponent's PER report and response to public submissions

In relation to the preferred Perth — Darwin National Highway route, Main Roads has given the following commitments:

- Main Roads will undertake to avoid indirect impacts on System 6 conservation areas.
- Main Roads will minimise disturbance to regionally significant vegetation adjacent to the consensus route. Areas disturbed by construction of the consensus route will be rehabilitated by Main Roads as soon as practicable. An EMP to address rehabilitation needs will be prepared prior to construction.
- Main Roads will minimise disturbance of significant flora in the vicinity of the consensus route. In the event that significant flora species are found in the corridor, an EMP will be developed in consultation with CALM.
- Main Roads will undertake to protect significant species of fauna. In the event that any significant fauna or fauna habitat are found in the corridor, an EMP will be developed in consultation with CALM and the WA Museum.

The proponents PER report indicates that the excision of a portion of State Forest No. 65 for urban development does not impact upon System 6 Conservation Areas, regionally significant vegetation, or significant flora or fauna.

4.3 Wetland protection

The 1992 State of the Environment Report for Western Australia indicated that since European settlement, 70 to 80 percent of wetlands on the Swan Coastal Plain have been affected by urban, industrial and agricultural development. Many wetlands no longer exist, and others have reduced conservation values. (Western Australia Government 1992)

There is a growing view in the community, that the remaining wetlands of the Swan Coastal Plain are essential for the maintenance of ecological systems and the time has been reached where strong action needs to be taken to protect them. (Environmental Protection Authority 1990)

Evaluation framework

Existing policy framework/objective

Since 1971, the Environmental Protection Authority has consistently recognised the need to conserve lakes and wetlands and has developed a strategy for wetland protection on the Swan Coastal Plain (Environmental Protection Authority 1993, Bulletin 685).

The Environmental Protection Authority discourages proposals which would affect significantly functional lakes and wetlands, that is:

- Lakes nominated for protection in the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992;
- representative wetlands recommended for protection in the Environmental Protection Authority's System Six report;
- wetlands with rare vegetation communities not adequately represented in reserves, or rare flora and fauna (and their habitats); and
- wetland recognised by international agreement because of their importance primarily for waterbirds and their habitats.

Any proposals affecting wetlands which do not fall into the above categories are expected to be managed by the proponent within the management objectives for the relevant category of wetland identified in the Environmental Protection Authority's Bulletin 686, A Guide to Wetland Management in the Perth and near Perth Swan Coastal Plain Area.

Technical information on impacts associated with the different options

OPTION 1

- Specific impacts are not known. However, this option traverses the Melaleuca Management Area (System 6 Recommendation M9) which has a number of Category C wetlands.

OPTION 2

- Specific impacts are not known. However, option 2 has the potential to impact upon gazetted lakes (Category C wetlands) in the north west of the Lexia conservation area, and Category C and R wetlands north of Maralla Road.

COMMUNITY OPTION

- Specific impacts are not known. However, the community option avoids the Lexia conservation area and wetlands therein.

OPTION 3

- Specific impacts are not known.

PREFERRED OPTION

- The preferred route for the Perth — Darwin National Highway has the potential to impact upon, wetlands protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992, and upon wetlands classified as Category C (Conservation wetlands having high wildlife value), Category R (Resource Enhancement wetlands having moderate human-use and wildlife value) and Category M (Multiple use wetlands having low human-use and wildlife value).
- Immediately north of Maralla Road, the proponents' consultants, Dames & Moore, indicate that the preferred route alignment will cross the cleared portion of a Category C (conservation) wetland, and south of Warbrook Road it will impact upon a Category R (resource enhancement) wetland. It is also suggested that construction of the road may result in loss of remnant wetland vegetation in the immediate vicinity of the road and may result in changes to the hydrology of the wetlands.
- The preferred route alignment is located within the area identified in the Semeniuk report as containing wetlands of the Bennett Brook suite. An environmental study of the North East Metropolitan Corridor commissioned by the Department of Planning and Urban Development specifically identified wetlands of the Bennett Brook suite occurring within the Whiteman Park area as providing "...the best opportunity to secure examples of the wetlands of this suite...[and that] it is important to carefully consider any proposals that would interfere with or alter the natural hydrological processes of this suite..." (V & C Semeniuk Research Group 1992)

OPTION 4

- BSD consultants (1994) indicate in relation to the Great Northern Highway option that the initial stages associated with the Reid Highway — Great Northern Highway intersection requires modification that may impact upon a number of wetlands.
- Option 4 has no known effect on wetlands in other sectors but this issue has not been examined in detail.

OPTION 5

- The Travers Morgan Report (1991) indicates that this option has no known effect on wetlands.

OPTION 6

- The Travers Morgan Report (1991) indicates that this option has no known effect on wetlands.

General management

Wetlands are valuable assets because they carry out a number of important processes, either ecological (biological and chemical), hydrological or social. These processes can be called wetland "functions" and are described in the Environmental Protection Authority's Bulletin 685, Strategy for the protection of lakes and wetlands of the Swan Coastal Plain. Development can severely impact on nearby wetlands in the following ways:

- loss of wetland function;
- loss of habitat through clearing of wetland vegetation, including increased recreational pressures;
- changes in hydrology due to draining, inflow of stormwater and loss of deep rooted vegetation; and
- loss of water quality from pollutants exported from the development through ground or surface water. [EPA (forthcoming)]

This does not mean that development should not occur rather that development should proceed in a manner that protects the wetlands environmental values.

In relation to construction and operation of transport infrastructure such as roads the following potential impacts to wetlands have been identified:

- Construction of the road may result in loss of remnant wetland vegetation in the immediate vicinity of the road and may result in changes to the hydrology of the wetlands;
- Wetlands may also be affected by stormwater runoff from construction sites and the completed highway; and
- Serious road accidents, such as collisions involving heavy haulage vehicles carrying hazardous substances, have the potential to release large quantities of liquid contaminants into the stormwater drainage system.

The Environmental Protection Authority expects that Main Roads would recognise that all wetlands have special value and that they should be appropriately managed to maintain their human use and natural values when assessing possible uses. The main factors to take into account in protecting these seasonal wetlands include:

- assessment and management of the wetlands having regard to the Environmental Protection Authority's guidance contained in Bulletin 686; and
- protection of water levels and water quality through management of drainage.

In previous assessments, the Environmental Protection Authority has required Main Roads to ensure that wetland functions are replaced where impacts upon the wetlands cannot be avoided. This strategy is consistent with recent environmental assessments undertaken by the Environmental Protection Authority for the proposal by Main Roads to extend Kwinana Freeway from Forrest Road to Thomas Road, Casuarina, and the Water Authority of Western Australia for development of Stage 2 of the Jandakot Groundwater Scheme.

The policy and management framework for the protection of wetlands is generic and should be applied to the Perth — Darwin National Highway option that is approved by Government. Accordingly, the Environmental Protection Authority's views in regard to wetland protection apply to all remaining options.

Public submissions

A summarised list of issues raised through the public submissions is included in Appendix 2. A large number of submissions indicated concern at the impact of the preferred Perth — Darwin National Highway route on the following:

- Category C and R wetlands north of Maralla Road;
- the Lexia Wetlands complex, including wetlands east and west of the proposed transit corridor; and
- wetlands within Whiteman Park and in particular, Horse Swamp.

Comments from the proponent's PER report and response to public submissions

The Public Environmental Review indicates the objective for wetland management is to avoid disturbance of lakes protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy and minimise disturbance of other wetlands in the vicinity of the preferred route.

In relation to the proposed Perth — Darwin National Highway (preferred route), Main Roads has given the following commitment:

- Main Roads will undertake to avoid disturbance of lakes protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy and minimise disturbance of other wetlands in the vicinity of the consensus route [preferred route]. An EMP that will address the management of wetlands affected by the consensus route [preferred route] will be prepared in consultation with the EPA and the Water Authority of Western Australia.

In relation to the State forest land the land severance and rezoning proposal will have no direct impact on wetlands. Indirect impacts on wetlands will be managed in accordance with commitments made by Ellenbrook Management with respect to groundwater levels and quality (Dames & Moore 1994).

4.4 Pollution and drainage management

Evaluation framework

As discussed above, the construction and operation of all options of the Perth — Darwin National Highway and associated developments have the potential to alter existing surface and groundwater regimes.

The Public Environmental Review does not address water quality and quantity issues in a detailed way. The report presents the broad objectives of water management and provides a general indication of the management strategies required. However, the proponent does indicate a willingness to manage water quality and quantity issues associated with the proposal and has provided a number of commitments to this effect.

Public submissions

A summarised list of issues raised through public submissions is included in Appendix 2. In addition to specific concerns regarding drainage design, submissions were also concerned with drainage impacts to wetlands and groundwater areas.

Comments from the proponent's PER report and response to public submissions

In relation to the preferred route for the Perth — Darwin National Highway, Main Roads has given commitments in relation to the protection of groundwater and wetlands indicated elsewhere in this report, which necessarily involve the management of drainage.

In relation to the portion of State forest land alienated by the highway proposal and proposed for rezoning and urban development, Ellenbrook Management Pty Ltd has given the following relevant commitments not mentioned in other sections of this report:

- Ellenbrook Management will undertake to achieve the objectives for groundwater level management developed for the Ellenbrook project for the area of State forest proposed for rezoning.
- For the State forest exchange area, Ellenbrook Management will undertake to achieve the nutrient export management objectives developed for the Ellenbrook project so that nutrient discharges from the site to Ellen Brook and the upper reaches of the Swan River will be minimised and the trophic status of the Swan River will not be adversely affected.

4.5 Noise management

Evaluation framework

Existing policy framework

Since 1989, the Environmental Protection Authority has changed its emphasis in environmental impact assessment for proposals such as roads. This is due to a number of factors including the willingness of agencies such as Main Roads to accept responsibility for the management of environmental issues such as roadside vegetation and landscape. This willingness has

increased over the past ten years to the extent that the management of many environmental issues remains with other agencies to varying degrees.

In many instances the management is within guidelines prepared by the agencies for different environmental issues. The adoption by Main Roads of guidelines for the satisfactory management of traffic noise so that new roads are planned and managed so that noise will not exceed 63 dB(A) at any residence adjacent to the route is an example.

Public submissions

A summarised list of issues raised through public submissions is included in Appendix 2. Concerns were raised in regard to noise impacts to nearby residents and areas designated for conservation, arising from construction and operational stages of the proposal.

Comments from the proponent

Main Roads has committed to designing the road so that the L₁₀ (18 hour) noise level 63 dB(A) used by Australian Regulatory Authorities when considering traffic noise is not predicted to be exceeded at any residence adjacent to the route. In addition, Main Roads has indicated its intention to implement a number of other strategies to minimise the impact of noise and vibration on the environment.

4.6 The Environmental Protection Authority's evaluation

In undertaking its evaluation, the Environmental Protection Authority is aware of the long planning history for the corridor and the difficulties encountered with earlier decisions to locate the proposed Perth — Darwin Highway to the east of the railway line or along the existing Great Northern highway due to the local community's opposition. The Environmental Protection Authority is also aware of the local community's strong opposition to the proponent's preferred alignment along Lord Street for similar reasons.

The Environmental Protection Authority has concluded that while it will provide advice so that environmental impacts can be kept to determined levels, it will not comment on the impacts associated with changes in lifestyle in an area resulting from the rural / urban transition which in the Metropolitan area are properly the responsibility of the planning agencies. In taking this approach, it is not intended to diminish the importance of the issues associated with changing lifestyle or to discourage community concerns, but rather to indicate the role of the planning process in making decisions regarding the use of the land.

As discussed previously, noise management and impact on amenity are issues which will affect all alignments for the Highway and Main Roads has committed to manage the road so that noise levels will be kept to policy levels. Noise management is therefore not included in the ranked evaluation in the table below.

In order to evaluate the impacts from the different transport routes, the Environmental Protection Authority has ranked each highway option and associated development proposals between 1 (best) and 8 (worst) according to the length and location of the highway on the priority 1 and 2 areas and the area of associated development which will impact on the groundwater and on impacts on key conservation features, vegetation and wetlands. The options in Table 2 are presented in descending order of preference, whereby the option with the most environmental impacts is ranked as number 8 and the option with the least environmental impacts is ranked as number 1.

Table 2. Ranking of highway options (descending order of preference)

Highway options	Groundwater protection	Vegetation, fauna and flora	Wetland protection	Rank
Option 1	<p>Priority 1 30 kms in centre of area</p> <p>Priority 2 0 kms</p> <p>Associated development none</p>	<ul style="list-style-type: none"> • Could impact upon regionally significant vegetation complexes. • Directly impacts upon the System 6 Area M9 (Melaleuca Management Priority Area) 	Unknown, but has potential to impact directly upon Category C wetlands in Melaleuca Management Area	8
Option 2	<p>Priority 1 13 kms in centre of area</p> <p>Priority 2 0 kms</p> <p>Associated development none</p>	<ul style="list-style-type: none"> • Could impact upon regionally significant vegetation complexes. • Directly impacts upon the Lexia Wetland conservation area. • May require crossing of Ellen Brook. 	<ul style="list-style-type: none"> • Unknown, but has potential to impact upon gazetted lakes (Category C wetlands) in the north west of the Lexia Wetlands conservation area and Category C and R wetlands north of Maralla Road. 	7
Community Option	<p>Priority 1 11 kms in centre of area</p> <p>Priority 2 1.5 kms</p> <p>Associated development none</p>	<ul style="list-style-type: none"> • Could impact upon regionally significant vegetation complexes. • Requires crossing of Sawpit Gully watercourse proposed for conservation, and the crossing of Ellen Brook before joining Great Northern Highway. 	Unknown	6
Option 3	<p>Priority 1 12 kms up edge of area</p> <p>Priority 2 0 kms</p> <p>Associated development 91 Ha excised from priority 1</p>	<ul style="list-style-type: none"> • Locally significant remnant vegetation in Whiteman Park and State Forest 65 • Severs Lexia conservation area from the Banksia woodland linkage in State Forest. This impact is significant and cannot be modified on this alignment. • Requires the crossing of Ellen Brook before joining Great Northern Highway. 	<ul style="list-style-type: none"> • Unknown, has potential to impact upon wetlands north of Maralla Road. 	5
Preferred Option	<p>Priority 1 7 kms up edge of area</p> <p>Priority 2 1.5 kms</p> <p>Associated development 91 Ha excised from priority 1</p>	<ul style="list-style-type: none"> • Locally significant remnant vegetation in Whiteman Park. • Edge of the Lexia conservation area but could be re-located to avoid this impact. 	<ul style="list-style-type: none"> • Indirect impacts on the Lexia wetlands. • Direct impact on two other small lakes protected by Swan Coastal Plain Lakes EPP. • Impacts on category C (conservation) wetland and a Category R (resource enhancement) wetland. 	4

Options associated with high risk to the environment

Highway options	Groundwater protection	Vegetation, fauna and flora	Wetland protection	Rank
Option 4	<p>Priority 1 0 kms</p> <p>Priority 2 0 kms</p> <p>Associated development none</p>	<ul style="list-style-type: none"> The alignment skirts the edge of the catchment of the Ellen Brook Nature Reserve (M17). Drainage impacts on the Reserve will have to be managed. Crossings will be required at the Swan River (M19), and other water courses. Impacts associated with crossings can be managed. 	<ul style="list-style-type: none"> Intersection of Great Northern Highway and Reid Highway may require wetland replacement and management. No known effect on wetlands in other sectors but this issue not examined in detail. A wetland management plan required to ensure that final alignment and management are satisfactory. 	3
Option 5	<p>Priority 1 0 kms</p> <p>Priority 2 0 kms</p> <p>Associated development none</p>	<ul style="list-style-type: none"> The alignment skirts the edge of the catchment of the Ellen Brook Nature Reserve (M17). Drainage impacts on the Reserve will have to be managed. Crossings on Swan River (M19), Jane Brook (M20), and other water courses. Impacts can be managed. 	No known effect on wetlands but this issue was not examined in detail. A wetland management plan is required to ensure that final alignment and management is satisfactory.	2
Option 6	<p>Priority 1 0 kms</p> <p>Priority 2 0 kms</p> <p>Associated development none</p>	<ul style="list-style-type: none"> The alignment skirts the edge of the catchment of the Ellen Brook Nature Reserve (M17). Drainage impacts on the Reserve will have to be managed. Crossings required at Swan River (M19) and other water courses. Impacts can be managed. 	No known effect on wetlands but this issue was not examined in detail. A wetland management plan is required to ensure that final alignment and management is satisfactory.	1

Options associated with a low risk to the environment

OPTIONS 1, 2, 3 AND THE COMMUNITY OPTION

Recommendation 1

In the absence of detailed information, the Environmental Protection Authority believes that options 1, 2, 3, and the community option could be associated with a high level of risk for irreversible impacts to strategic groundwater resources, and impacts to important conservation areas, and habitat linkages, and on environmental grounds are unacceptable. The Environmental Protection Authority therefore recommends that these alignments should be discounted in favour of options which by virtue of their improved location have less environmental risk.

THE PER PREFERRED OPTION

Recommendation 2

In the absence of detailed information, the Environmental Protection Authority believes that the Perth — Darwin National Highway (preferred route) alignment and the associated excision of land from the Priority 1 Source

Protection ground water area for urban development (State Forest No. 65) and rural development (Whiteman Park) could be associated with a high level of risk for irreversible impacts to strategic groundwater resources and on environmental grounds is undesirable.

However, the Environmental Protection Authority acknowledges that this alignment or one which closely approximates the preferred option for the proposed highway and public transport route may be selected, either for the Perth — Darwin National Highway or for a regional road to service the urban development which has already been approved in the locality. Should this be the case the Environmental Protection Authority recommends that the potential environmental impacts should be mitigated and managed according to recommendations 3 to 11 and recommendations 15 to 16, in this report.

Recommendation 3

Between Reid Highway and Maralla Road, a risk assessment study for both episodic spillages of pollutants (large discrete events), and cumulative impacts from long term road use should be undertaken to provide the basis for a management plan. The study should include the following:

- risk assessment primarily for contamination of Priority 1 and 2 groundwater areas and Lexia wetlands but also having regard for implications for other wetlands, Ellen Brook and the Swan River;
- road drainage issues; and
- impacts on water quality from existing and proposed Water Authority bores in the vicinity of the highway.

Subject to the results of the risk study, the proponent should prepare and implement a management strategy for both episodic spillages of pollutants and cumulative impacts to the requirements of the Environmental Protection Authority on advice from the Water Authority of Western Australia.

Recommendation 4

Should the Government decide to approve the construction and operation of the proposed Perth-Darwin National Highway and the public transport route, on the preferred route alignment, leading to the excision of land in State Forest No. 65 for urban development and land in Whiteman Park proposed for rural development, within the:

- Gnangara Mound Crown Land Policy Area; and
- Priority 1 Source Protection Area of the Mirrabooka Underground Water Pollution Control Area,

then the Environmental Protection Authority recommends that the following requirements are met:

- (i) the completion of studies to show that construction and operation of the highway, public transport route and urbanisation in this area will not adversely affect the water quality and quantity of the Priority 1 Source Protection areas for groundwater;
- (ii) finalisation of suitable arrangements with the Lands and Forests Commission for the land to be excised from State Forest; and
- (iii) finalisation of arrangements with the Water Authority of Western Australia for all land to be excised from the Priority 1 Source Protection areas for groundwater, which should not permit a net reduction in the total area of Crown land of the Water Reserve, nor a reduction in water quality and quantity for public water supply.

The fulfilment of these provisions should meet the requirements of the Minister for the Environment on advice from the Environmental Protection Authority, the Water Authority of Western Australia, the Department of Conservation and Land Management and the Department of Planning and Urban Development.

Recommendation 5

Environmental criteria and objectives for water quality and quantity should be established for the State Forest land proposed for urbanisation, based on a review of the work undertaken for the adjacent Ellenbrook and Egerton urban development projects, to meet the requirements of the Environmental Protection Authority on advice of the Water Authority of Western Australia, the Swan River Trust, the Department of Conservation and Land Management and the Shire of Swan, and should include consideration of the following:

- (i) the protection of water quality in the groundwater, wetlands, Ellen Brook and the Swan River from nutrients, pesticides and pollutants; and
- (ii) water level criteria which will ensure the maintenance of wetland function and protect adjoining land uses.

Recommendation 6

A detailed Environmental Management Program (EMP) for nutrient and drainage management which complies with the environmental criteria and objectives established by recommendation 5 should be prepared and implemented to meet the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia, the Swan River Trust, the Department of Conservation and Land Management and the Shire of Swan.

Recommendation 7

The alignment of the preferred route, including all interchange, drainage and other design requirements should be modified as far as possible, to avoid or reduce the impact on the land reserved as Parks and Recreation containing the Lexia Wetlands.

Recommendation 8

The requirement for a proposed access from the Perth-Darwin National Highway to the Lexia Wetlands conservation area should be considered within the context of an overall management plan for the conservation area to the requirements of the Department of Environmental Protection.

Recommendation 9

The requirement for a wildlife underpass between the Caversham Air Base and Whiteman Park should be determined as part of the proposed fauna and habitat survey along the route corridor to the requirements of the Department of Environmental Protection on advice from the Department of Conservation and Land Management.

Recommendation 10

A wildlife underpass between the Lexia Wetlands conservation area and the Sawpit Gully area should be incorporated into the highway design to enable to effective movement of wildlife between these two areas, to the requirements of the Department of Environmental Protection on advice from the Department of Conservation and Land Management.

Recommendation 11

Should the 'alternative' alignment option for the Perth-Darwin National Highway route (preferred route) north of Maralla Road be selected, a drainage management strategy for Twin Swamps Nature Reserve should be prepared which ensures the habitat, including water quality, of the western swamp tortoise, *Pseudemydura umbrina*, and its catchment is protected from adverse impacts associated with the construction and operation of the route, to the requirements of the Department of Environmental Protection on advice from the Department of Conservation and Land Management.

OPTIONS 4, 5 AND 6

Recommendation 12

The Environmental Protection Authority concludes that Options 4, 5 and 6 have no impact on strategic groundwater resources and that other potential impacts can be managed through the final design, construction and management phases, subject to recommendations 13 to 16 in this report.

Recommendation 13

A detailed Environmental Management Program (EMP) for detailed design for crossings of the Swan River and Jane Brook should be prepared and implemented, to the requirements of the Department of Environmental Protection on advice from the Swan River Trust.

Recommendation 14

A drainage management strategy for Ellen Brook Nature Reserve should be prepared which ensures the habitat, including water quality, of the western swamp tortoise, *Pseudemydura umbrina*, and its catchment is protected from adverse impacts associated with the construction and operation of the route, to the requirements of the Department of Environmental Protection on advice from the Department of Conservation and Land Management.

GENERAL RECOMMENDATIONS APPLICABLE TO THE PREFERRED OPTION AND OPTIONS 4, 5 AND 6

Recommendation 15

A strategy should be prepared and implemented for the protection of wetlands to the requirements of the Department of Environmental Protection, which should address:

- the feasibility of modifying the route alignment so as to avoid, or reduce, the environmental impacts on wetlands;
- details of wetland replacement;

- wetland management (including a monitoring plan); and
- the timing of any wetland replacement strategies.

Recommendation 16

Potential impacts from noise from the Highway should be managed as committed in the PER.

5. Conclusions

The Environmental Protection Authority concludes that the Perth — Darwin National Highway Options 4, 5, 6 could proceed subject to the above recommendations as reflected in the Environmental Protection Authority's Recommended Environmental Conditions.

Options 1, 2, 3 and the community option could be associated with risk for irreversible impacts to public groundwater supply, and impacts to important conservation areas and habitat linkages, and on environmental grounds are unacceptable.

The preferred option could be associated with risk for irreversible impacts to strategic groundwater resources and on environmental grounds is undesirable. However, should the preferred route, including the excision of land from the Priority 1 Source Protection Area in State Forest No. 65 and Whiteman Park, be selected for a highway or urban transport, this should only proceed subject to the above recommendations as reflected in the Environmental Protection Authority's Recommended Environmental Conditions.

The Environmental Protection Authority has established an implementation and auditing system which requires the proponent to advise the Environmental Protection Authority on how it would meet the requirements of the environmental conditions and commitments of the project. The proponent would be required to develop a *Progress and Compliance report* for this project as a section of the recommended audit programs.

The Environmental Protection Authority's experience is that it is common for details of the proposal to alter through the detailed design and construction phase. In many cases alterations are not environmentally significant or have positive effects on the environmental performance of the project. The Environmental Protection Authority believes that such non-substantial changes, and especially those which improve the environmental performance and protection, should be provided for.

The Environmental Protection Authority believes that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Environmental Protection Authority.

6. Overview

The Environmental Protection Authority recognises that many studies have been undertaken in the planning for Perth.

The Environmental Protection Authority also recognises that since 1991 a number of detailed studies have been undertaken to determine options for the Perth — Darwin National Highway and that most recently, these studies have culminated in the inclusion of a preferred alignment

for the Perth — Darwin National Highway in the North East Corridor Metropolitan Region Scheme Amendment.

In undertaking its evaluation of the Perth-Darwin National Highway including the excision of land in State Forest No. 65 and Whiteman Park, the Environmental Protection Authority's overall objective is that development should be environmentally sustainable in the long term over say a period of 10, 20, 50, 100 years and beyond.

The Environmental Protection Authority is concerned that development, including this highway proposal, between the Darling Range and the Gnangara Mound appears to be proceeding prior to the completion of regional studies to ensure an appropriate level of environmental protection and management.

The Environmental Protection Authority will be addressing these concerns in its advice on the North East Corridor Major Metropolitan Region Scheme Amendment 950/33.

7. Recommended environmental conditions

Based on the evaluation of alternative alignment options for the Perth-Darwin National Highway, the Environmental Protection Authority has provided two sets of recommended environmental conditions to the Minister for the Environment. Section 6.1 of this report provides the recommended environmental conditions considered appropriate for Options 4, 5 and 6, whereas Section 6.2 of this report provides the recommended environmental conditions considered appropriate should the PER preferred option be selected.

7.1 Recommended environmental conditions for Options 4, 5 and 6

Based on its assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate should options 4, 5 or 6 be selected for the Perth-Darwin National Highway.

ROUTE ALIGNMENT FOR PERTH TO DARWIN NATIONAL HIGHWAY (OPTIONS 4, 5 AND 6)

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 commitments made in the Public Environmental Review 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. These commitments are consolidated in Environmental Protection Authority Bulletin 753 as Appendix 6. (A copy of the commitments is attached.)

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. 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 Protection of regionally important conservation areas

Final design of the highway should ensure that the Swan River, Jane Brook, Ellen Brook Nature Reserve including appropriate water quality parameters necessary for the Western Swamp Tortoise, are protected.

3-1 Prior to construction of the highway, the proponent shall prepare a detailed Environmental Management Program (EMP) including detailed design plans for crossings of the Swan River and Jane Brook, to meet the requirements of the Department of Environmental Protection on the advice of the Swan River Trust .

3-2 The proponent shall implement the Environmental Management Program required by condition 3-1.

3-3 Prior to construction of the highway, adjacent to the Ellen Brook Nature Reserve, the proponent should prepare a drainage management strategy. The strategy shall ensure the habitat, including water quality, of the Western Swamp Tortoise, (*Pseudemydura umbrina*), and its catchment is protected from adverse impacts associated with the construction and operation of the highway to meet the requirements of the Department of Environmental Protection on the advice of the Department of Conservation and Land Management.

3-4 The proponent shall implement the strategy required by condition 3-3.

4 Protection and management of wetlands

4-1 Prior to construction, the proponent shall prepare a strategy for protection of the wetlands on the site to meet the requirements of the Department of Environmental Protection.

This strategy shall include, but not be limited to the following:

- the feasibility of modifying the Controlled Access Highway Reservation (and hence the alignment of the highway so as to avoid, or reduce, the environmental impacts on wetlands);
- details of wetland replacement;
- wetland management (including a monitoring plan); and
- the timing of any wetland replacement.

4-2 The proponent shall implement the strategy required by condition 4-1.

5 Management of noise impacts

5-1 The proponent shall manage noise impacts associated with all stages of the development according to the commitments given.

w Proponent

These conditions legally apply to the nominated proponent.

w-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.

x Time Limit on Approval

The environmental approval for the proposal is limited.

- x-1 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.)

y Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

- y-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of this project, in consultation with the Department of Environmental Protection.

Procedure

The Department of Environmental Protection is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Department of Environmental Protection, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

7.2 Recommended Environmental Conditions for the PER preferred option

The Environmental Protection Authority recognises that an alignment which matches or closely approximates the 'preferred option' for the proposed highway and public transport route may be selected, either for the Perth-Darwin National Highway or for a regional road to service the urban development which has already been approved in the locality. If this is the case, then based on its assessment of this proposal and recommendations in this report, the following Recommended Environmental Conditions are appropriate to minimise and ameliorate potential environmental impacts.

ROUTE ALIGNMENT FOR PERTH TO DARWIN NATIONAL HIGHWAY AND FAST TRANSIT ROUTE, AND EXCISION OF LAND FROM STATE FOREST NO. 65 AND PRIORITY 1 SOURCE PROTECTION AREA FOR URBAN DEVELOPMENT

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 commitments made in the Public Environmental Review 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. These commitments are consolidated in Environmental Protection Authority Bulletin 753 as Appendix 6. (A copy of the commitments is attached.)

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. 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 Risk assessment

Information concerning the risk of contamination of groundwater resources, the Swan River, wetlands and other areas arising from acute impacts and cumulative impacts, is required to provide the basis for a management plan.

3-1 Prior to final design of the road between Reid Highway and Maralla Road, the proponent shall undertake a risk assessment study for both episodic spillages of pollutants (large discrete events), and cumulative impacts of long term road use (eg: hydrocarbons) to provide the basis for environmental management. The study shall include, but not be limited to the following:

- (1) risk assessment primarily for contamination of Priority 1 and 2 groundwater areas and Lexia wetlands but also having regard for implications for other wetlands, Ellen Brook and the Swan River;
- (2) road drainage issues; and
- (3) impacts on water quality from existing and proposed Water Authority bores in the vicinity of the highway.

3-2 Subject to the results of the risk study required by condition 3-1, the proponent shall prepare a management strategy for both acute spillages of pollutants and cumulative impacts to the requirements of the Environmental Protection Authority on advice from the Water Authority of Western Australia.

3-3 The proponent shall implement the management strategy required by condition 3-2.

4 Development over important groundwater areas

The reservation and development of the Perth-Darwin National Highway (preferred route) alignment, the public transport route, and the excision of land in State Forest No. 65 for urban development, and land in Whiteman Park proposed for rural development, within the:

- (1) Gngangara Mound Crown Land Policy Area; and
- (2) Priority 1 Source Protection Area of the Mirrabooka Underground Water Pollution Control Area,

may proceed in certain circumstances.

4-1 Prior to final design of the road and, prior to subdivision of land proposed to be zoned urban in the Metropolitan Region Scheme, the proponent shall meet the following requirements:

- (1) completion of studies to show that construction and operation of the highway, public transport route and urbanisation in this area will not adversely affect the water quality and quantity of the Priority 1 Source Protection areas for groundwater;
- (2) finalisation of suitable arrangements with the Lands and Forests Commission for the land to be excised from State Forest; and
- (3) finalisation of arrangements with the Water Authority of Western Australia for all land to be excised from the Priority 1 Source Protection areas for groundwater, which should not permit a net reduction in the total area of Crown land of the Water Reserve, nor a reduction in water quality and quantity for public water supply.

- 4-2 Condition 4-1 should be carried out to meet the requirements of the Minister for the Environment on advice from the Environmental Protection Authority, the Water Authority of Western Australia, the Department of Conservation and Land Management and the Department of Planning and Urban Development as appropriate.

5 Drainage and Nutrient Management

Water quality and quantity management is required on the State Forest land proposed for urbanisation, to protect groundwater, wetlands, Ellen Brook and the Swan River.

- 5-1 Prior to subdivision, the proponent shall establish environmental criteria and objectives for water quality and quantity to the requirements of the Environmental Protection Authority on advice of the Water Authority of WA, the Swan River Trust and the Shire of Swan.

The criteria and objectives shall be based on a review of the work undertaken for the adjacent Ellenbrook and Egerton urban development projects and modified as appropriate, and shall include, but not be limited to, consideration of:

- (i) the protection of water quality in the groundwater, wetlands, Ellen Brook and the Swan River from nutrients, pesticides and pollutants; and
- (ii) water level criteria which will ensure the maintenance of wetland function and protect adjoining land uses.

- 5-2 Prior to development, the proponent shall prepare an Environmental Management Programme (EMP) for nutrient and drainage management which is consistent with the environmental criteria and objectives required by condition 5-1, and which includes the development of a comprehensive monitoring, management and reporting programme, to meet the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia, the Swan River Trust, the Department of Conservation and Land Management and the Shire of Swan.

- 5-3 The proponent shall implement the EMP required by Condition 5-2.

6 Protection of areas set aside for conservation

The Parks and Recreation reservation for the Lexia Wetlands conservation area which contains important wetlands and vegetation, should be protected.

- 6-1 The proponent shall, as far as possible, modify the location of the Perth-Darwin National Highway reservation, including all interchange, drainage and other design requirements, so as to avoid, or reduce, the area of the Lexia Wetlands reserved for Parks and Recreation, affected by the proposal.

- 6-2 Prior to construction, the proposed access from the Perth-Darwin National Highway to the Lexia Wetlands conservation area shall be considered within the context of an overall management plan for the conservation area to the requirements of the Department of Environmental Protection.

7 Requirement for a wildlife underpass

- 7-1 Prior to construction, the proponent shall, as part of a fauna and habitat survey along the highway alignment, report on the requirement for wildlife underpasses between the Caversham Air Base and Whiteman Park, to the requirements of the Department of Environmental Protection on advice from the Department of Conservation and Land Management.

- 7-2 Subject to condition 7-1, the proponent shall prepare design plans and incorporate wildlife underpass between the Caversham Air Base and Whiteman Park, to the requirements of Department of Environmental Protection on advice of the Department of Conservation and Land Management.

- 7-3 Prior to construction, the proponent shall prepare design plans for wildlife underpasses between the Lexia Wetlands conservation area and the Sawpit Gully area, to the

requirements of the Department of Environmental Protection on advice of the Department of Conservation and Land Management.

7-4 The proponent shall implement the plans required by conditions 7-2 and 7-3.

8 Protection and management of wetlands and conservation areas

North of Maralla Road, wetlands should be protected from the preferred alignment of the road and should the 'alternative' alignment for the Perth-Darwin National Highway route (preferred route) be selected, the habitat of the western swamp tortoise, and its catchment should be protected.

8-1 Prior to selection of the final alignment north of Maralla Road, the proponent shall prepare a strategy for protection of the wetlands on the site, to the requirements of the Department of Environmental Protection on advice of the Department of Conservation and Land Management.

This strategy shall include, but not be limited to the following:

- the feasibility of modifying the Controlled Access Highway Reservation (and hence the alignment of the highway) so as to avoid, or reduce, the environmental impacts on wetlands;
- details of wetland replacement;
- wetland management (including a monitoring plan); and
- the timing of any wetland replacement.

8-2 The proponent shall implement the strategy required by condition 8-1.

8-3 Prior to construction, the proponent shall prepare a detailed drainage management strategy for the Twin Swamps Nature Reserve, which ensures that the habitat, including water quality, of the Western Swamp Tortoise, (*Pseudemydura umbrina*), and the catchment is protected from adverse impacts associated with construction and operation of the 'alternative' alignment for the Perth-Darwin National Highway route (preferred route), to meet the requirements of the Department of Environmental Protection on advice of the Department of Conservation and Land Management.

8-4 The proponent shall implement the strategy required by condition 8-3.

w Proponent

These conditions legally apply to the nominated proponent.

w-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.

x Time Limit on Approval

The environmental approval for the proposal is limited.

x-1 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.)

y Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

- y-1 To help verify the environmental performance, the proponent shall prepare periodic Progress and Compliance Reports, in consultation with the Department of Environmental Protection.

Procedure

1. The Department of Environmental Protection is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.
2. If the Department of Environmental Protection, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

8. References

Referencing in the text and in this section should follow the Author-Date system described in the *Style manual for authors, editors and printers*, paragraphs 9.22 to 9.139. Letters and personal communications should be quoted as recommended in paragraph 9.123.

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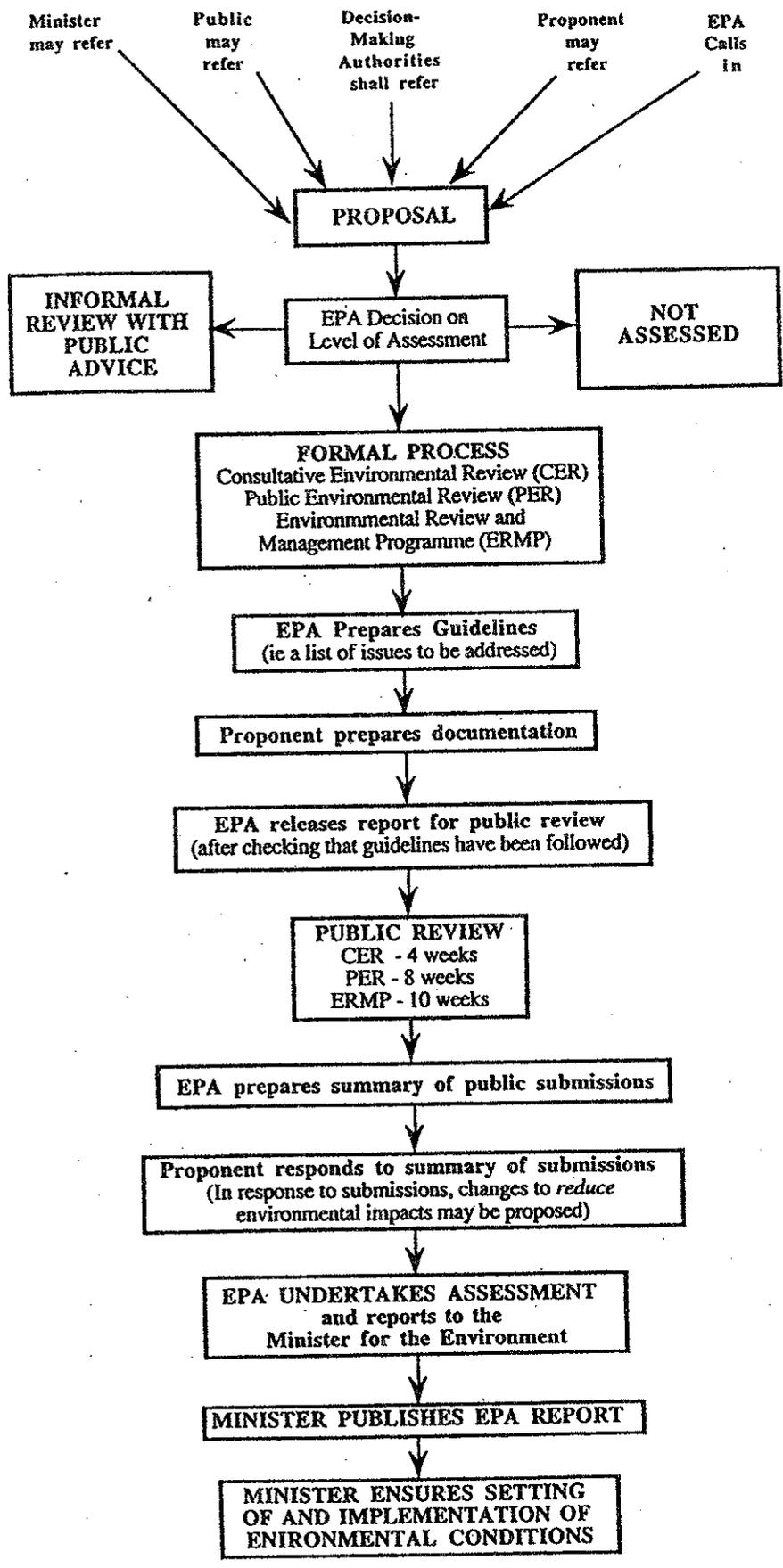
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Appendix 1

Environmental impact assessment flow chart



EPA decides within 28 days. Anybody may appeal to the Minister within 14 days on level set; Minister may direct higher level but not vice versa

DMA cannot allow implementation unless either no formal assessment or the Minister Authorises. Process not suspended

Draft guidelines usually issued within 14 days of first meeting with proponent

EPA usually completes summary in 2-3 weeks

Report release often 3-5 weeks after receipt of response to submissions

Anybody may appeal on EPA report to Minister within 14 days. Minister may remit to EPA or take appeal into consideration when setting conditions

Proponent may appeal on conditions within 14 days of issue

Appendix 2

Summary of submissions and proponents response

**PROPOSERS' RESPONSE TO SUBMISSIONS.
PERTH DARWIN NATIONAL HIGHWAY
FROM REID HIGHWAY TO MUCHEA
AND THE EXCISION OF A PORTION OF
STATE FOREST 65 FOR URBAN DEVELOPMENT**

1.0 CONSERVATION ISSUES

ISSUE 1.1:

The route appears to be designed to have minimal impact on the Ellenbrook developer's land and the environmentally sensitive areas have suffered as a consequence, namely:

- o the consensus route severs the conservation area along Maralla Road;
- o section to the south of Lexia Wetlands actually encroaches on the conservation area;
- o impacts to Whiteman Park;
- o impacts to Priority 1 Groundwater Protection Area;
- o proposed drainage and infiltration basins for highway are inappropriately located, eg. next to protected wetlands; and
- o the route disrupts water supply to Horse Swamp in Whiteman Park (an EPP wetland and System Six area).

RESPONSE TO ISSUE 1.1:

The alignment of the Perth Darwin National Highway consensus route is the result of over five years of planning studies and community discussion. It was selected after consideration of a broad range of environmental, social, technical, economic and political issues and is considered to represent a balance between the conflicting demands of groundwater protection (Gnangara Mound), preservation of social amenity (the Swan Valley), urban development, conservation and recreation.

The proposed boundary location and plan configuration of the Sawpit conservation area (as reported by Ellenbrook Management to the Minister for the Environment in response to Condition 3.1 of the Minister's statement of 13 October 1992) has always allowed for an arterial transit corridor through to the north of Maralla Road. The location of the corridor was chosen based on minimising impacts to both the Lexia Wetlands conservation area and the Sawpit conservation area, and crosses between these areas at their point of minimum width. The location of the

corridor also has desirable attributes in that landforms are conducive to the construction of an underpass which will provide a ground level fauna linkage between the Lexia and Sawpit conservation areas. The location of the consensus alignment in this area coincides with the transit corridor identified by earlier work carried out by Ellenbrook Management.

Whilst the consensus route will affect some peripheral and buffer areas of the Lexia Wetlands and Whiteman Park, core conservation areas have been avoided. Similarly, the location of the consensus route is unlikely to result in adverse impacts on the Priority 1 Source Protection area as the route traverses the eastern portion of this area and so is located down-gradient of the key groundwater resource. In addition, the consensus route is unlikely to disrupt water supply to Horse Swamp as this flows from the north west. However, the maintenance of surface water flow to Horse Swamp will be considered during further planning and design phases.

The location of drainage and infiltration basins has not been finalised and any information available to the public that describes the location of these basins is only indicative.

ISSUE 1.2:

Why does the route adjacent to the Lexia Wetlands need to encroach on the conservation area, now zoned as Parks and Recreation instead of being placed outside the boundary of this area? The conservation value of this land was determined through the Ellenbrook PER process.

RESPONSE TO ISSUE 1.2:

As indicated in the response to Issue 1.1, the alignment of the consensus route was selected after consideration of a broad range of issues and is considered to represent a balance between environmental and conservation requirements and requirements for urban expansion. Those areas of land identified through the PER process undertaken for the Ellenbrook Estate will be reserved for Parks and Recreation in the Metropolitan Region Scheme.

ISSUE 1.3:

What area of the Lexia wetlands conservation area currently zoned Parks and Recreation Reservation will be affected by the adoption of the consensus route?

RESPONSE TO ISSUE 1.3:

Approximately 25.0ha of land in the Lexia Wetlands area currently zoned Parks and Recreation is proposed to be rezoned as Controlled Access Highway (CAH). In contrast, 12.6ha of urban land and 23.2ha of urban deferred land in the Ellenbrook area is proposed to be rezoned as CAH and 20.7ha of urban deferred land is proposed to be rezoned as Parks and Recreation.

ISSUE 1.4:

The highway will affect the Caversham Air Base which has important Southern River vegetation and wildlife and the highway may sever wildlife links to Whiteman Park for animals such as Kangaroos, the Black Gloved Wallaby, and the bandicoot.

RESPONSE TO ISSUE 1.4:

This issue was addressed in section 6.4.1.2 of the PER. A survey of fauna species and fauna habitat along the consensus route will be undertaken and in the event that any significant fauna species or fauna habitat are found in the route corridor, an Environmental Management Plan (EMP) will be developed in further planning and design phases in consultation with the Department of Conservation and Land Management and the WA Museum (Commitment 6). This EMP will address the ecological management of important remnants within the road reserves and consider the provision of fauna corridors, including fauna underpasses where necessary, to link residual areas of fauna habitat.

ISSUE 1.5:

By considering only faunal "priority species", and ignoring the value of the area as an intact habitat, the PER has not fully considered the potential adverse impacts of the proposed route on fauna. In addition, potential impacts on the habitat of the endangered Western Swamp Tortoise at Ellen Brook and Twin Swamps Nature Reserves, which are listed in the Register of the National Estate, have not been adequately considered.

RESPONSE TO ISSUE 1.5:

The value of the area affected by the Perth Darwin National Highway proposal as a faunal habitat was discussed in Appendix C of the PER and placed in a regional context. The impact of the consensus route on significant fauna species and fauna habitat (and therefore the inhabitants of that habitat) was specifically addressed in section 6.4.1.2 of the PER. As indicated in the response to Issue 1.4, the environmental management of any significant fauna or fauna habitat found in the route corridor will be discussed in an EMP developed in further planning and design phases in consultation with the Department of Conservation and Land Management and the WA Museum (Commitment 6).

Potential impacts of the consensus route on the habitat of the Western Swamp Tortoise (M17 Ellen Brook and Twin Swamps Wildlife Sanctuaries) were addressed in section 6.2 of the PER, which states that no existing national parks, nature reserves or System 6 areas (existing or proposed) will be directly affected by the position of the consensus route. In addition, Main Roads has given a commitment to avoid indirect impacts on System 6 conservation areas (Commitment 3). Similarly, section 6.4.1.2 of the PER states that of the significant fauna species listed in Appendix C, only the Southern Brown Bandicoot, the Honey Possum and some reptile species may be impacted by the consensus route. Therefore, it is concluded that neither the Western Swamp Tortoise nor its habitat is likely to be affected by the consensus route.

ISSUE 1.6:

Page 4-15: The "consensus route" does not allow the "linkage to be maintained" between the east and the west sides of the Lexia and Sawpit Gully conservation areas and creates a "significant risk of water quality changes in the wetlands" due to the close proximity of the road to these wetland systems.

RESPONSE TO ISSUE 1.6:

This quote comes from section 4.2.3 of the PER, and was not made in relation to linkages between the east and west sides of the Lexia and Sawpit Gully conservation areas but in relation to the environmental advantages of the consensus route over the original Option 3 (as defined in the Stage 2 study). Originally, Option 3 passed between the Lexia Wetlands and State forest located to the immediate west, thereby reducing the value of the habitat linkage between the Mt Lawley land, Ellenbrook conservation reserves and the adjacent State forest. Realignment of the route to the east of the Lexia wetlands allows this linkage to be maintained.

The impact of the consensus route on the Lexia and Sawpit Gully conservation areas was addressed further in the sections 4.2.3 and 6.5 of the PER which note that whilst the separation of a number of related wetland features may result in the potential isolation of some fauna populations, a topographic "saddle" between consecutive dune crests provides an opportunity to construct a fauna underpass to assist the movement of ground dwelling native fauna.

The impact of road runoff and the risk of water quality changes in wetlands was addressed in section 6.5. Runoff from the road surface is likely to contain low concentrations of hydrocarbons (oil and grease), suspended sediment, lead, phosphorous and nitrogen. These low concentrations are not expected to pose a problem and will be further minimised by the use of sediment traps, swale drains and maximisation of infiltration.

Road runoff will be discharged to table drains within the median strip where most infiltration will take place. Excess flow will be directed to detention basins where nutrients and contaminants will be stripped from the water. Infiltration will take place in these areas which will affect water levels in adjacent wetlands. The drainage system will be designed to ensure that fluctuations in wetlands are as close as possible to natural variations.

The management requirements for wetlands affected by the consensus route will be addressed in an EMP prepared in consultation with the Department of Environmental Protection and Water Authority of Western Australia (Commitment 7). However, the Lexia Wetlands are unlikely to be affected as the consensus route is located downstream in terms of groundwater flow direction from the Lexia Wetlands, thereby removing any significant risk of water quality changes in these wetlands due to transit and transport activities on the highway.

ISSUE 1.7:

Page 4-15: Planning of a "fauna underpass" in an area where the numbers of migrating small and large animals is likely to be the greatest is impractical and will provide a quick meal for feral animals and shooters.

RESPONSE TO ISSUE 1.7:

This issue was addressed in section 6.4.1.2 of the PER. To be effective, it is necessary that fauna underpasses are located where animals will use them (ie. on "migration" routes). The monitoring of fauna use of underpasses already constructed by Main Roads in similar situations (such as the

southern extension of Kwinana Freeway) will determine the success of underpasses in providing for fauna movement. Consideration of appropriate designs and locations will be given in further planning and design phases.

ISSUE 1.8:

The inclusion of the Crested Shrike-tit and the Red-eared Firetail in Appendix C-8 is misleading. Neither occurs in the area covered by the PER.

RESPONSE TO ISSUE 1.8:

The presence of the Crested Shrike-tit *Falconulus frontatus* in the project area is possible, given its range and habitat preferences. The range of this species in Western Australia is generally described as from Geraldton-Norseman to the south coast east of Albany (Pizzey, 1980; Blackers *et al*, 1984; Simpson and Day, 1989). Though it generally inhabits the eucalypt forests and woodlands and timbered watercourses, it also occurs occasionally in Acacia and Banksia scrub and in urban habitats (such as golf courses, orchards, parks and gardens), which are present in the project area.

The inclusion of the Red-eared Firetail *Emblema oculata* in Appendix C was also based on information on its range and habitat. It is endemic to southwestern Western Australia and confined to suitable pockets of dense habitat in coastal and near-coastal areas (Pizzey, 1980). Though this species has not been recorded on the coastal plain near Perth in recent times there are pockets of suitable habitat present in the area (Blackers *et al*, 1984).

ISSUE 1.9:

Section 6.4.1.1: It would be almost impossible to find isolated plants of *Caladenia huegelii* in one survey. Some years the plants don't flower and flowering stems are often eaten by grazing kangaroos and rabbits. Surely it would be better to avoid the plants' habitat completely.

RESPONSE TO ISSUE 1.9:

This issue was addressed in section 6.4.1.1 of the PER. *Caladenia huegelii* does not appear to be particularly habitat specific but is known to occur in *Banksia* woodlands, low in the landscape, and often in association with *Allocasuarina fraseriana*. This species is known to be present in the Maralla Road wetlands area but it is not known whether suitable habitat is present in the vicinity of the route. A spring flora survey will be undertaken at the same time as it is found that the

species is flowering at known localities as close and as similar as possible to this area. This survey will facilitate the identification of potential habitats within the project area. If this species is not found as a result of this survey, the survey may be repeated to determine the likelihood of this species being present. The more frequent and detailed the survey, the greater the probability of accurately determining the presence of this species. If this species is not found in suitable habitats after a number of surveys have been undertaken, the probability of it occurring in that area is greatly reduced.

ISSUE 1.10:

Section 6.6.2.2: The species composition of an area like the Ellenbrook bushland is unique to that area (Weston, Griffin & Trudgen, 1993). What are the implications for the bushland's regional conservation values if a "shift in species composition in the long-term" was to occur, as stated in the PER? Surely the conservation value of the bushland could be severely compromised.

RESPONSE TO ISSUE 1.10:

The average position of water tables in the superficial aquifers of the Swan Coastal Plain varies over long periods, in response to climatic trends. These long term trends in water table position result in natural changes in the distribution of vegetation types in areas with relatively shallow water tables. For example, there is evidence in the Lexia wetlands that water levels are "naturally" falling. Young *Eucalyptus rudis* trees, which normally occur at the wetland fringes have established more centrally in the Lexia wetlands, in areas which appear too wet for this species, based on typical distribution of *E. rudis* in relation to water levels.

This change in species composition should not be regarded as "seriously compromising" the conservation value of the wetland, but is more appropriately viewed as a demonstration of natural long term variation in species composition in relation to climatic and water level factors.

Wetland vegetation patterns should not be considered to be static, as variation under natural conditions over long periods is quite normal.

Long term climate changes are the most dominating factor of the suite of environmental characteristics which change as new land uses are imposed, and which together determine the average water table position.

Ellenbrook Management is bound by commitments to the Minister for the Environment to manage water table levels in the project area in accordance with conservation objectives for the Lexia wetlands. In this regard any change in species composition will be confined to those types of changes which could occur naturally in response to climate trends, as discussed above.

ISSUE 1.11:

The alignment will maintain the contiguous linkage that exists between the Lexia wetlands and the State Forest to the west and it also allows the establishment of habitat linkages to other conservation areas within the Ellenbrook project land.

RESPONSE TO ISSUE 1.11:

This statement is correct and illustrates one of the main environmental advantages of the consensus route over the original Option 3 (as defined by the Stage 2 study).

2.0 WHITEMAN PARK ISSUES

ISSUE 2.1:

Why is the majority of the route located within Whiteman Park which has impacts on these areas conservation and recreational values. The proponents appear to have selected the line of least resistance from a social and economic perspective at the expense of the environment.

RESPONSE TO ISSUE 2.1:

This issue was addressed in sections 6.2 and 7.4 of the PER. The consensus route will be located adjacent to the eastern boundary of Whiteman Park. An alignment further east would impact extensively on private property and result in substantial property resumption both adjacent to and northeast of Whiteman Park. The proposed alignment of the consensus route traverses grazing and buffer areas which provide protection of the core conservation area of Whiteman Park (ie. M13 Whiteman Park [Mussel Pool]) and are used for recreation. The loss of a small portion of this area is unlikely to adversely impact its function in terms of conservation and recreational values. In addition, the consensus route will provide a physical barrier between the core conservation area and the urban development to the east, which will enhance the protection of conservation values.

ISSUE 2.2:

Whiteman Park is a major attraction in the Swan Valley and it is essential that it remain its current size and not be utilised as a road reserve.

ISSUE 2.3:

This park was set aside to meet the needs of a growing population and is fulfilling that aim. Reducing its size is short term thinking and could set a dangerous precedent. How can reduction in the size of a major recreational area be justified when population and urban growth in the North-East Corridor is expanding and will require all the Open Space possible?

RESPONSE TO ISSUES 2.2 AND 2.3:

These issues were addressed in section 7.4 of the PER. The minor reduction in the total area of Whiteman Park Regional Open Space available for recreation is not considered to be significant due to the large areas of land that remain available for recreation, including off-road vehicle activity, horse riding and walking. The proximity of the Perth Darwin National Highway is unlikely to alter the status of Whiteman Park as a major attraction in the Swan Valley.

In addition, the current draft structure plan for the North-East Corridor indicates that an approximately equal area in the northwest corner of Whiteman Park is to be confirmed as open space on the basis that it may no longer be required as a truncation to accommodate the Perth Darwin National Highway.

ISSUE 2.4:

No consideration has been given for the impact that the route has in isolating Whiteman Park from the local community and Swan Valley.

RESPONSE TO ISSUE 2.4:

The consensus route is unlikely to isolate Whiteman Park from the local community any more than existing roads and infrastructure. Whiteman Park is already subject to restricted access and the provision for all types of access will be considered in further planning and design phases.

ISSUE 2.5:

Why didn't the consultants undertake a complete review of environmental studies undertaken in Whiteman Park? Past research indicates that the protection of the core environmental area is dependent upon preserving the current buffer and grazing areas. Surely the highway is at odds with that requirement.

RESPONSE TO ISSUE 2.5:

This issue was addressed in section 6.2 and Appendix C of the PER. Whilst the role of the buffer and grazing areas in the protection of the core conservation area of Whiteman Park (ie. M13 Whiteman Park [Mussel Pool]) is recognised, the loss of a relatively small portion of Whiteman Park is unlikely to adversely impact the function of these areas. Main Roads will minimise encroachment on Whiteman Park and will also avoid indirect impacts on System 6 conservation areas (Commitment 3).

ISSUE 2.6:

In the listing of fauna it must be stressed that Whiteman Park is "home" for all species listed on page C-7 and C-8 (except the Western Swamp Tortoise). Even though it fulfils an important recreational function its value to wildlife should not be underestimated or eroded by proposals such as the highway.

RESPONSE TO ISSUE 2.6:

The conservation value of Whiteman Park was discussed in Appendix C. M13 Whiteman Park (Mussel Pool) is considered to have considerable conservation value due to its rich diversity of flora and fauna. This area is known as the core conservation area and is located in the central portion of the Park. The affected area of Whiteman Park is outside the core conservation area. Consequently, the value of this area to wildlife is unlikely to adversely affected.

ISSUE 2.7:

Whiteman Park is a major site for Equestrian Activities within the Swan Valley. The Equestrian trails and activities within Whiteman Park are very important in maintaining this industry and the lifestyle of local residents. What impact will the highway have on these activities and why wasn't this properly considered in the report?

RESPONSE TO ISSUE 2.7:

This issue was addressed in section 7.4 of the PER. Impacts on the recreational activities (such as horse riding) currently undertaken in Whiteman Park are not considered to be significant due to the large areas of land that remain available for these activities. Main Roads will undertake to minimise the impact of the consensus route on existing recreational facilities and areas (Commitment 25).

ISSUE 2.8:

A link between the high value remnant vegetation at Caversham Air Base and Whiteman Park should be aimed for, not further cut off by the Government Consensus Route.

RESPONSE TO ISSUE 2.8:

This issue was addressed in section 6.3.1 of the PER. Main Roads will minimise disturbance to regionally significant vegetation adjacent to the consensus route and rehabilitate areas disturbed by construction of the consensus route as soon as practicable (Commitment 4).

ISSUE 2.9:

If this route is approved, will wildlife links (underpass) be provided for all bush areas adjoining Whiteman Park?

RESPONSE TO ISSUE 2.9:

This issue was addressed in response to Issue 1.4.

ISSUE 2.10:

Will there be access to Whiteman Park for horses, walkers and cyclists at the following points - Harrow Street, Whiteman Park main entrance, Woolcott Road, and Park Street?

RESPONSE TO ISSUE 2.10:

The need for access to Whiteman Park at Harrow Street, Woolcott Street and Park Street will be determined in consultation with the Department of Planning and Urban Development, Shire of Swan and local communities and established in accordance with the management plan for Whiteman Park. Under the current proposal, the main access to Whiteman Park would be via Youle-Dean Road.

ISSUE 2.11:

How will the conservation values of Whiteman Park be protected from the pressures of development in the Whiteman Park exchange area eg: dogs, cats, weeds etc?

RESPONSE TO ISSUE 2.11:

Environmental pressures due to the presence of weeds and feral animals already exist in the Whiteman Park area. The protection of Whiteman Park from environmental pressures associated with development in the exchange area is essentially a park management issue to be discussed by the Department of Planning and Urban Development, Main Roads and Ellenbrook Management. Suitable management strategies may include the use of fencing screened with vegetation and the implementation of a weed control program (addressed in section 6.9.3 of the PER). Main Roads will undertake to develop an EMP that will address the prevention of the introduction and spread of weeds (Commitment 16).

Management measures undertaken by Main Roads will also protect Whiteman Park from those environmental pressures that may originate from the proposed Whiteman Park excision and rezoning area, which is completely separated from Whiteman Park by the proposed Perth Darwin National Highway alignment.

3.0 NATIONAL ESTATE ISSUES

ISSUE 3.1:

In its consideration of heritage issues the PER totally ignores natural heritage values, despite the area being classified by the National Trust for its natural values, and a reference in Appendix C to the nomination of the area to the Register of the National Estate.

ISSUE 3.2:

The Ellenbrook area has national estate values and the Australian Heritage Commission has recently decided to enter the area shown in Attachment 1(a) to the Register of the National Estate. The national estate listing for the Ellenbrook area will be gazetted late in 1994.

RESPONSES TO ISSUES 3.1 AND 3.2:

The Australian Heritage Commission proposes to include the northern part of the Ellenbrook area on the Interim Register of the National Estate. The Australian Heritage Commission has advised that listing in the Register of the National Estate is not a land-use decision and places no obligations on owners or local or State governments to conserve the places listed. However, those areas identified as being of conservation value during the PER process for the Ellenbrook Estate project have or will be reserved for Parks and Recreation in the Metropolitan Region Scheme.

The Proponents are aware of the natural heritage values of the Ellenbrook area though the natural values of the proposed State forest excision area may be questionable as this area consists of land from which natural vegetation has been cleared and replaced with pine plantations.

ISSUE 3.3:

Although localised values along the final route of the proposed highway will be conserved through the detailed design stage, the broader scale values of the Ellenbrook area have been given scant consideration. It is largely these extensive values that the decision has been made to list the area in the Register of the National Estate.

RESPONSE TO ISSUE 3.3:

The alignment of the consensus route in the Ellenbrook area was dictated by local environmental and land use planning requirements and is considered to represent a balance between the values the community puts on groundwater protection, the maintenance of a link between wetlands and other significant habitats and the broader scale values of the Ellenbrook area. As indicated in the response to Issues 3.1 and 3.2, the interim listing of this area in the Register of the National Estate is not a land-use decision and does not consider the broader issues relevant to that area.

ISSUE 3.4:

The building of a highway along the 'consensus route' would substantially reduce the value of the Ellenbrook area as a wildlife habitat and its importance for relatively undisturbed Bassendean processes and representative wetland and banksia communities, by both direct means (through habitat destruction and fragmentation, erosion and sedimentation, weed invasion, spread of dieback) and indirect means (through disruption to hydrological processes, groundwater contamination). The proposed siting of an interchange in the area would exacerbate these impacts and further decrease national estate values.

RESPONSE TO ISSUE 3.4:

The construction of the Perth Darwin National Highway alone is unlikely to substantially reduce the value of the Ellenbrook area in terms of biophysical components and processes. It is the overall land use changes proposed for the Ellenbrook area that are more likely to result in disruption to these features. However, the PER process undertaken for the Ellenbrook Estate identified those areas of land that should be conserved and the Proponents have clearly illustrated their commitment to minimising disturbance of significant habitats and managing the environmental impacts that may arise from the implementation of these proposals.

The location of the interchange in the vicinity of the Lexia wetlands is preliminary only and will not affect national estate values of the area.

4.0 WETLANDS

ISSUE 4.1:

Why, when over 80% of wetlands on the Swan Coastal Plain have been lost and the remainder are in varying degrees of degradation do the proponents put forward a proposal which damages high quality wetlands and other conservation areas - Maralla Road, Whiteman Park, Lexia wetlands, Horse Swamp?

RESPONSE TO ISSUE 4.1:

As indicated in response to issue 1.1., the consensus route is considered to represent a balance between the conflicting demands of groundwater protection, the preservation of social amenity, conservation and recreation and the presence of privately-owned lands.

ISSUE 4.2:

Section 5.1 Figure 5.2: The major interchange at the wetlands in Lot 48 brings the route dangerously close to the main Lexia wetlands. This is the wrong place to consider a major interchange. What function will this interchange serve and what are the impacts associated with this interchange on the nearby wetlands?

RESPONSE TO ISSUE 4.2:

The location of the interchange as illustrated on Figure 5.2 of the PER is preliminary only and the final location will be determined in accordance with the management requirements for the proposed Lexia wetlands nature reserve. The potential impacts of the interchange will be assessed during further planning and design phases.

Main Roads will undertake to avoid disturbance of lakes protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy and minimise disturbance of other wetlands in the vicinity of the consensus route. An EMP that will address the management of wetlands affected by the consensus route will be prepared in consultation with the Department of Environmental Protection and the Water Authority (Commitment 7).

ISSUE 4.3:

Section 5.2: How will "Conservation of the Lexia Wetland system in reserves ... meet community expectations" if the wetlands are segregated and not properly managed as an entire system?

RESPONSE TO ISSUE 4.3:

The proposal by Ellenbrook Management which is undergoing assessment through this PER process is the excision for urban development of State Forest land located in the south-west portion of the broader project area, which is some 2km distant from the southern boundary of the Lexia wetland conservation area. Management of the Lexia and Sawpit conservation area is the subject of separate commitments made by the proponent to the Minister for the Environment.

However, it should be noted that all wetlands which occur in the area and are listed in the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 are to be conserved under current planning for the project area and close environs.

ISSUE 4.4:

Section 6.5 Page 6-9: In regard to construction impacts and the loss of remnant wetland vegetation, exactly what does the term "... in the immediate vicinity of the road ..." actually mean in terms of width of clearing required?. The loss of remnant vegetation should be restricted to within the road reserve and specifically within the requirements for the actual highway width.

RESPONSE TO ISSUE 4.4:

This issue was addressed in section 6.3.1 of the PER. The clearing of remnant vegetation will be restricted to within the road reserve and earthworks will be restricted to the width of the highway where possible. Main Roads will minimise disturbance to vegetation adjacent to the consensus route and rehabilitate areas disturbed during the construction phase. Rehabilitation needs will be addressed in an EMP (Commitment 4).

ISSUE 4.5:

How will road runoff affect wetlands?

RESPONSE TO ISSUE 4.5:

The impact of road runoff on wetlands was discussed in section 6.5 of the PER and was addressed in response to Issue 1.6.

ISSUE 4.6:

Horse Swamp is an important winter wetland and the proposed construction of the highway through the paddocks which help protect this winter/spring breeding ground for wildlife should be avoided. This would be overcome if the highway was located west of the park or along the existing Lord Street.

Will the route disrupt water supply to Horse Swamp in Whiteman Park (an EPP wetland, System Six area and the last "live" lake in the metropolitan area and spawning ground for Swan River fish)? What measures will be implemented to ensure the ecological function of this wetland is retained during and after construction?

RESPONSE TO ISSUE 4.6:

As indicated in the response to Issue 1.1, surface water flow to Horse Swamp will be taken into consideration during further planning and design phases and culverts incorporated as necessary to maintain the current pattern of flow. Temporary culverts may be used during the construction phase if surface water is present.

ISSUE 4.7:

Page 4-15: The "absence of wetlands constraints" is false! The dunal soils are very porous and any toxic spills will also affect Sawpit Gully wetlands downstream.

RESPONSE TO ISSUE 4.7:

The reference on page 4-15 of the PER to an "absence of wetland constraints" refers to direct physical impacts. The need for sound management of road runoff to prevent down-gradient impacts on groundwater and wetlands is clearly recognised throughout the PER. In particular, the management of toxic spills is discussed in section 6.5 of the PER and was addressed in response to Question 1.6.

ISSUE 4.8:

Section 6.5: The Government Consensus Route passes within 40m of the EPP wetland vegetation north of Maralla Road. The PER actually states that it passes through the cleared portion of this wetland. Clearly the Government Consensus Route will pose a threat to water quality, remnant vegetation, declared rare fauna, declared rare flora in this wetland area. This wetland is the only source of permanent water easily accessible to local fauna. The property is owned by environmentally aware residents, thus ensuring it's long-term viability. This can only occur without outside interference from roads and other developments.

RESPONSE TO ISSUE 4.8:

This statement is incorrect. Section 6.5 of the PER states that the consensus route will cross the cleared portion of a Category C (conservation) wetland located immediately north of Maralla Road and adjacent to the EPP Maralla Road wetlands. The consensus route takes into account the presence of the Maralla Road wetlands and provides as large a buffer as possible between the road and the wetlands. Main Roads will investigate the conservation status of wetlands affected by the consensus route and address the management of these wetlands in an EMP prepared in consultation with the Department of Environmental Protection and the Water Authority. The management options described in section 6.5 of the PER will be implemented as appropriate to achieve the protection of wetland values.

ISSUE 4.9:

It may not be possible to "design drainage to maintain the present hydrology of adjacent wetlands". The North-East Corridor Environmental Audit states that the whole corridor has very complex stratigraphy on a small scale. The existing hydrological regime may be very difficult to duplicate exactly (Semeniuk, 1992).

RESPONSE TO ISSUE 4.9:

The existing hydrology of wetlands adjacent to area in which the consensus route will be located has already been modified by a number of factors including groundwater extraction, clearing of vegetation and rural drainage schemes. Road drainage, which has a more restricted impact, will be designed to maintain the continuity of defined channels and, as far as possible, to achieve similar fluctuation rates to the existing regime.

ISSUE 4.10:

Where is the area proposed to "replace wetland areas" that will be affected by the highway? It is clear that the road reserve cuts into the conservation reserve.

RESPONSE TO ISSUE 4.10:

As indicated in section 6.5 of the PER, the replacement or enhancement of wetlands disturbed by road construction with equivalent areas in that region is one of the management strategies proposed to minimise or avoid wetland disturbance. The requirement for and location of such areas will be determined once the alignment of the Perth Darwin National Highway is finalised and the actual location and degree of wetland disturbance is known. Should the need for the adoption of this strategy be identified, the replacement wetlands will be located as close as possible to the site of impact. This management strategy, if required, will be addressed in an EMP prepared in consultation with the Department of Environmental Protection and the Water Authority (Commitment 7).

ISSUE 4.11:

Section 4.2.3 Page 4-14: There are several Melaleucas worthy of preservation on the eastern edge of the wetland affected by the proposed highway in the section north of the interchange, south of Maralla Road. One Melaleuca is one of the largest in the Lexia wetlands conservation area. Will the highway alignment be modified to avoid impacts to these significant features? What procedures will be implemented to ensure these features are protected?

RESPONSE TO ISSUE 4.11:

This issue was addressed in section 6.3.1 of the PER. Main Roads will minimise disturbance to regionally significant vegetation adjacent to the consensus route and restrict clearing of remnant vegetation to the minimum necessary for permanent road works and confine temporary works areas as far as possible to previously cleared areas. Natural vegetation and isolated trees adjacent to the proposed route that can be retained will be identified on construction plans prior to the commencement of clearing. Minor adjustments to the alignment of the consensus route to avoid significant trees or other objects will be considered during further planning and design phases. Wherever possible, such features will be retained as part of the landscaping of the road reserve.

5.0 GROUNDWATER ISSUES

ISSUE 5.1:

9km of the route traverses the Priority 1 Groundwater Protection Area.

RESPONSE TO ISSUE 5.1:

This issue was addressed in section 6.6.1 of the PER. The boundary of the Priority 1 Source Protection Area is primarily defined by existing cadastral boundaries and not necessarily by the actual extent of the groundwater mound. The consensus route traverses the eastern edge of the Priority 1 area and is down-gradient, in terms of groundwater flow, from the proposed Lexia public water supply borefields. Main Roads will minimise the risk of contamination of the Priority 1 Source Protection Area using management strategies and procedures described in an EMP (Commitment 8).

ISSUE 5.2:

The proposed route alternatives and the urban development identified in the PER pose an unacceptable risk to groundwater quality in the Priority 1 Source Protection Area. Although the construction of the road is unlikely to create a significant environmental impact, there is potential for spillage and hence, groundwater pollution.

RESPONSE TO ISSUE 5.2:

The issue of groundwater protection for the Perth Darwin National Highway proposal was addressed in section 6.6.1 of the PER. The risk of spillage during construction of the consensus route will be minimised by:

- o restricting vehicle and machinery movement to designated access tracks;
- o conducting maintenance operations in designated paved areas;
- o on-site containment of waste oils and solvents (degreasers) and other toxic materials and recycling or disposal at approved liquid disposal areas;
- o containment of domestic sewage at suitably located portable toilet facilities followed by removal by a licensed contractor for disposal to an approved site; and
- o transport of general refuse to approved disposal sites or as required by local authorities.

The potential for pollution from the Perth Darwin National Highway when in operation will be minimised by the use of sediment traps, detention basins and swale drains, as discussed in response to Issue 1.6. A recent unpublished study of groundwater adjacent to an infiltration basin near Leach Highway (a major arterial road in Perth) found that concentrations of toxic metals, nutrients, pesticides and phenolic compounds were very low and generally well within drinking water guidelines.

The issue of controlled urban development in the vicinity of the Priority Source Protection areas for groundwater has been extensively evaluated by Ellenbrook Management in consultation with the Department of Environmental Protection, the Water Authority and the Department of Planning and Urban Development. This work has been carried out in the course of meeting requirements set by the Minister for the Environment for the major elements of the Ellenbrook project which were assessed by a Public Environmental Review published in 1992. The Minister for the Environment has formally approved environmental criteria and Nutrient and Drainage Management Plans for Ellenbrook which have been prepared by Ellenbrook Management for the major portion of the overall project area.

These issues, which must be addressed within the proposed excision area, do not differ from those already addressed by the previous environmental criteria and nutrient and drainage management plans. In Commitment 9 of the PER, Ellenbrook Management commits to manage water quality in the proposed excision area in accordance with procedures already established for directly adjacent land which has equivalent relative location to the priority source protection areas, to the area presently under assessment.

ISSUE 5.3:

The proposed urban development lies within an area where the unconfined aquifer is in direct hydraulic contact with underlying aquifers. As a consequence, there is a risk that these aquifers may be contaminated.

RESPONSE TO ISSUE 5.3:

Planning for the establishment of urban land uses in the Ellenbrook project area has proceeded in accordance with requirements of the Minister for the Environment, which specify that environmental criteria for groundwater quality in the superficial aquifer (amongst other matters) and management plans which demonstrate how these criteria are to be met, are to be developed and agreed to by the appropriate regulatory authorities.

These environmental criteria and management plans have been developed by the Proponent, reviewed and agreed by the regulatory authorities, and formally accepted by the Minister for the Environment.

Development of the criteria and management plans has incorporated findings from the most recent local investigations of the influence of land use on groundwater quality in superficial aquifers. The bases of land use management for groundwater protection purposes for the Ellenbrook project area include:

- o no noxious or hazardous industries, waste disposal sites, intensive agriculture or petrol stations or water pollution control ponds within Priority Two Source Protection areas; and
- o only sewered residential land uses will be planned for areas designated as Priority Two Source Protection areas.

Maintenance of groundwater quality at acceptable levels in the superficial aquifer will also protect any underlying aquifers which have vertical hydraulic connection from unacceptable water quality deterioration.

ISSUE 5.4:

The proposed sewered urban development may affect groundwater quality. The PER suggests that this is an unlikely event. However, research undertaken by the Department of Minerals and Energy (Geological Survey Division) and the CSIRO Division of Water Resources, indicates that groundwater contamination in these areas can occur as a result of leakages from underground petrol storage tanks, sewerage mains and excessive fertiliser usage.

RESPONSE TO ISSUE 5.4:

The key elements of the criteria and management plans for the protection of groundwater quality which have been accepted for this area by the Department of Environmental Protection and the Minister for the Environment, have as their basis the control of land use in areas of specific importance such as groundwater source areas. These criteria and management plans will also be applied to the land area currently the subject of assessment.

As such, petrol stations, and intensive agriculture, which are recognised as having comparatively higher risk of creating groundwater contamination will not be permitted within the land excision area.

There is a minor element of risk that sewer main leakages could occur. However, the Proponent considers that the probability of major leakage leading to significant contamination is acceptably low in the context of the water quality objectives for Priority 2 Source Protection areas.

It is important to note that the sewerage of new urban development is a fundamental component of the Water Authority's approach to groundwater protection in the Metropolitan area.

Ellenbrook Management's planning for the area incorporates an objective for the use of garden fertilisers to be minimised. This planning will include the provision of educational materials to future residents in which practical means of reducing fertiliser usage will be explained.

ISSUE 5.5:

Management strategies outlined by the proponent on page 6-13 to line the infiltration basins with red mud will have a minimal effect on the infiltration of toxic organic compounds such as hydrocarbons and chlorinated solvents.

RESPONSE TO ISSUE 5.5:

The key consideration in regard to contaminant removal by infiltration basins lined with red-mud, is that none is proposed to be located within the proposed land excision area, and all basins will be placed outside of and "down-gradient" from Priority Two Source Protection areas.

ISSUE 5.6:

Any proposal to redefine the boundary of the Priority 1 Source Protection Area to follow the western boundary of the consensus route, would have a significantly detrimental impact upon the groundwater quality, and has to be subject to approval by the Water Authority of Western Australia.

RESPONSE TO ISSUE 5.6:

This PER is undergoing assessment by the Department of Environmental Protection. This assessment includes referral of the proposal to the Water Authority for technical review and comment. Any proposal to redefine the boundary of the Priority 1 Source Protection Area would be subject to approval from the Water Authority.

ISSUE 5.7:

A major road such as the Perth-Darwin Highway aligned so close to the Gnangara Mound could promote further roads. The provision of this infrastructure could see arguments put up for linking roads to the East Wanneroo area including the Flynn Drive Industrial Area and industrial sites at Landsdale and Wangara.

This would create a risk of groundwater contamination. Vehicles transporting fuel or chemicals involved in an accident could pollute this important groundwater resource. The persistence of hydrocarbon contamination of groundwater has been pointed to by research of the CSIRO, it could mean the loss of important water supplies and down-gradient impacts on users of groundwater including commercial horticulture and wetlands.

The 'flow on' effects, such as urban development, of the suggested route aren't considered.

Allowing some of the Priority 1 Source Protection Area to be used for the highway alignment and urban development suggests a primacy of these uses over source protection. Chipping away at the edges through proposals such as this one means incremental and gradual development of the

mound and loss of the security of the resource. The strategic, economic and environmental importance of Gnangara Mound groundwater is such that it should be afforded the highest degree of protection.

RESPONSE TO ISSUE 5.7:

The potential effects on groundwater quality of the Perth Darwin National Highway and of urbanisation in areas currently proposed for rezoning are considered in full in the PER. Any further development within the source area in the future is not within the scope of this PER and would be the subject of environmental assessment at the appropriate time.

ISSUE 5.8:

Section 6.6.1: The PER states that "...any decline in water levels is likely to be relatively short-term...". Over what duration will this decline take place and will the vegetation have time to adapt?

RESPONSE TO ISSUE 5.8:

This issue was addressed in section 6.6.1 of the PER. Any decline in water levels and the extent and duration of associated impacts will depend on dewatering requirements and site-specific groundwater conditions. These declines will be highly localised and will probably be confined to within a metre of the actual excavation works. They will occur only during the construction phase. The impact on vegetation will be minor and the plants will have time to adapt to this small change in the regime, if required.

ISSUE 5.9:

Section 6.6.2.2: How can the balancing effect of the proposed Lexia Scheme be assumed when this scheme has not been given any environmental assessment and cannot therefore be taken for granted?

RESPONSE TO ISSUE 5.9:

Review of the PER text will reveal that a balancing of water table levels by the proposed Lexia Scheme is not assumed, but is noted as a possibility.

ISSUE 5.10:

The best route is up Beechboro Road. The argument that this route is over the Gngangara Mound is not valid, given the many roads (eg. Neaves and Gngangara Roads) already on the mound and a suitably high standard of construction and drainage management of the Perth - Darwin Highway which would solve many of the problems.

RESPONSE TO ISSUE 5.10:

This issue was addressed in section 4.0 of the PER. Groundwater protection was an important consideration in the route selection process. The Beechboro Road option is up-gradient of the mound and bore fields and discussions with officers from the Department of Environmental Protection and the Water Authority indicate that this route is not acceptable.

6.0 DRAINAGE

ISSUE 6.1:

Proposed drainage and infiltration basins for highway are inappropriately located eg: next to protected wetlands.

RESPONSE TO ISSUE 6.1:

As indicated in the response to Issue 1.1, the location of drainage and infiltration basins has not been finalised and any information available to the public that describes the location of these basins is only preliminary. Final locations will take into consideration both topographic requirements and the proximity of significant features, such as wetlands.

ISSUE 6.2:

The drainage and nutrient stripping ponds will bring an influx of mosquitoes and midges with the possibility of Ross River Virus. Who will spray these ponds and who will pay?

RESPONSE TO ISSUE 6.2:

In general, detention ponds will be designed to retain water for a short duration and standing water will not be present beyond the winter "wet". Consequently, these basins will not add significantly to the area of wetlands (and hence potential mosquito and midge breeding area) already present in the vicinity of the consensus route.

ISSUE 6.3:

Where is the polluted spoil from the nutrient stripping basins to be disposed? Who will monitor and manage this?

RESPONSE TO ISSUE 6.3:

The disposal of spoil from the nutrient stripping basins will be carried out at an approved site and managed by Main Roads in consultation with local government. This activity will be monitored by the Department of Environmental Protection.

ISSUE 6.4:

Direct drainage into Bennett Brook will cause increased nutrients, alter its natural cycle of seasonal wetness, impact negatively on existing ecology.

RESPONSE TO ISSUE 6.4:

There is no plan for direct drainage into Bennett Brook.

7.0 STATE FOREST LAND

ISSUE 7.1:

Almost no information is given to assess the proposal to convert this land to urban. The justification to rezone is predicted on the location of the highway.

RESPONSE TO ISSUE 7.1:

Information relevant to assessment of the proposal to excise State Forest Land for urbanisation is given in sections 1.1, 1.3, 2.3, 3.0, 4.3.1, 4.3.2, 5.2, 6.3, 6.4, 6.6, 6.9.6.2, 7.1, 7.2, 7.3, and 9.0 of the PER.

The compilation of the PER has been in direct accordance with the guidelines for the PER established by the Department of Environmental Protection, and in this regard provides all information requested by the Department of Environmental Protection in relation to assessment of the proposal.

ISSUE 7.2:

What impact will urbanisation of the State Forest land have on water quality and quantity for Henley Brook residents who rely on groundwater for domestic and livestock use?

RESPONSE TO ISSUE 7.2:

Ellenbrook Management proposes in Commitment 9 to implement land use control and management such that groundwater quality within the State forest area proposed for excision and urbanisation remains in compliance with ANZECC guidelines for raw water for drinking water supply. With Commitment 10, Ellenbrook Management proposes to maintain the pre-development water balance in the State forest excision area.

Under this set of management commitments, Henley Brook residents will continue to be able to utilise groundwater for domestic and livestock usage.

**8.0 MINERAL RESOURCE DEVELOPMENT AND
BASIC RAW MATERIALS PROTECTION**

ISSUE 8.1:

Although the PER identifies extractive industry activities as being a principal environmental and social issue for the consensus route (Table 5.2 page 5-2), the document has not addressed the issue of mineral resources and basic raw materials. The area under consideration in the PER is covered by 8 Mining Act tenements (granted and applied for) which indicates the area's importance for high quality sand, silica sands, clay and mineral sands. Extractive industry licences are issued by Shires and their occurrence should be confirmed prior to any land-use changes.

The consensus route of the highway and the land severance and rezoning proposal lie within a sand resource area and a priority resource area. The alternative route borders the western boundary of the clay resource area. These resource areas were identified in the Basic Raw Materials Policy Statement for the Perth Metropolitan Region April 1991 (Department of Planning and Urban Development).

In this document "resource areas" are designated as having high resource potential (including proven reserves) from which future requirements for the region are to be met. "Priority resources areas" include those portions of resource areas within which extraction is considered to be a priority land-use. It is desirable to protect these resource reserves for future extraction.

It is suggested that in the case of Mining Act tenements and Local Government extractive industry licences, consideration be given to sequential or staged land-use (ie: mining of the resources and highway construction should be synchronised).

ISSUE 8.2:

Not only has the PER not dealt with the excision of land from existing mining leases (which would be required for the route to proceed through this area), but should mining proceed road construction contours would vary from those proposed in the PER and may impact upon the route.

RESPONSE TO ISSUES 8.1 AND 8.2:

Competing land uses will remain an issue in those parts of the Metropolitan area where urban expansion is proposed or under way, and will also remain an issue for which the Department of Planning and Urban Development will be the principal decision making authority, in consultation with other appropriate government agencies. Decisions about the relative desirability of rezoning for other land uses will be made by government agencies with reference to a broad range of factors which include basic raw materials supply potential.

Wherever possible, the construction of the consensus route will follow extraction of the basic raw material and mineral resources. Main Roads will consult with the relevant lease holders during further planning and design phases to establish suitable timeframes for extraction.

9.0 CONSTRUCTION AND OPERATIONAL IMPACTS

ISSUE 9.1:

The community should have Saturday and Sunday to enjoy their homes free from the noise, dust, vibration and traffic associated with construction. The proposed 120 hours per fortnight should be reduced to 100 hours construction time per fortnight.

RESPONSE TO 9.1:

This issue was addressed in section 6.8 of the PER. Main Roads will undertake to minimise the impact of dust, noise and vibration during construction (Commitments 13 and 14). Strategies to achieve this objective include negotiating construction hours with local authorities and affected communities before the commencement of construction and undertaking a review of operations to prevent or minimise the impact of vibration on property and members of the public.

ISSUE 9.2:

The impact of noise on the Ellenbrook conservation area may be as important as on the housing development, particularly in terms of a proposed sanctuary for the Lexia wetlands area. Will Main Roads implement the same noise attenuation initiatives as proposed for existing and proposed residential areas to the conservation areas, and if not why not?

RESPONSE TO ISSUE 9.2:

This issue was addressed in section 6.8 of the PER. In general, noise attenuation initiatives are not implemented near areas zoned as Public Open Space or Parks and Recreation. However, if there is a demonstrated sensitivity of particular areas to road noise, then this policy will be reviewed.

ISSUE 9.3:

What will be the impact of Highway lighting on adjacent conservation areas and sanctuary proposals?

RESPONSE TO ISSUE 9.3:

Highway lighting will not impact on adjacent conservation areas and sanctuary proposals as this lighting is designed to provide for a "cut-off" of illumination outside the road reserve.

ISSUE 9.4:

Will construction sites, compounds and stockpile areas etc be located within the actual highway alignment and not in surrounding bushland area? These activities should not impact upon the Parks & Recreation Reservation or other bushland areas.

RESPONSE TO ISSUE 9.4:

This issue was addressed in section 6.3.1 of the PER. All temporary works areas such as construction sites, compounds and stockpile areas will be confined as far as possible to existing or previously cleared areas. Main Roads will minimise disturbance to remnant vegetation and will rehabilitate all areas disturbed during the construction phase (Commitment 4).

ISSUE 9.5:

Prolonged construction work in close proximity to residences (which are dependent upon rainwater collected from rooftops for consumption) will make rooftops so dirty as to make any rainwater undrinkable during construction.

RESPONSE TO ISSUE 9.5:

This issue was addressed in section 6.9.1 of the PER. Main Roads will minimise the impact of fugitive dust during construction (Commitment 14) and will rehabilitate exposed surfaces to prevent ongoing dust generation (Commitment 4).

ISSUE 9.6:

The proposed interchanges are not described sufficiently to determine the impact of these facilities on adjacent area.

RESPONSE TO ISSUE 9.6:

The location and design of the proposed interchanges will be finalised during the design phase. The potential environmental impacts of the interchanges will be identified during this phase and the characteristics of the interchanges will be modified to optimise their use whilst minimising their effect on adjacent areas.

10.0 REGIONAL EFFECTS OF THE PROPOSAL

ISSUE 10.1:

Why does the proposal only consider the Highway to the north of Reid Highway? There is no indication of how the PDNH and the NEC MRS Amendment will impact on residents and land owners to the south of Reid Highway.

RESPONSE TO ISSUE 10.1:

The proposal only considers the Perth Darwin National Highway north of Reid Highway as the National Highway terminates at Reid Highway. The Lord Street connection is essentially a link in the urban arterial network which serves the metropolitan area and so is not related to the function of the National Highway. Consequently, the impact on residents and land owners to the south of Reid Highway is not relevant to this proposal and was not discussed in this PER.

ISSUE 10.2a:

The report addresses the potential environmental impacts of the proposed national highway route, however, the approval of the route in this location will then create the planning framework for other planning decisions which will have significant environmental implications, in particular:

- a) the required upgrading and deviation of Lord Street south of the Reid Highway required by the virtue of the proposed location of the Perth - Darwin highway;
- b) the urban development accompanying the highway as proposed in the North-East Corridor Structure Plan; and
- c) the public transit reservation proposed under the North-East Corridor Structure Plan.

None of these planning proposals have had any detailed environmental assessment, yet the approval of the road alignment at this stage will, to a degree, predetermine these other planning proposals.

How can the environmental assessment of this route be divorced from the related environmental impact of the associated development and road proposals to the south of Reid Highway. The environmental assessment does not take account of the associated and related road, public transport and urban development which will be part of the planning for the North-East Corridor of Perth.

RESPONSE TO ISSUE 10.2a:

The approval of the consensus route will not create the planning framework for other planning decisions. The structure planning process for the North-East Corridor has been in place since the early 1990s and the Perth Darwin National Highway is one part of the road hierarchy designated for that corridor. The planning of the National Highway route was integrated with the overall planning of the North-East Corridor.

- a) The widening of the Lord Street reservation south of Reid Highway was proposed in the North-East Corridor Structure Plan (1994) and is not relevant to the Perth Darwin National Highway proposal. The Lord Street proposal requires further environmental assessment and is proposed to be included in a later amendment when this assessment has been completed (State Planning Commission, 1994).

- b) The environmental implications of urban development accompanying the highway as proposed in the North-East Corridor Structure Plan are not relevant to this proposal.
- c) The public transit reservation proposed under the North-East Corridor Structure Plan is an autonomous reservation and is not relevant to the Perth Darwin National Highway proposal. This proposal requires further environmental assessment and is proposed to be included in a later amendment when this assessment has been completed (State Planning Commission, 1994).

ISSUE 10.2b:

Will the positioning of the highway have an adverse impact on residents south of Reid Highway in the medium term as traffic seeks to find its way south? The route does not offer a solution for redirecting traffic away from southern areas. These implications should be considered in the PER.

RESPONSE TO ISSUE 10.2b:

This issue was addressed in response to Issue 10.1.

ISSUE 10.3:

The construction of the highway has severe impacts on residents to the south of Reid Highway because the North-East Corridor Plan has a major arterial road continuing from the junction of Perth-Darwin/Reid intersection.

RESPONSE TO ISSUE 10.3:

This issue was addressed in response to Issues 10.1 and 10.2.

ISSUE 10.4:

When the effects of a flow on of traffic and Rapid Transit Route south of Reid Highway are included in Table 3A (BSD Stage 2 Report), the Lord Street Option becomes the least desirable. The manipulation of figures indicates that the decision to consider the PDNH only north of Reid highway is a political one.

RESPONSE TO ISSUE 10.4:

This issue was addressed in response to Issue 10.1.

ISSUE 10.5:

The route does not make connection with Great Northern Highway. What percentage of heavy vehicles currently using the existing Great Northern Highway are likely to use the Perth - Darwin highway as an alternative?

RESPONSE TO ISSUE 10.5:

As indicated in section 1.1 of the PER, the consensus route connects with the Great Northern Highway near Muchea. A traffic analysis was not undertaken as part of this PER and the reader is referred to:

Travers Morgan, Feilman Planning and Cossill & Webley (1991) Supplementary Report No.2 (Traffic Appraisal). Prepared for Main Roads Western Australia and the Department of Planning and Urban Development.

ISSUE 10.6:

The route strongly influences transport planning consideration for the location of other roads which will have adverse social and environmental impacts eg: proposed connection of Gngangara and West Swan Roads.

RESPONSE TO ISSUE 10.6:

Planning for a network of arterial roads was undertaken as part of the structure planning process for the North-East Corridor with consideration of social and environmental impacts. The Perth Darwin National Highway is only one part of the road hierarchy designated for that corridor.

ISSUE 10.7:

Future urban development in the Henley Brook Region would be better suited to direct access from the proposed highway. If the alignment was to be redirected to an area further away from the proposed urban node, then it is expected that the urban traffic will be filtering through the existing and established special rural and rural areas.

RESPONSE TO ISSUE 10.7:

This statement appears to support the Perth Darwin National Highway proposal providing that suitable access to the National Highway is provided from existing and proposed urban development. This access will be provided by Gngangara Road and Youle-Dean Road and will minimise the distance travelled to and from urban nodes.

11.0 SOCIAL ISSUES

ISSUE 11.1:

Why has there been no social impact studies undertaken for this proposal?

RESPONSE TO ISSUE 11.1:

The social impact assessment of the Perth Darwin National Highway and land severance and rezoning proposals was addressed in section 7.1 of the PER.

The social impact assessment for the Perth Darwin National Highway proposal was based on work undertaken in previous route selection studies. Additional studies were not initiated for this proposal as the time constraints put on the preparation of the PER by other government authorities did not allow sufficient time for these studies. However, Main Roads will establish a community consultation program to review the impact assessment undertaken for this proposal and the proposed management of these impacts.

The proposal for rezoning of land in the Ellenbrook area and urban development has been subject to public comment in the course of the town planning process over the last six years, commencing with the review of the corridor plan issued by the (then) State Planning Commission, and culminating in the Ellenbrook Structure Plan issued by Ellenbrook Management in 1993. Over much of this period Ellenbrook Management has undertaken a community consultation program which has involved regular liaison with relevant agencies and interest groups. Any social impact matters which arise from the State forest land exchange will be handled through this ongoing program.

ISSUE 11.2:

Commitment 19 is too late. Consultation needs to occur before the decision is made. There has been no community consultation on this proposal. "Consensus of opinion among Government Decision-making Authorities" in order to find the preferred route is meaningless without extensive community consultation on that particular route.

RESPONSE TO ISSUE 11.2:

This issue was addressed in sections 1.5.3 and 7.1 of the PER. The concept of a reservation and/or alignment for a northern highway has been presented in various forms to the public a number of times over the last 20 years through the town planning process and has been the subject of a number of community consultation exercises.

Refinement of the southern section of the consensus route (Reid Highway to Maralla Road) will be made with consideration of public submissions made in response to this PER and the MRS amendment. Unresolved issues associated with the northern section of the consensus route (Maralla Road to Muchea) will also be addressed with consideration of submissions made in response to this PER and issues raised during the community consultation program that will be established by Main Roads (Commitment 19).

ISSUE 11.3:

The PER is grossly deficient. It does not present information and views from the community. It does not provide public input and consultation for the new proposal and yet this was an important element of the consideration of the two previous proposals ie: upgrading of existing Great Northern Highway or construction of a new National Highway adjacent to the eastern side of the Midland to Muchea railway. Why was this approach adopted for this proposal? Does Main Roads acknowledge that there has been no public consultation for the consensus route?

RESPONSE TO ISSUE 11.3:

These questions were addressed in response to Issues 11.1 and 11.2.

ISSUE 11.4:

Section 9.0: If the EMPs, community consultation, further survey and research are carried out, and likely impacts prove to be high, will the road reserve be moved? Will there be public consultation on new alternatives?

RESPONSE TO ISSUE 11.4:

As indicated in section 1.3 of the PER, the timing of the construction of the consensus route is dependent on traffic growth and safety expectations resulting from urban development in the North-East Corridor and growth in road transport freight movements to and from agricultural, mining and pastoral regions north of Perth. Main Roads recognises that environmental and social

issues may change over time and that these issues will need to be addressed when the construction timetable has been defined. A number of these issues will be addressed in the community consultation program to be established by Main Roads for this proposal (Commitment 19). The road reserve will be altered where there is a requirement to do so and the opportunity is still available.

ISSUE 11.5:

The highway will affect residents economic viability, lifestyles and rural enterprises in the land west of Bullsbrook. Has this impact been considered and how will these effects be managed?

RESPONSE TO ISSUE 11.5:

Whilst this issue was addressed in general terms in section 7.3.1 of the PER, the extent of the impacts on existing communities such as Bullsbrook need to be further assessed to determine the most appropriate management strategies. It is important to note that the alignment of the consensus route north of Maralla Road is only indicative and that opportunity exists to modify this alignment with respect to the results of the community consultation program (Commitment 19) and further impact assessment processes, if required.

ISSUE 11.6:

Tourist Drive 203 will be dramatically changed as a result of the proposed North-East Corridor Structure Plan and its relationship to the proposed Perth - Darwin National Highway. This will have serious consequences to the tourist appeal of the area and it is essential that the status of this important scenic drive be recognised and preserved.

RESPONSE TO ISSUE 11.6:

The location of the consensus route was proposed with recognition and consideration of the importance of Tourist Drive 203, which comprises portions of West Swan Road and Great Northern Highway. The status of this route as an important and scenic tourist drive is unlikely to be adversely affected by the Perth Darwin National Highway proposal. Indeed, there may be a number of benefits, including a reduction in the amount of traffic originating from outside the North-East Corridor.

ISSUE 11.7:

A major road will only increase pollution to the NE Corridor and particularly to the Caversham area which already records high pollution levels.

RESPONSE TO ISSUE 11.7:

In general, air pollution levels are inversely proportional to the speed at which vehicles are moving. Therefore, it is highly likely that traffic growth in the North-East Corridor would result in increased congestion and consequently higher pollution levels if a freely-flowing road such as the Perth Darwin National Highway is not constructed.

ISSUE 11.8:

Has the impact of the highway on the Culunga Aboriginal Community School been considered? What are the likely effects from noise, vehicle emissions etc on the health of these children.

RESPONSE TO ISSUE 11.8:

The Perth Darwin National Highway proposal has not reached a level of planning that allows for investigations into such specific issues or locations. These impacts and their management will be considered in further planning and design phases and through the community consultation program.

ISSUE 11.9:

The PER has not considered the impacts of the proposal on landscape values in the area, although it acknowledges the potential of the highway to be a conspicuous feature of the landscape.

RESPONSE TO ISSUE 11.9:

This issue was addressed in section 6.9.5 of the PER, which notes that the open nature of the majority of the area through which the consensus route will pass means that the road, and particularly the traffic it carries, has the potential to be a conspicuous feature of the landscape. Main Roads will undertake to minimise the visual impact of the consensus route and will prepare an EMP to address the achievement of this objective (Commitment 18).

ISSUE 11.10:

Page 4-15: "by passing Bullsbrook" may not be considered an advantage by local businesses that rely on passing trade. Consultation with the community, including the businesses, is necessary to determine this. The possibility of relocating the Pearce Airbase, in the future, may open up a lot of degraded land that could be used to locate the PDNH to the west of Bullsbrook town later.

RESPONSE TO ISSUE 11.10:

These issues were addressed in response to Issue 11.5.

ISSUE 11.11:

A number of submissions, including from specific Aboriginal Community Groups, raised concerns at the lack of consultation with Aboriginal residents and Aboriginal people with ties to the Swan Valley.

Specific concerns were raised in regard to impacts associated with the Perth to Darwin National Highway and Excision of State Forest No.65 on Sacred Sites, Religious Grounds, Archaeological and Ethnographic sites and the effects of the proposal on Aboriginal culture, social well being and religious beliefs.

RESPONSE TO ISSUE 11.11:

The community consultation program to be established by Main Roads (Commitment 19) will involve consultation with all interested parties, including Aboriginal people.

ISSUE 11.12:

Page 4-10: "no impact on significant Aboriginal and European heritage sites". This statement is wrong! Option 3 impacts directly and indirectly on many sites that are sacred and significant to Nyungar - Aboriginal communities in the Swan Valley. Many European and historical buildings exist between Henley Brook and Bassendean. The route has the potential for a flow on effect that could impact on the historical town of Guildford. These features would have been revealed if communities in these areas had been consulted.

RESPONSE TO ISSUE 11.12:

This issue was addressed in section 7.2.1 of the PER. There are no known features of European heritage in the vicinity of the consensus route and a search of WA Museum records and a review of studies undertaken in the region to date indicate that no significant archaeological or ethnographic sites, apart from Ellen Brook, are known to occur in the vicinity of the consensus route. However, it is recognised that this is more likely to be the result of a lack of regional research rather than the absence of sites *per se*.

Main Roads will undertake an archaeological and ethnographic survey prior to the finalisation of land requirements for the consensus route and will develop an EMP if significant Aboriginal sites are found in the vicinity of the route (Commitment 21). This will be undertaken in consultation with the relevant Aboriginal communities. Main Roads will also comply with the requirements of the Aboriginal Heritage Act 1972-1980 (Commitment 22).

ISSUE 11.13:

Section 1.1: The impact on properties between Gngangara and Pearce is briefly mentioned in regard to the proposed public transit corridor. How many residents in Bullsbrook and Muchea have been consulted or even informed about these proposals? There is no discussion on the need or alternatives for the transit corridor.

RESPONSE TO ISSUE 11.13:

Whilst this issue was addressed in general terms in section 7.3.1 of the PER, the extent of the impacts on existing communities and private properties will be assessed further to determine the most appropriate management strategies. As indicated in the response to Issue 11.5, the alignment of the consensus route north of Maralla Road is indicative and that opportunity exists to modify this alignment with respect to the results of the community consultation program (Commitment 19) and further impact assessment processes, if required.

The objectives, scope and timing of the Perth Darwin National Highway proposal were discussed in section 1.3 of the PER. The route selection process and the assessment of the environmental effects of the route options were addressed in sections 4.1 and 4.2 of the PER.

12.0 ALTERNATIVE ROUTE OPTIONS

ISSUE 12.1:

Section 4.1: Why wasn't the Community Groups Consensus Route (see Attachment 1B) given any consideration in this section or anywhere else in the report? The relevant Government authorities are well aware of the community proposals.

RESPONSE TO ISSUE 12.1:

The Community Groups Consensus Route was not discussed in this PER for the following reasons:

- o a similar route option was assessed in the Perth Darwin National Highway Termination Study (Stage 2) and opposed by the Department of Environmental Protection and the Water Authority primarily due to groundwater protection issues;
- o there are a number of constraints in the Bullsbrook area which mitigate against the longterm use of the Great Northern Highway (which is an integral component of the Community Groups Consensus Route); and
- o much of the route alignment is contrary to the structure planning reflected in the Metropolitan Region Scheme, in that it would sever urban zoned land in the northern section of Ellenbrook.

ISSUE 12.2:

Section 4.3.1: Any "loss of potential land stocks" should not be replaced on the Swan Coastal Plain which is considered by many to be already over populated. The Community Consensus Route would allow for more degraded pine plantations to be swapped for more Ellenbrook bushland. This would decrease the edge effects and the subsequent management problems associated with a very complex conservation area boundary. Land exchange to assist in the achievement of conservation targets is philosophically acceptable (EPA Bulletin 642).

RESPONSE TO ISSUE 12.2:

The excision of State forest land proposed for urbanisation will only partly replace land within the Ellenbrook Joint Venture's holding which was initially thought to have development potential but which now will be conserved in Regional Open Space. The excision area has been determined by the location of the consensus route. As noted in the PER, and earlier comments in this response

document, the consensus route was selected after five years of planning studies and community discussion and is considered to represent a balance between the conflicting demands of groundwater protection, social amenity in the Swan Valley, urban development and conservation.

ISSUE 12.3:

Section 5.2.2: Rather than removing the north-east corner from Whiteman Park it would be preferable to remove a similar area from the north-west corner (already road reserved) in order to bring the Community Consensus Route further south-east, thus impinging less on the Gngara area.

RESPONSE TO ISSUE 12.3:

This comment does not provide any technical evidence to support the preference for excising land in the northwest corner of Whiteman Park in comparison to the northeast corner. The poor biological condition and low conservation value of land in the north east corner of Whiteman Park is a key factor in the proposal for excision for the Perth Darwin National Highway and rezoning to rural.

ISSUE 12.4:

Section 6.3.1: The Community Consensus Route would impact on less regionally significant vegetation and cut across fewer drainage lines than the Government Consensus Route. Clearing of vegetation should not occur in reserve areas.

RESPONSE TO ISSUE 12.4:

Whilst the benefits of the Community Groups Consensus Route are recognised, these are generally outweighed by the issues raised in response to Issue 12.1.

The impact of the consensus route on regionally significant vegetation was addressed in section 6.3.1 of the PER. Potential impacts include the loss of small portions of significant and/or representative vegetation. Main Roads will minimise disturbance to regionally significant vegetation adjacent to the consensus route. Areas disturbed by construction of the consensus route will be rehabilitated by Main Roads as soon as practicable. An EMP to address rehabilitation needs will be prepared prior to construction (Commitment 4).

ISSUE 12.5:

Locating the road to the west of Whiteman Park would result in less noise and disturbance to established residences.

RESPONSE TO ISSUE 12.5:

Placement of the route west of Whiteman Park is contrary to the policies of the Department of Environmental Protection and the Water Authority designed to protect the Gnangara Mound and existing borefields from possible detrimental effect of roads. These are considered of greater community value than noise and disturbance to existing local residences as the latter can be compensated for in road design.

ISSUE 12.6:

It is recognised that the option to the west of Whiteman Park is across the Gnangara Mound. However, appropriate drainage provisions could be incorporated into the Gnangara Mound option to prevent spills and contamination.

RESPONSE TO ISSUE 12.6:

Whilst the engineering appraisal of route options undertaken by Cossill & Webley (1992) concluded that the route options between Tonkin Highway and Muchea were feasible, despite constraints such as the groundwater area and the RAAF 3TU facility. The study did not necessarily imply that there would be no risk to the groundwater, but rather that the risks could be managed at a cost to within acceptable levels. However, the cost would be significant and there still remains some uncertainty regarding the sustainability and energy requirements of the design provisions and risks associated with their maintenance.

ISSUE 12.7:

The consideration of options does not make use of the existing railway option to the east. Previous decisions should be reviewed in light of environmental, engineering/economic and social issues associated with current options.

RESPONSE TO ISSUE 12.7:

In October 1991, the Department of Planning and Urban Development released a discussion paper outlining options for urban development in the North-East Corridor and discussed possible alignments of the Perth Darwin National Highway. A large number of public submissions received

in response to this paper strongly opposed the recommended route and suggested that the future National Highway alignment should not affect the Swan Valley due to social and heritage constraints. As a result, the Government discounted further study of route options east of the Midland-Muchea railway.

ISSUE 12.8:

The community proposal to the west of Whiteman Park has problems such as bi-secting the State Forest to the north and interfering with the Overseas Telecommunications Buffer requirements to the west. In addition if the alignment of the highway is pushed further to the west, traffic from the future Ellenbrook and Henley Brook areas will naturally filter to West Swan Road as it would then provide a more direct route. This would be inappropriate given the historic, heritage value of West Swan Road.

RESPONSE TO ISSUE 12.8:

The constraints of the Community Groups Consensus Route described in this submission are consistent with the findings of the route selection process undertaken by Main Roads.

13.0 LENGTH OF PUBLIC REVIEW PERIOD

ISSUE 13.1:

The length of the public review period is not sufficient particularly in view of the other proposals affecting the area ie: the North-East Corridor MRS Amendment.

Some documents referred to in the report were found to be "unpublished" source materials. The time available and access to these documents is insufficient for informed review and comment.

ISSUE 13.2:

The public comment process in this instance is a procedural whitewash in regard to this development and lacks accountability for long term outcomes and environmental, social and cost-related issues due to the ignorant methods and procedures used.

RESPONSE TO ISSUES 13.1 AND 13.2:

The length of the public review period was determined by the Environmental Protection Authority.

ISSUE 13.3:

Much of the detail as to how impacts are to be managed does not appear in the document. Instead, the PER refers to later Environmental Management Plans which will be prepared without the opportunity for public comment. Will the proponents make these EMPs available to the public prior to their endorsement by government authorities.

RESPONSE TO ISSUE 13.3:

It is standard practice to produce EMPs after the environmental impact assessment of a project has been completed. Public input from all interested groups including road users into the preparation of the EMPs for the environmental management of the consensus route will be encouraged as part of the community consultation program to be established for this proposal (Commitment 19). The finalised EMPs may be made available to the public at the discretion of the Environmental Protection Authority.

14.0 OTHER

ISSUES 14.1:

The PER has not given adequate weighting to the area's biological values in assessing the environmental impact of the proposed route. Combining all potential environmental impacts, including landscape amenity into only four of twenty-four criteria, and allocating social impacts and engineering considerations to the remainder, results in heavy weighting towards the social and engineering/economic categories.

RESPONSE TO ISSUE 14.1:

Weighted ranking and sensitivity analyses of the route options and sub-options were not undertaken as part of the scope of this PER, but were undertaken previously by BSD Consultants (1994) as part of the Perth Darwin National Highway Termination Study (Stage 2). Section 4.2.2 of the PER summarises the findings of the Stage 2 study within the context of historical decision-making.

Whilst the Stage 2 study was considered adequate for the purposes of route selection, it was recognised that the biophysical features of the project area required further investigation and impact assessment. Consequently, an environmental impact assessment was undertaken for the consensus route, as reported in this PER.

ISSUE 14.2:

The PER goes on to state that subsequent weighted rankings and sensitivity analyses consistently indicated that Option 3 was the most desirable option. Why is no information regarding the subsequent weightings or the methodology for the sensitivity analysis provided, to enable readers of the PER to assess the validity of this claim?

ISSUE 14.3:

There is no explanation of assessment criteria or ranking/rating included in the PER. This makes it impossible to follow the process that was undertaken. Some descriptions are given in the BSD Stage II document although these are vague and by no means comprehensive. There is no way of working out how various alternatives were ranked or rated.

RESPONSE TO ISSUES 14.2 AND 14.3:

As indicated in the response to Issue 14.1, this PER only summarised the findings of the Stage 2 study and reported them in the context of historical decision-making. The summary of the methodology and main findings of the Stage 2 study was given in section 4.2.2 and a summarised extract of the route option analysis was presented in Appendix D of the PER. Readers were referred to BSD Consultants (1994) for further information, if required.

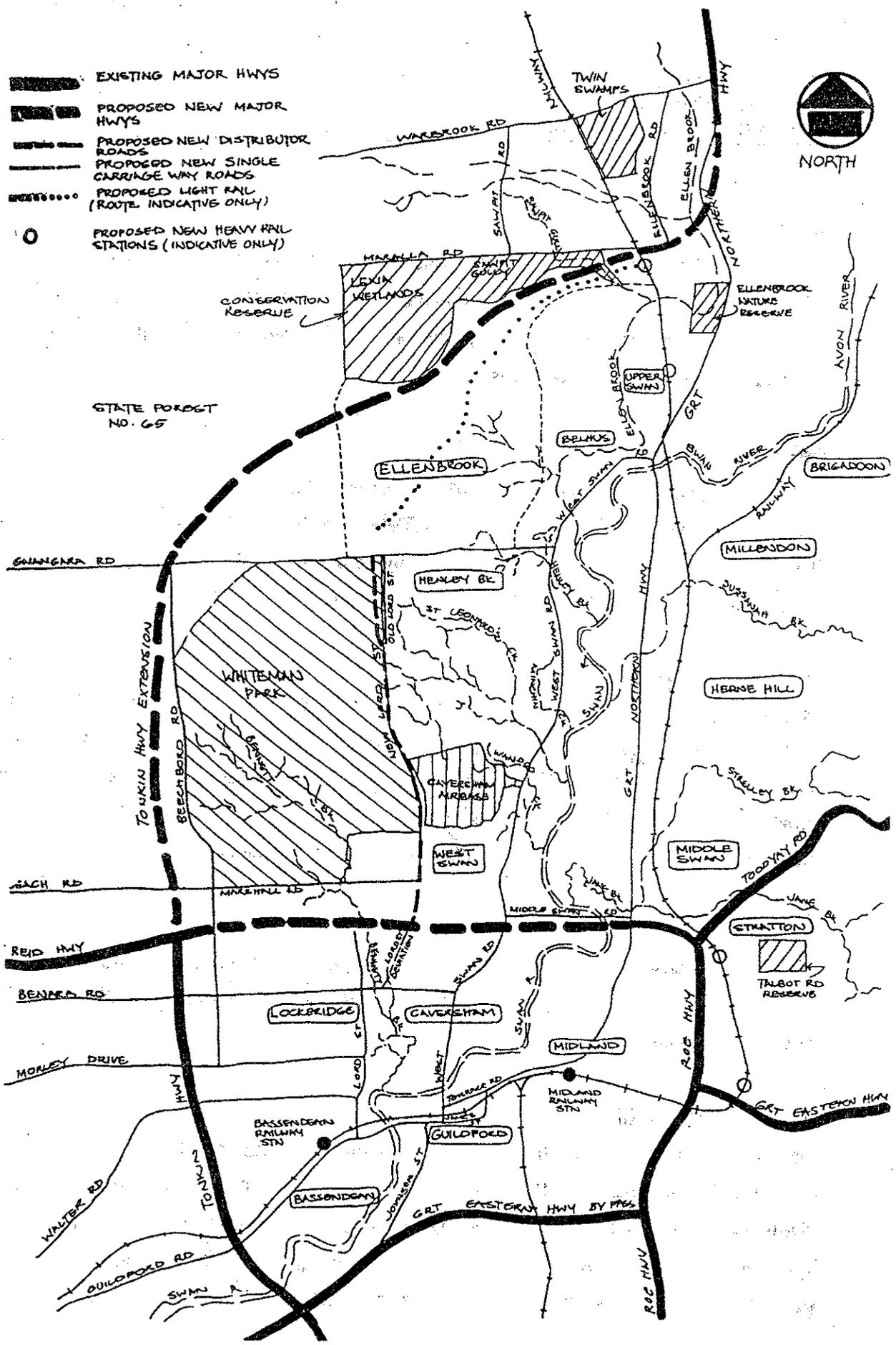
ISSUE 14.4:

There is no assessment of the consensus route based on the criteria used to assess the previous route options. There is no comparison of how well this consensus proposal rates along side of the previous route options.

RESPONSE TO ISSUE 14.4:

The consensus route is essentially a variation of Option 3 as defined and assessed in the Stage 2 study by BSD Consultants (1994). No assessment of the consensus route was undertaken using the criteria used to assess the previous route options as officers of the Department of Environmental Protection advised that a weighted analysis would not be appropriate for the environmental impact assessment of the Perth Darwin National Highway proposal.

-  EXISTING MAJOR HWYS
-  PROPOSED NEW MAJOR HWYS
-  PROPOSED NEW DISTRIBUTOR ROADS
-  PROPOSED NEW SINGLE CARRIAGE WAY ROADS
-  PROPOSED LIGHT RAIL (ROUTE INDICATIVE ONLY)
-  PROPOSED NEW HEAVY RAIL STATIONS (INDICATIVE ONLY)



STATE FOREST NO. 65

Community Groups Consensus Route

Appendix 3
List of submitters

Australian Heritage Commission
B K & D C Clausen
Bassendean Preservation Group Inc
Coalition for Wanneroo's Environment
Culunga Aboriginal Community School
Board
Department of Aboriginal Sites
Department of Minerals and Energy
Dept of Conservation and Land Management
Edgecombe Bros Pty Ltd
Ellenbrook Conservation Group
Friends of Bennett Brook
G A Rogers
H B Gratte
H V Gratte
Homeswest c/- Greg Rowe & Assoc
Lord Street Group
Messrs G J & J M Jankowski
Messrs M & D Cooper
Messrs N Ciffolilli and M A H Boogaerd
Messrs R & C Henderson
Mr A Gianatti
Mr A Manolini (petition 33 signatures)
Mr A Smith
Mr B Carter
Mr C K H Brown
Mr D Kehoe
Mr G Borello c/- Greg Rowe & Assoc
Mr I Turner
Mr S Jackson
Mrs H Turner
Ms D Gratte
Ms E Bauwman
Ms J Evans
Ms K Tullis
Ms S Hurt
Ms S M Codd
Ms T Rowan
Ms Z Tabart/Ms D Cochrane
Mt Lawley Pty Ltd
R Hainke
Success Hill Action Group
Swan Valley Nyungah Community
Swan Valley Tourism Council
Town of Bassendean
WA Museum
Water Authority of Western Australia

Tom Butler MLC Member for E Metro Region
Ms N A Nolan
G E Doyle
Assoc Professor D Blair
Ms A Solig
Rocla Quarry Products

Ms A Scobie
Henley Brook Locality Group
K Gregory
Ms M Parry
Ms C Rogers
K R Scobie
Messrs A & C Tampalini
Ms M Nolan
Mr R Parry
Ms C Heal
Messrs E & Y Scott
Messrs G & M Bray
Messrs G R & S M Menzies
Messrs H & E Mattingly
Ms A Herlihy
Mr R Gregory
Mrs L Vrolyk
Mr C Brown MLA, Member for Morley
Messrs J & G den Haan
Messrs J W & B A Thompson
Messrs J & M Blair
Messrs E & M A Rosher
Ms K Hainke
Mr R Nolan
Mr K G Saw
Ms M Cope
Ms J Zeck
Mrs M O'Sullivan
Messrs K & L Jeffries
Mr G Zeck
Mr M E Huppert
Messrs M & D Taylor
Messrs N & P Betty
Mrs J DEL Bovello
Ms E Boyd
Ms B I B Saw
Messrs P G & K L Pearson
Mr J A Whitesmith
Ms A Torrens
Messrs R & S Barrett-Lennard
Mr A Smith

Appendix 4

**Copy of EPA letter regarding extension
to public review period**



«ADD1»
«ADD2»
«ADD3»
«ADD4»
«ADD5»

Your ref:
Our ref: 20/94
Enquiries:

«IF DEAR>""
Dear «IF DEAR="S/M"»Sir/Madam«ELSE»«IF DEAR="S"»Sir«ELSE»«IF
DEAR="M"»Madam«ELSE»«DEAR»«ENDIF»«ENDIF»«ENDIF»
«ENDIF»

**ROUTE ALIGNMENT FOR PERTH TO DARWIN HIGHWAY AND
EXCISION OF LAND FROM STATE FOREST 65 AND PRIORITY ONE
WATER PROTECTION AREA FOR URBAN DEVELOPMENT AND FAST
TRANSIT ROUTE (870)**

Thank you for your letter dated «DATE» in which you outlined your concerns regarding the length of the public review period for the above proposal which closed on the 16 May 1994.

The Environmental Protection Authority considered that an extension to the public review period was not considered appropriate for the following reasons:

- that the length of the public review period document is 8 weeks and it is considered that this length of time provides sufficient opportunity for the public to respond to issues of concern regarding the proposal without unreasonably affecting the expectations of the proponents (Main Roads and Ellenbrook Management Pty Ltd) in regard to timing of the environmental assessment process and the Government's timing of the Major Metropolitan Region Scheme Amendment;
- that senior officers from the Department of Environmental Protection had attended a public presentation at the Guildford Town Hall on 11 May 1994, where issues of concern to the community regarding the proposal were presented; and
- that the Environmental Protection Authority was mindful of setting precedents with changing public comment periods when very frequently it receives requests for both lengthening and shortening the public comment periods.

The Environmental Protection Authority has received a large number of submissions regarding the Public Environmental Review and is currently summarising the issues raised in those submissions.

The Environmental Protection Authority's summarised list of issues and the proponent's response to those issues will be considered by the EPA in its assessment of the proposal and will also be included as an appendix in the EPA's report and recommendations to the Minister for the Environment.

«IF DEAR>""»

Yours «IF DEAR="S/M"»faithfully«ELSE»«IF DEAR="S"»faithfully«ELSE»«IF DEAR="M"»faithfully«ELSE»sincerely«ENDIF»«ENDIF»«ENDIF»
«ENDIF

Rob Sippe
DIRECTOR
EVALUATION DIVISION

24 May 1994

Perth Darwin National Highway 240594

Appendix 5
Copy of Main Roads letter



MAIN ROADS
Western Australia

Don Aitken Centre
Waterloo Crescent
East Perth WA 6004

Enquiries: Mr Muttaqui on 323 4261

Our Ref: 90-2148-21

Your Ref:

Manager
Department of Environmental Protection
Westralia Square Building
141 St George's Terrace
PERTH WA 6000

ATTENTION: MS P KEEN

DEPARTMENT OF ENVIRONMENTAL PROTECTION	
26 JUL 1994	
20/94	initials
	initials

PERTH-DARWIN NATIONAL HIGHWAY

I refer to recent discussions between Paul Trichilo of Main Roads and Prue Keen of the Department of Environmental Protection (DEP) about the proposed alignment of the Perth Darwin National Highway (PDNH) as shown on the major Metropolitan Region Scheme (MRS) amendment proposals for the north east corridor.

The future PDNH is planned to be a Controlled Access Highway (CAH) similar to Kwinana Freeway. Freeway routes are designed to high standards and have much lower accident rates than other roads in the hierarchy. Studies of past accidents show that the average accident rate for the freeway system in Perth is about 0.7 accidents per million vehicle kilometres. This is about five to six times lower than the accident rates on other primary roads within the Perth metropolitan region.

It is therefore, envisaged that the risk of accidents involving hazardous substances on the future PDNH would be extremely low. The probability of such an accident occurring in a storm event and spilling contamination beyond the highway drainage system would be even lower. An approximate risk calculation indicates that the probability of overflow of spillage could be as low as 1 in 100 million for a drainage designed for a 1 in 100 year storm.

In view of the random nature of road accidents, the low risk factor on roads designed to freeway standards and the relatively small quantities in individual truck loads, the proposed strategy for the future PDNH is to implement management measures to deal with spillages when and where they may occur.

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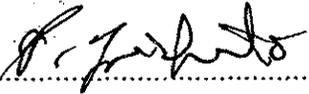
Page 1

The recent design of Kwinana Freeway over Jandakot water mound has included a similar strategy with specific measures for the management of spillage of hazardous substances from road accidents. The management measures have been developed as part of the Environmental Management Programme (EMP) agreed with the DEP. The Kwinana Freeway design provides a two stage detention basin system to minimise the potential for a spill to adversely affect the groundwater. If a spillage of a hazardous substance enters any table drain leading to a detention basin system, the substance is likely to be absorbed into the top layer of the base of the drain. The substance would be excavated, removed and replaced with clean materials to reinstate the drain to pre-accident condition. If the hazardous substance enters the detention basin, the impervious base would retain the substance until it is removed.

Prior to future construction of the proposed PDNH a similar EMP would be developed in consultation with DEP and implemented to safeguard the Gnangara Water mound. Main Roads is committed to the EMP through the PER process.

J G O Hackett
DIRECTOR STRATEGIC ROAD PLANNING

Per



July 22 1994

Appendix 6
Proponents commitments

TABLE 9.1
SUMMARY OF COMMITMENTS

Commitment Number	Issue	Commitment	Operator	Management Strategies	Phase	Proposed Auditor
1	Legal Requirements	The Proponents will undertake to fulfil all management commitments described in this PER in accordance with applicable State laws and regulations with standards and procedures agreed with the State.	Main Roads and Ellenbrook Management	Not applicable.	Strategic Planning	EPA
2	Environmental Management	Ellenbrook Management will undertake to manage the State forest area proposed for rezoning in a manner consistent with the environmental criteria and management strategies developed for the Ellenbrook project, in accordance with commitments made by the Proponent for that project.	Ellenbrook Management	Refer to criteria and strategies cited in Bowman Bishaw Gorham (1994).	Operational	EPA, CALM, WAWA
3	System 6 Conservation Areas	Main Roads will undertake to avoid indirect impacts on System 6 conservation areas.	Main Roads	Minimise the encroachment on Whiteman Park.	Strategic Planning	DPUD
				Use appropriate fencing along the boundary between Whiteman Park and the highway to reduce the potential for native fauna road-kills.	Operational	Main Roads, CALM
				Control the quantity and quality of stormwater discharged into Whiteman Park.	Operational	EPA, WAWA
4	Regionally Significant Vegetation	Main Roads will minimise disturbance to regionally significant vegetation adjacent to the consensus route. Areas disturbed by construction of the consensus route will be rehabilitated by Main Roads as soon as practicable. An EMP to address rehabilitation will be prepared prior to construction.	Main Roads	Restrict the clearing of remnant vegetation to the minimum area necessary for permanent road works, and confine temporary works areas as far as possible to previously cleared areas.	Strategic Planning and Operational	Main Roads, CALM
				Identify on construction plans natural vegetation and isolated trees adjacent to the proposed route that can be retained, prior to the commencement of clearing.	Operational	Main Roads, CALM
				Erect temporary fences to protect natural vegetation and isolated trees adjacent to the consensus route from trunk and root damage by vehicles.	Operational	Main Roads, CALM
				Rehabilitate areas disturbed by the construction of the consensus route with native species.	Operational	Main Roads, CALM
5	Significant Flora	Main Roads will minimise disturbance to significant flora in the vicinity of the consensus route. In the event that significant flora species are found in the corridor, an EMP will be developed in consultation with CALM.	Main Roads	Conduct a flora survey along the proposed route alignment during the flowering season and during the definition of the corridor for the road to determine the presence of significant flora.	Strategic Planning	CALM, EPA
				Develop an EMP in consultation with CALM if any such plants are found in the corridor.	Strategic Planning	CALM, EPA
6	Significant Fauna	Main Roads will undertake to protect species of significant fauna. In the event that any significant fauna or fauna habitat are found in the corridor, an EMP will be developed in consultation with CALM and the WA Museum.	Main Roads	Undertake a survey of fauna and fauna habitat along the consensus route.	Strategic Planning	CALM, WA Museum, EPA
				Develop an EMP for the management of fauna habitat.	Strategic Planning	CALM, EPA
7	Wetlands	Main Roads will undertake to avoid disturbance of lakes protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy and minimise disturbance of other wetlands in the vicinity of the consensus route. An EMP that will address the management of wetlands affected by the consensus route will be prepared in consultation with the EPA and the Water Authority of Western Australia.	Main Roads	Confirm the conservation status of affected wetlands.	Strategic Planning	EPA, WAWA
				Prepare an EMP that will address the management requirements of affected wetlands.	Strategic Planning	EPA, WAWA
8	Priority 1 Source Protection Areas	Main Roads will undertake to minimise the risk of contamination of Priority 1 Source Protection Areas. Processes to achieve the objective will be described in an EMP.	Main Roads	Prepare an EMP.	Strategic Planning	EPA, WAWA

TABLE 9.1
(continued)

Commitment Number	Issue	Commitment	Operator	Management Strategies	Phase	Proposed Auditor
9	Groundwater Quality	Ellenbrook Management will undertake to manage groundwater quality in the area of State forest proposed for rezoning in a manner consistent with the environmental criteria, nutrient and drainage management plans approved for the Ellenbrook development, and environmental management commitments made subsequent to these approvals.	Ellenbrook Management	Relocate the Priority 1 boundary to follow the western boundary of the PDNH.	Strategic Planning	EPA, WAWA
				Prevent discharge of contaminants (e.g. stormwater) to Priority 1 Source Protection Areas.	Strategic Planning and Operational	EPA, WAWA
				Surround the boundaries of Priority 1 Source Protection Areas with a buffer of Priority 2 Source Protection Areas. The proposed alignment of the Priority 2 boundary will provide at least a 500m buffer to the nearest Lexia scheme bore.	Strategic Planning	EPA, WAWA
				No noxious or hazardous industries, waste disposal sites, intensive agriculture, petrol stations or water pollution control ponds will be located within Priority 2 Source Protection Areas.	Strategic Planning and Operational	EPA, WAWA
				Connect urban development zone to reticulated sewerage.	Operational	EPA, WAWA
				Disposal of domestic sewage in the special rural rezoning sector with approved on-site effluent disposal technology incorporating disinfection and nutrient removal capabilities.	Operational	EPA, WAWA
				Maintain groundwater quality in Priority 2 Source Protection Areas in accordance with ANZECC guidelines for raw water for drinking water supply.	Operational	EPA, WAWA
				Disposal of stormwater outside and downgradient of Priority 1 areas by using lined water pollution control ponds and/or infiltration basins of appropriate design to achieve nutrient objectives.	Operational	EPA, WAWA
		Amendment of infiltration basins with red mud as a water treatment measure.	Operational	EPA, WAWA		
10	Groundwater Levels	Ellenbrook Management will undertake to achieve the objectives for groundwater level management developed for the Ellenbrook project for the area of State forest proposed for rezoning.	Ellenbrook Management	Maintain pre-development water balance.	Operational	WAWA
				Maximise on-site storage and utilisation of stormwater.	Operational	WAWA
				Minimise generation of runoff and encourage localised recharge.	Operational	WAWA
				Emphasise use of vegetation to slow and filter runoff.	Operational	WAWA
				Aim to infiltrate 80% of stormwater runoff.	Operational	WAWA
				Utilise subsoil drainage to control maximum water levels in the superficial aquifer.	Operational	WAWA
11	Nutrient Export	For the State forest exchange area, Ellenbrook Management will undertake to achieve the nutrient export management objectives developed for the Ellenbrook project so that nutrient discharges from the site to Ellen Brook and the upper reaches of the Swan River will be minimised and the trophic status of the Swan River will not be adversely affected.	Ellenbrook Management	Planning and engineering design as discussed in Bowman Bishaw Gorham (1994).	Strategic Planning and Operational	WAWA
12	Drainage Lines	Main Roads will undertake to minimise the impact of the consensus route on the function, habitat and biota supported by drainage lines crossed by that route.	Main Roads	Size culverts to maintain the flow characteristics of all drainage lines affected by the highway construction.	Operational	WAWA, EPA
				Maintain fringing vegetation in the vicinity of road crossing where possible.	Operational	Main Roads, CALM
				Rehabilitate fringing vegetation disturbed by highway construction to maintain the continuity of fauna corridors.	Operational	Main Roads, CALM
				Provide fauna underpasses where necessary to facilitate fauna movement.	Operational	Main Roads, CALM

TABLE 9.1
(continued)

Commitment Number	Issue	Commitment	Operator	Management Strategies	Phase	Proposed Auditor
13	Noise and Vibration	Main Roads will undertake to minimise the impact of noise and vibration on the environment.	Main Roads	Fit all heavy machinery used during road construction with appropriate noise suppression equipment.	Operational	Main Roads
				Operate heavy vehicles used during road construction only during daylight hours.	Operational	Main Roads
				Negotiate construction hours with the local authority before the commencement of construction.	Operational	Main Roads
				Include in the road design noise attenuation features such as appropriate surfacing, soil bunds and walls where these will provide a potential benefit to the environment.	Operational	Main Roads, EPA
				Design the road such that a $L_{10/15/10, 900m}$ noise level 63 dBA used by Australian Regulatory Authorities when considering traffic noise is not predicted to be exceeded at any residence adjacent to the route.	Operational	Main Roads, EPA
				Observe obligations under the Noise Abatement Act 1972-1981 and the Noise Abatement (Neighbourhood Nuisance) Regulations 1979.	Operational	Main Roads, EPA
				Restrict site work to a maximum of 120 hours per fortnight, with a maximum of ten hours per day between 7.00am and 6.00pm.	Operational	Main Roads
14	Dust	Main Roads will undertake to minimise the impact of dust during construction.	Main Roads	Review operations to prevent or minimise the impact of vibration on property and members of the public.	Operational	Main Roads
				Minimise fugitive dust generation.	Operational	Main Roads, EPA
15	Dieback	Main Roads will undertake to prepare a dieback management plan.	Main Roads	Rehabilitate exposed surfaces to prevent ongoing dust generation.	Operational	Main Roads, EPA
				Prepare a dieback management plan prior to construction in accordance with Main Roads dieback policy (as discussed in the Main Roads Environmental Management Manual).	Operational	Main Roads, CALM
16	Weeds	Main Roads will undertake to develop an EMP that will address prevention of the introduction and spread of weeds.	Main Roads	Carry out a survey to determine the presence of dieback along the road alignment prior to the start of the construction phase.	Operational	Main Roads, CALM
				Implement a weed control program prior to the start of the construction phase and during rehabilitation.	Operational	Main Roads
17	Erosion	Main Roads will undertake to minimise soil erosion.	Main Roads	Minimise the size and length of time exposed soil is present.	Operational	Main Roads
				Use water sprays as required to keep the soil surface damp and prevent sand movement.	Operational	Main Roads
				Stabilise road verges and median strips with a surface mulch or other appropriate treatment.	Operational	Main Roads
				Rehabilitate all areas disturbed during road construction.	Operational	Main Roads, EPA
18	Landscape	Main Roads will undertake to minimise the visual impact of the consensus route. An EMP will be prepared to address the achievement of this objective.	Main Roads	Undertake a visual assessment.	Strategic Planning	Main Roads
				Develop an EMP.	Strategic Planning	Main Roads, EPA
				Give consideration to the characteristics of the naturally occurring vegetation when defining the road reserve width and vary that width in accordance with those characteristics.	Strategic Planning	Main Roads
19	Community Consultation	Main Roads will establish a community consultation programme.	Main Roads	Select plant species used for landscaping from those which naturally occur along the road and wherever possible source propagation material from the immediate vicinity of the road.	Operational	Main Roads
				Not applicable.	Strategic Planning	Main Roads, EPA
20	Community Consultation	Ellenbrook Management will continue to address any social impact matters arising from the State Forest excision proposal through the existing community consultation programme.	Ellenbrook Management	Refer to existing community consultation programme for the Ellenbrook development.	Strategic Planning	Ellenbrook Management, EPA

TABLE 9.1
(continued)

Commitment Number	Issue	Commitment	Operator	Management Strategies	Phase	Proposed Auditor
21	Aboriginal Heritage	Main Roads will undertake an archaeological and ethnographic survey of the proposed route alignment and prepare an EMP that will address any significant Aboriginal sites found in that area.	Main Roads	Undertake an archaeological and ethnographic survey prior to finalisation of land requirements for the route.	Strategic Planning	Department of Aboriginal Sites
				Develop an EMP if significant Aboriginal sites are found in the vicinity of the consensus route, in consultation with the relevant Aboriginal communities.	Strategic Planning	Department of Aboriginal Sites
22	Aboriginal Heritage	Main Roads will comply with the requirements of the Aboriginal Heritage Act 1972-1980.	Main Roads	Compliance by Main Roads with all legal requirements regarding disturbance of Aboriginal sites.	Operational	Department of Aboriginal Sites
23	Existing Communities and Land Uses	Main Roads will undertake to minimise the effects of construction of the consensus route on existing communities and residences.	Main Roads	Consult with landowners to minimise the impact of the construction and operation of the consensus route on private property.	Strategic Planning	Main Roads, DPUD
				Locate the final alignment along property boundaries where possible, thereby reducing property severance.	Strategic Planning	Main Roads, DPUD
				Restrict site work to a maximum of 120 hours per fortnight, with a maximum of ten hours per day between 7.00am and 6.00pm.	Operational	Main Roads
24	Existing Communities and Land Uses	Ellenbrook Management will undertake to continue the existing community consultation programme established as part of the approvals process for the Ellenbrook project, to review the impacts and identify management requirements for the State forest land severance and rezoning proposal.	Ellenbrook Management	Continue the existing Ellenbrook development community consultation programme.	Strategic Planning	Ellenbrook Management
25	Recreation	Main Roads will undertake to minimise the impact of the alignment of the consensus route on existing recreational facilities and areas.	Main Roads	No special management strategies are considered necessary.	Strategic Planning	Main Roads