Proposed urban development of Lots 35 and 48, Brixton Street, Kenwick, City of Gosnells

St Joseph's Properties and Dudley & Dwyer Limited

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 635
July 1992

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 recommendations.

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 assessment report 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
18th Floor, Allendale Square
77 St George's Terrace
PERTH WA 6000

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on the 1 August, 1992.

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Contents

Figures

Appendices

Summary and recommendations

The Environmental Protection Authority has assessed a proposal by St Joseph's Properties and Dudley & Dwyer Limited to develop a 30 hectare site on Lot 48 and Part Lot 35 Brixton Street, Kenwick, for mixed density housing (Figure 1).

The Authority's conservation efforts in the metropolitan area are primarily based on the System 6 Report of 1983. Other areas perceived to be worthy of conservation are generally considered through the planning process at the State and local government authority level. The Brixton Street site is not part of System 6, because at the time of the System 6 study its conservation values were not fully known. Since then, the circumstances pertaining to this site have changed.

The preservation of genetic diversity is one of the three principle objectives of "living resource conservation" identified in the World Conservation Strategy (1980). This has been endorsed at the National (National Conservation Strategy for Australia - 1983) and State (State Conservation Strategy - 1987) level. The practical implementation of these global and local objectives will become increasingly important in the context of the "ecologically sustainable development" debate.

Recently, the Authority assessed a development proposal on Lots 37 and 47 immediately to the south of this site and, because of the diversity of the vegetation and its scarcity, recommended the development be refused. The land will be included in a conservation reserve.

The land immediately to the north of this site is subject to a System 6 recommendation and is managed as a conservation reserve by the University of Western Australia, the owner of the land.

The land, the subject of this proposal, is ecologically similar to the reserves north and south and forms a link between these areas

Accordingly, assessment under the Environmental Protection Act was required for this development proposal.

The level of assessment was set at Consultative Environmental Review with a public review period of four weeks commencing on 7 January, 1992, and finishing on 4 February, 1992. During this period 33 submissions were received by the Authority and nearly all opposed the proposal as described.

There were two main issues (with a number of sub-issues) of significance identified by the public submissions and the Authority in the assessment of the proposal.

- *The intrinsic value of the site as a representative wetland habitat for both flora and fauna.*

  The site is almost flat with a mosaic of wetland vegetation and the soils are predominantly clays associated with the Guildford Formation. Rainfall cannot drain from the virtually flat site nor can it permeate the clay soil. Consequently, the gently inclined site creates "perched" seasonal wetlands and a gradient of vegetation and habitat.

  There are at least seven complexes of vegetation on the site primarily related to the varying soil types and hydrological regimes. Despite the disturbed nature of part of the site, the area supports declared rare species associated with the wetlands, a high species diversity and notable species of fauna.

  The development proposal requires a sand pad fill of at least 0.6 metre to improve the site's foundation stability and drainage characteristics. This would result in the loss of vegetation on the site.

- *The long term integrity of the ecosystem.*

  As identified previously, the site lies between two conservation reserves (Figure 2). To the north-east there is an existing botany reserve (Yule Brook Reserve, M69). To the south lies an area that is a proposed reserve for the protection of flora and fauna (Lots 37 and 47). These two areas of remnant bush are both considered to be biologically important, especially in regard to their native flora.

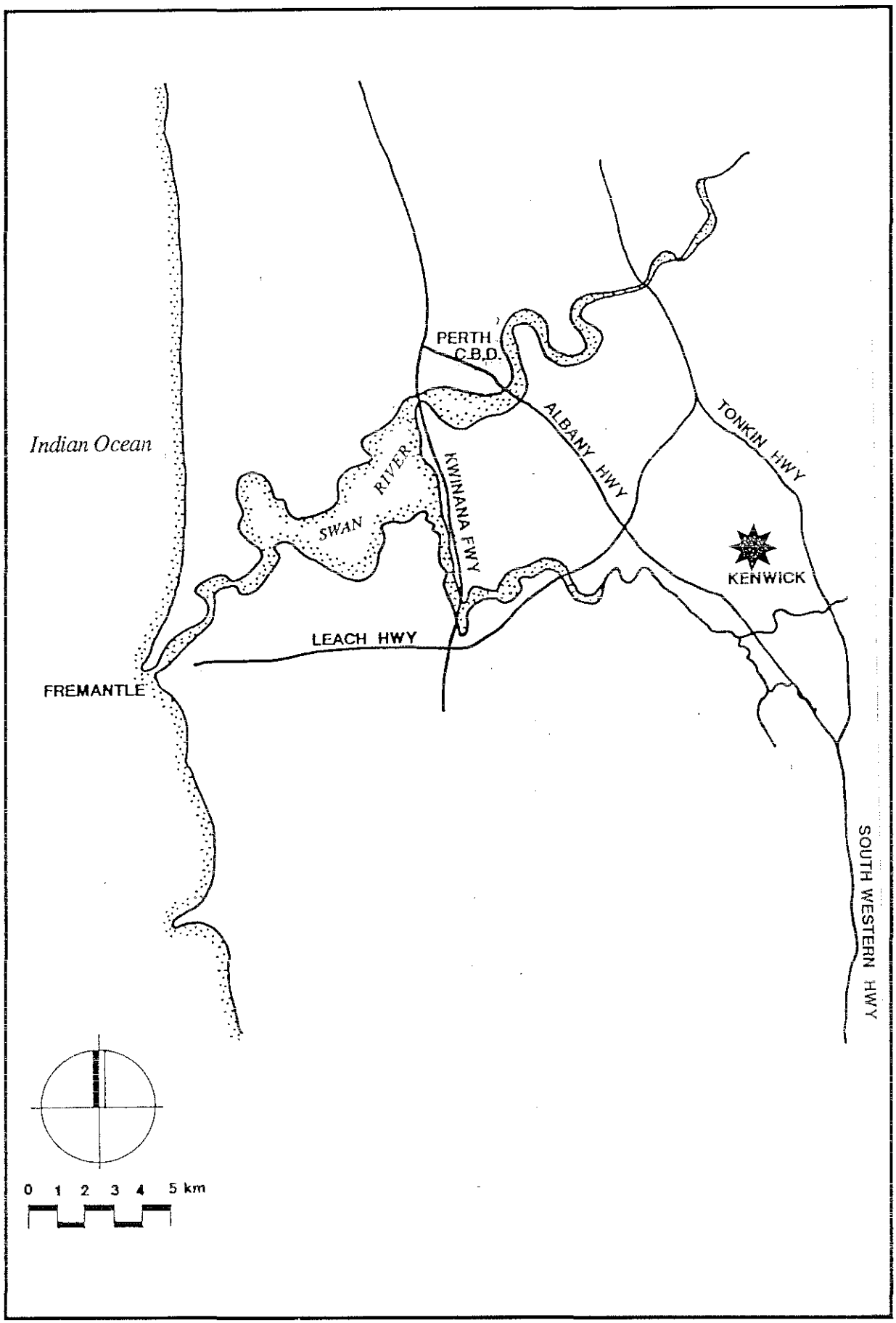

Figure 1. Locality map

The site's significant environmental value comes in part from its intermediate position between the highly valued adjacent reserves. The site enhances the biological values of the adjacent reserves, is a part of the vegetation "continuum" and links the reserves permitting fauna movement. The proposed development's potential impacts on the adjacent nature reserves are primarily associated with the impacts from hydrological changes and increased human pressures.

In its submission, the Department of Conservation and Land Management advised:

> "Lots 35 and 48 Brixton Street have conservation value due to the presence of the flora and fauna species detailed above, vegetation associations that are not well reserved on a regional basis, and their location as a corridor to link the prime conservation areas of Lots 37 and 47 Brixton Street, with the University of Western Australia "botany reserve".
>
> Urbanisation of Lots 35 and 48 is also considered likely to affect regional conservation values due to the increased urban pressure placed on existing conservation areas.
>
> This Department could undertake the management of Lots 35 and 48 in conjunction with Lots 37 and 47 Brixton Street, should it be decided that the area be reserved for conservation purposes."

The Department of Planning and Urban Development proposed that a portion of Lots 48 and 35 be developed and the remainder be set aside as a conservation reserve (Figure 2).

The Department of Planning and Urban Development stated:

> "The Department considers that such a proposal would have merit and need not adversely affect the housing subdivision. The Department would also be prepared to recommend acquisition of land beyond the normal open space provision and contributions towards fencing and other protective measures."

The partial development option would meet the environmental needs of the ecosystem by protecting the most valuable and least degraded areas of vegetation on the site and forming the "corridor" linking the proposed reserves. It would also meet the community needs by enabling some development of the land to proceed in conformity with government policies on urban consolidation.

From the issues raised in submissions, information in the Consultative Environmental Review and its own investigations, the Authority believes that the potential environmental impacts associated with the development are compatible with the maintenance of the conservation values of the area as long as an area of the site linking the existing reserves to the north-east and south is set aside for the purpose of conservation and the subdivision plans are revised to reflect this change. Therefore, subject to compliance with the recommendations listed below, the Authority considers that the environmental issues associated with the project are manageable, and recommends accordingly.

Recommendation 1

The Environmental Protection Authority has concluded that the proposed urban development on Lots 48 and Part Lot 35, Brixton Street, Kenwick is environmentally acceptable and should proceed subject to a representative portion of the site becoming a conservation reserve.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as:

- **the site itself;**
- **impacts on adjacent reserves; and**
- **linkage with adjacent reserves.**

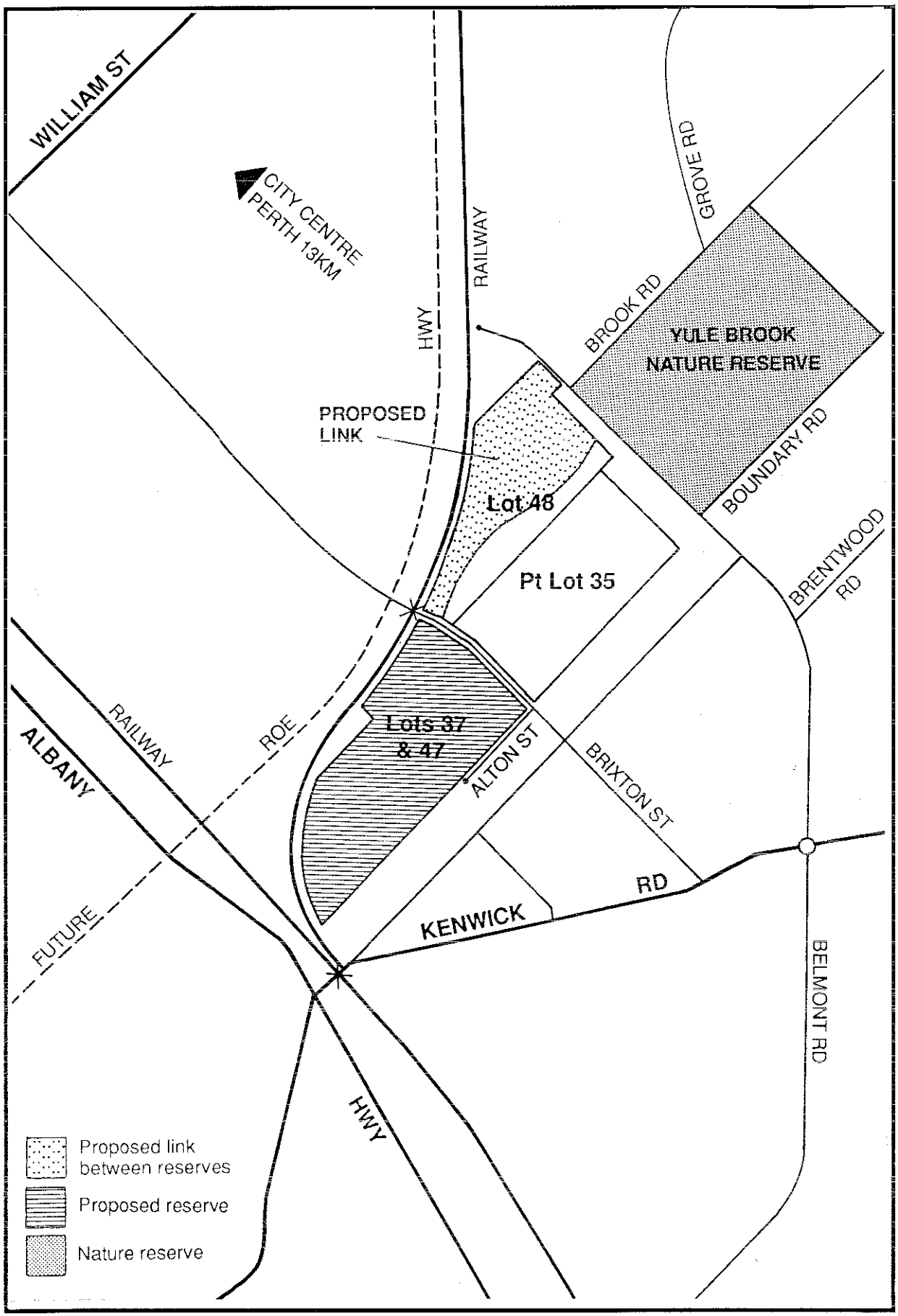

Figure 2. Adjacent reserve and proposed reserves map

The Department of Conservation and Land Management has indicated that with respect to the long term integrity of the adjacent reserve areas, and also with respect to the intrinsic value of the site as a representative wetland habitat for both flora and fauna, conservation of at least a portion of the site would be desirable. At a minimum, it is desirable to retain a corridor between the adjacent conservation reserves. By setting aside the most environmentally significant portion of the site, a representative sample of vegetation would be preserved. This would permit the integrity of the ecosystem to be maintained and movement of flora and fauna to occur between reserves.

Recommendation 2

The Environmental Protection Authority recommends that the most environmentally significant portion of Lots 48 and Part Lot 35 is set aside in order to retain native vegetation and to provide a vegetation continuum for the movement of flora and fauna between the adjacent nature reserves; accordingly, prior to subdivision, the proponent should revise the subdivision plans to include a reserve to meet the requirements of the Environmental Protection Authority on advice from the Department of Conservation and Land Management and the Department of Planning and Urban Development.

The wetlands on the System 6 reserve and the proposed reserve are dependent on rain water for their continued survival. Any alteration to the existing drainage pattern would jeopardise the rare wetland vegetation, Declared Rare Flora and the Priority Species. The proposed development's drainage management plan must cope with increased urban runoff and stormwater disposal and must not impact on reserves.

Recommendation 3

The Environmental Protection Authority recommends that, prior to subdivision, the proponent should design and implement a drainage management plan to minimise impacts on adjacent reserves and that prior to implementation, the management plan be submitted to the Environmental Protection Authority.

Whilst making these recommendations, it should be recognised that the Authority is not setting a precedent in terms of development on non-System 6 areas around the Brixton Street site, and any other proposals will be judged on their merits.

1. Project description and referral

St Joseph's Properties and Dudley & Dwyer Limited propose to develop Lot 48 and Part Lot 35 Brixton Street, Kenwick for residential housing. Lot 48 and Part Lot 35 comprise a total area of approximately 30 hectares and are located one kilometre north of Albany Highway, in the vicinity of the Kenwick passenger rail station, and approximately 14 kilometres south east of the Perth Central Business District (Figure 1).

St Joseph's Properties and Dudley & Dwyer Limited propose to construct a mixed residential development with property sizes ranging from individual group housing lots of 335m^2 to single residential lots of 750m^2.

Development would include the provision of normal services such as sewerage, water supply, power, telephone, stormwater drainage disposal, gas, roads, and street lighting. In addition, due to the ground condition and drainage problems, 0.6 metres of sand fill would be needed.

The usual requirement for 10% of the area to be given up for public open space would be incorporated into the development. A small neighbourhood shop is also proposed to cater for local convenience goods shopping.

Access to the development site would be from Brixton Street and Bickley Road.

Development of the site was referred to the Environmental Protection Authority by Gosnells City Council in 1991, due to concerns primarily related to the floristic value and strategic location of the site between a System 6 area and an area recently recommended for conservation by the Authority (Figure 2).

2. Background to the assessment

2.1 Planning context

In 1968, Lot 48 and Part Lot 35 were zoned 'urban' under the Metropolitan Regional Scheme. Since the land was zoned 'urban', the Perth metropolitan area has significantly expanded, most of the Pinjarra Plain has been cleared and remnant vegetation is poorly represented in the metropolitan area. The request for the City of Gosnells to update the local Town Planning Scheme by re-zoning Lot 48 and Part Lot 35 as 'urban' raised the issue of the lots' current environmental significance.

In 1987, the Department of Planning and Urban Development (formerly the State Planning Commission) released Policy DC1.6 titled "Development Near Metropolitan Railway Stations" that recommended increased housing densities in locations near railway stations in line with recent moves towards urban consolidation in existing urban areas.

Urban consolidation has many advantages including:

- reduced costs for the provision of infrastructure;
- environmental benefits in terms of reduced transport energy consumption and pollution through reduced commuter travel distances; and
- a reduction in the areal growth rate of the Perth metropolitan area.

As the proposed development site lies in the centre of one of the Perth Metropolitan Region's urban development corridors and is immediately to the east of the Perth-Armadale railway line, the majority of the site fits into this category. This fact has provided much of the impetus for development.

The Environmental Protection Authority supports the concept of urban consolidation and the increased use of public transport.

The Environmental Protection Authority's conservation efforts on the Swan Coastal Plain are based primarily on the 1983 System 6 study. This study identified 209 metropolitan and country areas of regional conservation significance and/or regional representation of biological and physical values on the Swan Coastal plain and made recommendations for their management.

The Authority believes the integrity of System 6 areas should not be compromised. Conversely, non-System 6 areas are generally not given the same level of protection.

This does not necessarily mean that all areas outside System 6 are not environmentally significant for any conservation values, but rather that decisions on the use of these areas should be the primary responsibility of the planning process, both at the State and local government authority level.

2.2 History of surrounding land

The proposed development site lies in an intermediate position between an existing and a proposed conservation area.

To the north-east of the site is "Yule Brook Botany Reserve", owned by the University of Western Australia since 1949. The 35 hectare reserve, used for teaching and research purposes, is also the subject of a System 6 recommendation (M69).

The 1983 System 6 report, or "Red Book" identified areas which are desirable for Regional Parks, Nature Reserves, National Parks, and major associated recreational areas. The System 6 region extends from Moore River to the north, to Blackwood River to the South, and east from the coast approximately 80 kilometres.

Red Book recommendation M69 recognised Yule Brook Botany Reserve's conservation significance which had increased significantly since the land was purchased by the University. The reserve's importance has increased even more since the recommendation was made as urbanisation has further reduced remnant vegetation, specifically wetland vegetation, in the metropolitan area.

To the south of the site are Lots 37 and 47 that have recently been recognised for their outstanding flora. These lots have Declared Rare Flora, Priority Species, rare co-occurrences, geographically restricted species and a diversity of floral species. This area was recently proposed for medium density housing development but, owing to its high conservation value, development was recommended against by the Environmental Protection Authority and the area is now a proposed conservation reserve.

A railway, a gas pipeline easement, and the Roe Highway alignment run along the site's western boundary (Lot 48). A vacant lot flanks the eastern side of the site (Part Lot 35).

3. Existing environment

3.1 Physical

The topography of Lot 48 and Part Lot 35 Brixton Street is generally flat, low lying and subject to waterlogging. Tracks and firebreaks surround and cross the site, and drainage channels run along two of the boundaries.

In geological terms, the area is on the eastern side of the Swan Coastal Plain on a fairly wide development of the Geomorphic Unit known as the Pinjarra Plain. The surface soils mainly consist of clayey sands while the subsurface conditions of the site reveal a variable profile mostly consisting of clays, sands, clayey sands and sandy clays.

The complex soil structure and impervious nature of the clays is responsible for the poorly drained soils. Much of the site is "wet" to some extent in winter, due to rain water becoming perched on the clay soils.

The hydrology of the region has been influenced by drainage works to permit access to and development of the area. Historically, drainage construction in the area has not significantly altered groundwater levels. Studies have shown groundwater and surface water on the site are not linked. The wet areas are surface features and rely on winter rainfall for their continued survival, not groundwater.

3.2 Biological

The value of the area for conservation rests primarily with its flora and its relative position to reserves containing outstanding flora. There were 48 species of exotic flora identified in a total of 212 species on the site.

The vegetation features include:

- three species of priority listed flora (priority listing for flora means that they are not Declared Rare Flora under the Wildlife Conservation Act but are sufficiently scarce to warrant further study and surveys);
- five other flora species of significance;
- 164 indigenous flora species. The site provides increased representation of scarce vegetation communities as almost half (73) of the native species identified on the site are common to the site and the adjacent reserves;
- the likely occurrence of *Calectasia grandiflora* on the site. If so, then it is the only other occurrence on the Swan Coastal Plain, with the adjacent Lots 37 and 47; and
- a diversity of flora species (212 vascular plants).

There are at least seven vegetation complexes on the site ranging from a low (0.5m), open community of sedges (*Leptocarpus* species) and samphires (*Halosarcia halocnemoides*), to dense thickets of *Melaleuca* species 3m in height. The majority of the site, however, supports various dense shrublands which rarely exceed 1.5m. The site occupies an intermediate position in the continuum of vegetation types across the area as a whole.

Disturbance of the vegetation on the site is most severe along the deeply incised tracks which also act as de facto drainage systems. This does not appear to have affected the adjacent vegetation. However, all the tracks are weed infested. The sedgelands and low shrublands on the western two thirds of the site are in a good condition (Lot 48), despite the weedy tracks and occasional bulbous species.

The site's primary difference from the adjacent reserves is due to its gently sloped land that presents a unique set of niches for plant growth and consequently the site has a different range of species and habitats. For example, the 'swamp of form' of *Eremophila glabra* occurring on lots 35 and 48 is not found in other reserves.

The vegetation surrounding the wetlands is also important as a habitat for wildlife, including reptiles, invertebrates, amphibians, bush birds and small mammals. The specific species of note are the gazetted rare and endangered Southern Brown Bandicoot and the protected Jewel Beetle.

The site supports a small but apparently viable population of the Southern Brown Bandicoot. Bandicoots are also represented on the adjacent conservation areas and there is a possibility that at present the three sites are functioning effectively as one habitat despite the roads acting as barriers. Although opportunistic and capable of inhabiting areas with disturbed vegetation, the bandicoot population in the metropolitan region is thought to be rapidly diminishing as urbanisation destroys its habitat.

The site provides a potential vegetation "corridor" for movement of flora and fauna between the adjacent conservation areas.

3.3 Other

3.3.1 Social

Currently, the site is not used permanently. Apart from a network of tracks which are presumably part of a firebreak system there is no development on the site. The site is used, however, on a temporary basis for horse agistment, cycling or playing by children, trail bike riding and dumping of garden refuse.

The site is not known to have any cultural significance of Aboriginal or European cultures.

3.3.2 Traffic

Brixton Street crosses the railway and provides an important link between Brixton, Kenwick and the Albany Highway.

A proposal to build a flyover at the intersection of Brixton Street and the future Roe Highway is currently being assessed by the Environmental Protection Authority.

3.3.3 Noise

The site has a standard gauge railway line along its western boundary and the Perth-Armadale railway line to the South. The future Roe Freeway will be built to the west of the site. The site is also within the Australian Noise Exposure Forecast (ANEF) 20 contour for the Perth Airport. Noise levels associated with these issues are acceptable.

4. Submissions received

4.1 Public submissions

Comments were sought on the proposal from the public, community groups and local and State Government authorities. The Consultative Environmental Review document prepared by the consultants for St Joseph's Properties and Dudley & Dwyer Limited was available for public comment for a period of 4 weeks between 7 January 1992 and on 4 February 1992.

There were 33 public submissions received which raised numerous issues, the general issues of concern included:

- what are the alternatives to the proposal;
- protection of the ecosystem;
- protection of fauna;
- protection of flora;
- impacts of development on the hydrology;
- future management of the area; and
- inconsistencies with established environmental policies.

By far the most frequently raised issue in submissions was that of the importance of the site as a vegetation link between the existing System 6 area and a proposed nature reserve over Lots 37 and 47. Many submissions supported the reservation of all the site and questioned whether a land swap between the Department of Conservation and Land Management and the proponent could achieve this aim. There was a strong preference expressed for the site to be managed in conjunction with the adjacent reserves as one reserve of approximately 100 hectares, so that the ecosystem could be managed in a coordinated manner.

From the submissions received, a list of questions and issues was compiled and sent to the proponent (Appendix 1). The proponent's response is given in Appendix 2.

The Authority has included consideration of the submissions received as part of the assessment process.

4.2 Government submissions

The advice of the Department of Conservation and Land Management and the Department of Planning and Urban Development provided information used during the project assessment and it is felt a separate discussion of these submissions is warranted.

The Department of Conservation and Land Management stated:

> "Lots 35 and 48 Brixton Street have conservation value due to the presence of the flora and fauna species detailed above, vegetation associations that are not well reserved on a regional basis, and their location as a corridor to link the prime conservation areas of Lots 37 and 47 Brixton Street, with the University of Western Australia "botany reserve".
>
> Urbanisation of Lots 35 and 48 is also considered likely to affect regional conservation values due to the increased urban pressure placed on existing conservation areas.
>
> This Department could undertake the management of Lots 35 and 48 in conjunction with Lots 37 and 47 Brixton Street, should it be decided that the area be reserved for conservation purposes."

A copy of the Department of Conservation and Land Management's full submission is attached as Appendix 3.

The Department of Planning and Urban Development indicated that Lot 48 and Part Lot 35 lie in the centre of one of the Perth Metropolitan Region's urban development corridors, are immediately to the east of the Perth-Armadale railway line and form a "pocket" of land capable of residential development. Development in this area could provide urban consolidation in existing urban areas.

The Department of Planning and Urban Development acknowledges the site's environmental significance and development potential and has proposed a partial development solution (Figure 3). In its submission, the Department offered the following advice:

> "Accordingly the Department is not prepared to recommend reservation and acquire all of the site comprising Lot 48 and part Lot 35 Brixton Street, Kenwick. The Department, would, however, be prepared to recommend protecting some key areas of the site as part of the planning for the housing development. Subject to detailed planning, the Department believes the area shown on the attached map could be protected through a combination of local open space provision and reservation and acquisition, for use as a "local conservation area." This would:-
>
> - protect the better samples of five of the seven vegetation types in the Consultative Environmental Review.
> - provide a buffer between housing and the railway, gas pipeline and Roe Highway;
> - integrate drainage design to afford protection to the open space;
> - provide physical access and a degree of landscape continuity between Lots 37 and 47 Brixton Street and M69, and thence areas to the North East, whilst acknowledging their ecological continuity, would be minimal, as stated in the Consultative Environmental Review;
> - require redesign of part of the subdivision; and
> - cause some extra unit servicing costs to the subdivision.

The Department considers that such a proposal would have merit and need not adversely affect the housing subdivision. The Department would also be prepared to recommend acquisition of land beyond the normal open space provision and contributions towards fencing and other protective measures."

5. Environmental impacts and their management

5.1 General

Following consideration of the Consultative Environmental Review, submissions from the public and Government agencies, the proponent's response to them, and the recent decision on adjacent Lots 37 and 47, the Authority believes that the potential environmental impacts are compatible with the maintenance of the conservation values of the area as long as an area of the site is set aside for the purpose of conservation reserve and the subdivision plans are revised to reflect this change.

The partial development proposal put forward by the Department of Planning and Urban Development would meet the environmental needs of the ecosystem by protecting the most valuable and least degraded areas of vegetation on the site and forming the necessary corridor linking the proposed reserves. It would also meet the community needs by enabling some development of the land to proceed in conformity with government policies on urban consolidation.

Recommendation 1

The Environmental Protection Authority has concluded that the proposed urban development on Lots 48 and Part Lot 35, Brixton Street, Kenwick is environmentally acceptable and should proceed subject to a representative portion of the site becoming a conservation reserve.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as:

- **the site itself;**
- **impacts on adjacent reserves; and**
- **linkage with adjacent reserves.**

5.2 Environmental values of the site

In a regional context, the habitats typical of the Pinjarra Plain geomorphic unit are becoming increasingly scarce, and this is particularly so for the ephemeral wetland communities represented on this site and on the adjacent reserves.

In a local context, the primary environmental values of Lot 48 and Part Lot 35 include the site's:

- species composition of flora and fauna;
- role as a vegetation "continuum" between the adjacent reserves; and
- impacts on management of adjacent reserves.

5.2.1 Species composition of flora and fauna

Lot 48 and Part Lot 35's specific vegetation characteristics differ from the reserves on either side and form a continuum in type with representatives of species not found in these other areas. Despite the disturbed nature of part of the site, the areas is still floristically diverse.

Priority List species (two of very limited distributions and another which is poorly known), increase the value of the site floristically.

The sedgelands and low shrublands on the western two thirds of the site (Lot 48) are in a good condition, despite the weedy tracks.

Should development of the site proceed, these species and habitat would be removed from the site and no techniques or programs are know to minimise or negate the impact of development.

The impact of development on fauna, especially the gazetted species of Southern Brown Bandicoot, and its various habitats is also of concern.

5.2.2 Role as a vegetation "continuum" between the adjacent reserves

The impact of development on the flora in general and on particular species and habitats, would be primarily because of the loss of the vegetation continuum. The site may provide a function with respect to the movement of the rare fauna species. It represents a significant patch of remnant bushland providing resources for a wide range of fauna. In addition to the Southern Brown Bandicoot many other vertebrates inhabit the area.

The proposed development would destroy the habitat link between the reserves. Bandicoots on the adjacent reserves, which are thought to be using the three sites despite the roads acting as barriers, would become isolated communities. The Bandicoot population of the area as a whole would certainly decrease both as a direct result of clearing Lots 35 and 48, and/or indirectly due to aggressive competition between animals displaced to adjacent areas.

During development of the site these species and habitat would be removed from the site.

5.2.3 Impacts on management of adjacent reserves

The proposed development's potential impacts on the Yule Brook Botany Reserve and the proposed reserve on Lots 37 and 47 are of concern. The wetlands on the System 6 reserve and the proposed reserve are dependent on rain water for their continued survival. Any alteration to the existing drainage pattern would jeopardise the rare wetland vegetation, Declared Rare Flora and the Priority Species. Of specific concern are the potential impacts of increased human pressures and altered drainage on the ecosystem's integrity.

Nearby urban development presumably has already impacted flora and fauna on the adjacent reserves. Fences discourage people entering the reserves but are ineffective in keeping out domesticated predators such as cats and dogs.

The risk of introduced flora and fauna species, predation by domesticated animals, urban runoff, vandalism and fire would increase with further urban development. These impacts are of particular concern given the development proposal's central location with respect to the two reserves.

5.2.4 Summary

For these reasons, the Authority believes that a corridor, covering the best of the representative vegetation should be retained between the two existing reserves.

The partial development proposal put forward by the Department of Planning and Urban Development has been assessed and it is agreed that an area such as this would:

- maintain the vegetation link and enhance the long-term integrity of the ecosystem;
- protect the better samples of the vegetation types on the site;
- preserve habitat for the gazetted fauna;
- meet urban consolidation goals.

The development proposal requires revision in order to incorporate the recommended reserve. The reserve area, access to the housing development, and the housing layout would need to be reconsidered.

Therefore, subject to compliance with the recommendations listed below, the Authority considers that the environmental issues associated with the project are manageable and recommends accordingly.

Recommendation 2

The Environmental Protection Authority recommends that the most environmentally significant portion of Lots 48 and Part Lot 35 is set aside in order to retain native vegetation and to provide a vegetation continuum for the movement of flora and fauna between the adjacent nature reserves; accordingly, prior to subdivision, the proponent should revise the subdivision plans to include a reserve to meet the requirements of the Environmental Protection Authority on advice from the Department of Conservation and Land Management and the Department of Planning and Urban Development.

5.3 Drainage

Disruption of the hydrological scheme also potentially affects the wetlands on the adjacent reserves. Potential drainage impacts from the proposed development include the effects of accelerated surface water drainage on wetland species, surface soil salinity, and weed invasion within the adjacent reserves.

Hydrological studies indicate the wetlands in the area depend on rainfall for their continued existence. Therefore the effect of the proposed development on the hydrology of adjacent nature reserves would be insignificant provided appropriate drainage management plans were in place.

The proponent would undertake the following measures in order to minimise hydrological impacts:

- subdivisional works for the area would include the shaping of clay such that runoff is directed to the site drainage system and/or the roads;
- sand would be placed on top of the shaped clay to facilitate site drainage and building;
- subsoil drainage would be provided at approximately the sand/clay interface; and
- runoff from the site flows away from urban (M69) and would go into the piped drainage system.

Recommendation 3

The Environmental Protection Authority recommends that, prior to subdivision, the proponent should design and implement a drainage management plan to minimise impacts on adjacent reserves and that prior to implementation, the management plan should be submitted to the Environmental Protection Authority.

5.4 Other impacts

There are other issues affecting the development and a brief discussion of these is given below.

5.4.1 Traffic

A proposal to build a flyover at the intersection of Brixton Street and the future Roe Highway is currently being assessed by the Environmental Protection Authority.

5.4.2 Noise

The site has a standard gauge railway line along its western boundary and the Perth-Armadale railway line to the South. The future Roe Freeway will be built to the west of the site. The design of the urban development on the site, and to some extent the proposed reserve, could be used to reduce potential noise levels affecting the subdivision.

The 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 Authority believes that such non-substantial changes, and especially those which improve environmental performance and protection, should be provided for.

The 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 Authority.

6. References

Regional Parks A New Approach to Nature Conservation in Urban Areas. A Discussion paper Prepared by The Conservation Council of Western Australia, November 1990. (as part of Beeliar Regional Park).

Hames Sharley Australia, 1991 "Consultative Environmental Review - Glenhaven Estate Lot 48 and Part Lot 35 Brixton Street, Kenwick, City of Gosnells", Perth WA.

Appendix 1

Summary of submissions

PROPOSED URBAN DEVELOPMENT OF LOTS 35 AND 48, BRIXTON STREET, KENWICK, CITY OF GOSNELLS (ASSESSMENT 633)

The following is a list of concerns/questions that have been compiled from submissions received from various individuals, organisations and Government Authorities. It would be appreciated if responses to the concerns/questions could be forwarded to the Authority as soon as possible. The items and St Joseph Properties/Dudley & Dwyer Limited's response will be reproduced in the Authority's report to the Hon Minister for the Environment on the project.

1 ALTERNATIVES

1.1 No development should be allowed on the site. The Government should exchange the land, or purchase, it in order to manage the area as a conservation reserve and thereby integrate the Yule Brook Botany Reserve (M69) to the north and proposed nature reserve, Lots 37 and 47, to the south.

1.2 Partial development should proceed on the site. The Government should acquire the most environmentally significant portion of the site for the purpose of a conservation reserve. This option would meet the environmental needs of protecting the site's vegetation and fauna and of providing a corridor and habitat for rare and endangered fauna on the site and on the adjacent reserves. The partial development option would also permit residential development to occur in one of the Perth Metropolitan Region's urban development corridors.

2 ECOSYSTEM CONCERNS

2.1 The remnant habitat of this type is now extremely rare and not well represented in reserves. Less than 3% of this type of landform, Ridgehill Shelf Formation, remains uncleared. It is extremely important that Lot 48 and Part Lot 35 Brixton Street be preserved as a representative of this particular type of ecosystem.

2.2 The proposal would disrupt the ecological continuum and destroy a corridor for flora and fauna movement between the two adjacent nature reserves.

2.3 The proposed development would increase human impact on the adjacent nature reserves. Damage to flora resulting from pedestrian traffic, domestic animal and weed invasion, urban runoff, bush fires, vandalism, rubbish dumping would increase.

3 SPECIFIC FAUNA CONCERNS

3.1 The proposed development site supports rare and endangered species. The Jewel Beetle and the Southern Brown Bandicoot are known to inhabit the site and the Echidna is a suspected resident. What is the proponent's fauna management plan?

3.2 Whilst there may only be 1-11 Bandicoots on the subject land , it is not known what use the adjacent populations make of this land. To remove the central portion of their habitat will isolate the populations in the neighbouring reserves and significantly reduce their chances of survival.

3.3 In addition to the rare and endangered species, there is an abundance of bird species including uncommon species found on the site.

4 SPECIFIC FLORA CONCERNS

4.1 The site is important as it supports a great diversity of flora and contains rare and priority listed flora. A brief survey showed there are 163 species of native flora, including two that are priority listed. A more in-depth survey would probably reveal more significant and complete results.

4.2 To conserve threatened or gazetted fauna species their habitat must first be protected. For example, the Jewel Beetle is species specific to vegetation type in its feeding and breeding patterns. Some of the vegetation on the site is an extremely important food source for the Jewel Beetle. and, due to urban development, has become very scarce in the metropolitan region.

5 HYDROLOGY

5.1 The hydrological regime of the site has not been adequately studied as the CER only refers to a study of a nearby site. There has been no on-site hydrological study of the proposed development site. The areas have different geology and vegetation characteristics.

Further studies are required to more precisely determine the effect of the proposed development on the area's water balance and its subsequent effect on flora and fauna. These studies should investigate the impacts of the proposed development on the proposed site and on the adjacent conservation reserves.

5.2 What are the details of the drainage plans that are proposed to control impacts on nearby wetlands and stormwater disposal?

6 FUTURE MANAGEMENT

6.1 The proposal does not acknowledge the need for buffer zones needed to minimise impact on the adjacent reserves and wetlands (5-0-100 metre minimum, buffers on wetlands).

6.2 To protect the two adjoining reserves, the proponent should establish vegetation buffers, fencing and a corridor that links the existing reserves. What are the proponent's detailed plans for these protective measures?

7 OTHER

7.1 The proposed development site is similar to the adjacent Homewest site that was recently deemed inappropriate for development, given its high conservation value. The same rationale should prevail.

7.2 The development is inconsistent with the Environmental Protection Authority's Wetland Environmental Protection Policy as the policy protects wetlands from being filled or drained.

7.3 Wetlands on the site are classified as "H - high conservation according to the Environmental Protection Authority's Bulletin 374. This indicates the area should be given highest priority for establishment and implementation as a regional park wetland. It should not be developed.

7.4 The concept of urban consolidation and higher density development is supported but should be done on land that is already cleared, not on remnant vegetation.

Appendix 2

Proponent's response to submissions

The following are Dudley and Dwyer Ltd and St Joseph Properties Pty Ltd responses to the list of concerns compiled by the Environmental Protection Authority from public submissions. The responses have been dealt with by category of subject in the same manner as presented.

1.0 ALTERNATIVES

1.1 The conservation or no development scenario was addressed in Section 6.0 of the Consultative Environmental Review . This scenario requires interest from the Department responsible for the purchase and future long term management of the site

1.2 The possibility of partial development was addressed in Section 3.7 concluding that the undeveloped portion of the site would be unsustainable as a viable ecosystem.

2.0 ECONOSYSTEM CONCERNS

2.1 Please note the site is not part of the Ridge Hill Shelf Geomorphic Unit (Refer to Section 4.1.2 of Consultative Environmental Review).

Matters of habitat type and distribution were covered in Section 4.2.1, 4.2.3 and 4.2.5.

2.2 The term *'continuum'* was used in the description of the vegetation of the site in a purely *DESCRIPTIVE* sense. The functional aspect of a spatial continuum from a biological point of view can only be speculated in this case. This also holds for all questions of Bandicoot and other animal movement and for the hydrological regime.

2.3 The integrity of the existing reserves is to be protected through the management recommendations given in the *System 6 Report and Bulletin number 577 (September 1992)* as applied to Yule Brook Reserve and the Homeswest site respectively.

The numerous problems associated with managing small areas of bush within the urban environment are illustrated by several authors in *"The Management of Small Bush Areas in the Perth Metropolitan Region." Seminar Proceedings Department of Fisheries and Wildlife 1984 (Susan A Moore).*

These include:

- *Fuel reduction and fire management*
- *Weed control*
- *Regulation of Public access and control of inappropriate uses, eg. trail bikes, horses, dumping of rubbish.*

- *Eutrophication of ground and surface waters.*
- *Maintenance of groundwater regimes.*
- *Pollution of ground and surface waters.*
- *Feral animals.*

Presumably management methods, including the use of fencing respective sites, should preclude indiscriminate access by pedestrians and vehicles therefore preventing damage to the flora and fauna.

Similarly feral animals will be excluded from these sites by fencing. Fencing will also reduce the likelihood of fire risk and rubbish dumping to the extent that people will not be able to enter the sites. Presumably fire breaks will also be employed.

It is understood that, no matter what precautions are taken, urbanisation is likely to increase the management difficultues of urban reserves. This is evident by both the Yule Brook Reserve, and the Homeswest site where motor vehicle dumping, rubbish dumping, weed infestation, potential pollution by septic tanks and alternation of water levels has or may have occured.

3.0 SPECIFIC FAUNA CONCERNS

3.1 Environmental Management plans are presented for both options in Section 6. Consultation with CALM could be undertaken on the consideration of possible relocation of resident populations if appropriate.

However, in respect to the Bandicoot population, Appendix 4.2 outlines the little that is known about their characteristic; this includes their mobility, particularly seasonal. More than likely, individuals on site defend a territory and do not generally interact with individuals on the other 2 sites.

Partial development of the site, perhaps in the form of a corridor as suggested elsewhere, may not provide a wide enough variety of habitat of benefit to the Bandicoots.

Assuming that the *"corridor"* access on the site mentioned in the responses to the Consultative Environment Review is meant to apply to the movement of fauna (including Bandicoots) the following points are relevant:

- *In order to stop all the inappropriate activities (see 2.3 above) the corridor would have to be fenced and fencing of the adjoining reserves will also probably be upgraded in the future thus movement of ground fauna will be restricted to some extent.*

- *The adjoining roads already provide barriers to movement, through the extent of this function is not known, (this doesn't apply to the arifauna of course).*

- *With reference to the Bandicoot - the lack of behavioural, feeding, population information for the species precludes making any predictions on its use of such a corridor.*

- *Lack of definitive knowledge regarding resident and migratory fauna, which presently may make use of the site, makes specific determination of the size of a supposedly viable corridor difficult.*

Please refer to Point 4.2 below for comments relating to Jewel Beetle.

3.2 Refer to Section 4.2.4 and Attachment 4.2 of Consultative Environmental Review and Point 3.1 above. From what is known, the bandicoots in adjacent areas would probably not be affected by development.

3.3 This statement is difficult to respond to other than by reference to Section 4.2.4 and Attachment 4.2 of the Consultative Environmental Review.

4.0 SPECIFIC FLORA CONCERNS

4.1 The Consultative Environmental Review level of assessment determined for the site is thought to be appropriate for the matters of concern as detailed in Attachment 4.2

4.2 The Jewel Beetle is specific in its preference for food plant. However, even with full development all of their habitat types will be present in adjacent areas.

5.0 HYDROLOGY

This statement is inaccurate, 2 site specific hydrological studies were undertaken (although perhaps not adequately reference) and are contained in Sections 4.1.3 and 4.1.4. They are:

- *Wood and Grieve Engineers:*
  Servicing Lots 48 and Pt Lot 35,
  Brixton Street, Kenwick
  (22 September 1989, ref: 117882).

- *Coffee and Partners:*
  Proposed Residential Subdivision,
  Brixton Street, Beckenham
  (March 1988, ref P173/1-AA).

5.2 *Surface Treatment*

- *Subdivisional works for Lots 35 and 48 will include the shaping of clay such that runoff is directed to the drainage system and/or the roads.*

- *On top of the shaped clay 600 mm of sand is placed to facilitate site drainage and building.*

- *At approximately the sand/clay interface, subsoil drainage adjacent to the roads if provided.*

- *The above treatment is in accordance with current Council requirements in this area.*

Internal Drainage System

- *All lots are provided with a drainage connections point, which in turn connects into the overall piped drainage system.*

- *The piped drainage system drains the roads and lots and carries the runoff to a compensating basin the south-western corner of the site.*

- *Discharge from the compensating basin is controlled to such a level that the peak flow is similar to that prior to development.*

- *In the short term the compensating basic discharge is directed into the existing open drain alongside Brixton Street. This drain carries the flow to Yule Brook.*

Long Term Solution

- *The Water Authority of Western Australia wishes to minimise flow to the Yule Brook due to a need to flood protect downstream reaches.*

- *In the longer term, the Water Authority of Western Australian plans to construct an open drawn from Bickley Brook up along Alton Street within an existing drainage reserve to Brixton Street. At this stage flow from the compensating basin will be redirected to this Alton Street drain.*

Surface Runoff

- *The conservation area is downstream of Lots 35 and 48. Currently no runoff from Lots 35 and 48 gets through to the conservation area because of the existing open drain alongside Brixton Street as well as the existence of Brixton Street itself.*

- *Following development the situation will be the same. No surface runoff will find its way to the conservation area as it will discharge into thee existing open drain in Brixton Street, or in the future the open drain alongside Alton Street. As such, no surface runoff effects occur on the conservation area due to the drainage of Lots 35 and 48.*

6.0 FUTURE MANAGEMENT

6.1 Protection of Reserves (Issue 4)

Protection of the Yule Brook Reserve (Kenwick Swamp) has been ensured to the satisfaction of the owners - the University of Western Australia - by the provision of reticulated sewer mains to the proposed development, appropriate drainage design and fencing between the site and adjacent Part Lots 77 and 78 Bickley Road. The proponents had previously undertaken to achieve these measures, in correspondence with the University of Western Australia in July 1991, as part of the rezoning and subdivision approvals pursuant to the Planning Act (1978) amended. Furthermore, Part Lots 77 and 78 act as buffers between the site and the main parcel of Yule Brook Reserve, being Lots 9 and 16.

With respect to the proposed Reserve on the Homewest site the subject site is separated by Brixton Street which , in this location is higher than ground level. This directs existing drainage to the calverts beneath the rail.

6.2 Refer to points 2.3 and 3.1 above.

7.0 OTHER

7.1 The Homewest site is similar but not the same with the major difference being the absence of declared rare flora on the subject site.

It was established in the Consultative Environmental Review that the site is of value to the community both in terms of its potential as a housing development and in terms of its conservation potential. These land use

options and their potential impacts were comprehensively addressed in Sections 3.0 and 6.0 of the Consultative Environmental Review.

To argue that the site is more important as a nature reserve is an incomplete appraisal of the situation.

The benefits to the community at large should be also viewed in terms of potential gains achieved through urban consolidation as opposed to further urban sprawl on the fringes. Continuous urban approval has environmental disadvantages of:

- *Greater consumption of fossil fuels due to further distances travelled; and,*

- *Potential erosion of possibly more pristine conservation reserves on the urban fringe.*

These aspects are significant environmental matters for consideration under the definition of *'environment'* in the Environment Protection Act 1986.

It is our contention that the environment quality of the site must be weighted against overall community benefit of the development scenario.

7.2 The subject site is not recognised by the Environmental Protection Authority in the *Environment Protection (Swan Coastal Plan Wetlands) Policy 1991* as being worthy of protection.

7.3 This is an inaccurate statement. The graph in Bulletin 374 does not indicate a Category H for seasonal and episodic wetlands with poorly defined boundaries.

7.4 On two occasions the site and its remnant vegetation characteristics have been reported as insignificant by CALM. Refer to attached CALM Letters of 17 February 1987 and 26 February 1990. The quality of the site must also be weighted against the advantages to the community of the development scenario.

Appendix 3

The Department of Conservation and Land Management's submission

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

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The Chairman
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38 Mounts Bay Road
PERTH WA 6000

ENVIRONMENTAL PROTECTION AUTHORITY
19 FEB 1992
File No. 1P 41.78 Initials BCU

Attention : B Cugley

REZONING AND SUBDIVISION OF LOTS 35 AND 48 BRIXTON STREET, KENWICK (633)

I refer to your letter of 3 January 1992, regarding the above proposal. This Department has examined the CER document and offers the following comments. These comments may be utilised by your Authority in the assessment report.

In section 4.2.1. of the CER it is pointed out that in 1987 this Department provided advice to the proponents that the site did not have the same level of conservation potential as the adjoining sites, namely Lots 37 and 47 Brixton Street, and the University of Western Australia "botany reserve". Since then the circumstances pertaining to this site have changed with the recent decision not to develop Lots 37 and 47 Brixton Street, and to reserve these Lots for conservation purposes.

As expressed in the CER, Lots 35 and 48 now occupy a strategic location, both in terms of the vegetation associations and the linkage between Lots 37 and 47, and the University land. The site has been shown in the CER to have some intrinsic conservation values. Furthermore, the site cannot be assessed in isolation from its regional context.

Assessment of Lots 35 and 48 can be based on three aspects: the intrinsic value of the area itself; the linkage it provides (along with part Lots 77 and 78) between the conservation areas on either side; and the impact that urban development in this area would have on the adjoining conservation areas.

The intrinsic values of Lots 35 and 48 are:

- the occurrence of populations of specific notable species of flora and fauna, namely the Southern Brown Bandicoot, the three species of priority flora, and the five other flora species of significance;
- the vegetation communities that provide increased representation of communities found on Lots 37 and 47 and the University land; and
- the wetland areas.

The population of Southern Brown Bandicoot is regarded (Section 4.2.4.) as being viable. It would appear however from the results expressed (between 1 and 11 individuals) that the population has been able to persist, rather than being viable in isolation. The relationship of this area to the adjacent land is thus probably of

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significance as either a corridor link, or an expansion of the area available for the total population of the region.

The significant flora present in Lots 35 and 48 are also present on either of the adjacent areas, with the exception of the 'swamp form' of *Eremophila glabra*.

The significant flora of the site are:

Grevillea thelemanniana* subsp *thelemanniana (Priority 1 species)

This taxon is only known from the Kenwick and Forrestdale areas, and is not known from any conservation reserves, although it is present on the University land (about half (300) of the known plants). This taxon is uncommon and at risk.

Eryngium pinnatifida* subsp *'palustris' (Priority 1 species)

Found also on Lots 37/47 and a degraded rail reserve north of Serpentine.

Gonocarpus pithyoides (Priority 3 species)

Occurs on the coastal plain where it has been recorded over a 280km range from Forrestdale and Jandakot north to the Arrowsmith River. Although a relatively widespread species, it is not recorded from any existing conservation reserves in the metropolitan area, although it is on Lots 37/47 and a large (400) population is on the University land.

Banksia telmatiaea

Has a limited distribution in the metropolitan area. Also present on the University land.

Anigozanthos x bicolor

Also present on Lots 37/47, such hybrids are not common.

Calectasia grandiflora

If this does turn out to be this taxon, then it is the only other occurrence, with Lots 37/47, on the Swan Coastal Plain.

Grevillea bipinnatifida

This species is normally associated with the lateritic or granitic soils of the northern jarrah forest and Darling Scarp. It is also present on Lots 37/47.

Eremophila glabra (swamp form)

This form of this species is poorly known. It is a taxon of restricted distribution, being confined to the eastern coastal plain. It is currently not known from any conservation reserve, although it is found on a proposed development site in Forrestdale that is currently under assessment for planning amendment. Further information on the species is contained in the attached extract from "Flora of the Perth Region".

The vegetation associated within Lots 35 and 48, while not appearing to be unique to the area (including Lots 37 and 47 and the University land), does add to the representation that may be reserved. In particular this relates to the less disturbed section, being mainly Lot 48.

The reservation of Lot 48 would protect the *Leptocarpus* flats, *Hypocalymma/Verticordia* low shrubland, *Viminaria* tall shrubland, and mixed low shrubland. The *Melaleuca* shrubland is only represented in Lot 48 in the northern corner, and would thus not be well represented by the reservation of this Lot only.

The *Pericalymma* low shrubland is mentioned as having the potential to be *Diuris purdiei* habitat, but this community is largely restricted to Lots 77 and 106, and is thus outside the current proposal. Similarly the *Eremaea* low shrubland is predominantly in these locations. Hence when considering the reservation of community types and potential rare flora habitat, the future use of Lots 77 and 106 will also need to be taken into account.

While it can be seen, and is acknowledged in the CER, that the area has some intrinsic conservation value, the main conservation value of the area is in providing a linkage between the adjacent areas for fauna movement (especially Southern Brown Bandicoot), and providing the opportunity to form a larger, more consolidated conservation reserve including Lots 37/47 and the University land.

It can be argued that this value can be accommodated by the reservation of only Lot 48, as this is less disturbed, it incorporates most of the vegetation types, and creates the corridor. Section 3.7 of the CER however states that "Partial development of the site ... would render the undeveloped portion ... unsustainable as a viable ecosystem in the long term".

Similarly, consideration will need to be given to the future of the adjacent Lots 77, 78 and 106 which are relatively undisturbed, contain vegetation types worthy of reservation, and would provide for an effective linkage between the University land and Lots 37 and 47. If these Lots are to be considered for reservation, then the enclosed Lot 35 would logically need to be included in the reserve, and rehabilitated.

At section 4.2.5 of CER is the statement: "Urbanisation of the site would also increase the pressures on the adjacent reserve areas from human interference and hydrological effects". This Department agrees with this comment, and make the point that the long term protection of the unique sites at Lots 37/47 Brixton Street and the University land can best be protected by the reservation of this area, and the resulting lower level of local urbanisation.

Increased urbanisation in this area will also increase the justification for the proposed Brixton Street flyover. Should this flyover proceed, then the impact on the conservation values of this region will be felt by the loss of part of Lots 37/47 Brixton Street, including some of the wetlands, and also the barrier that will be created to land fauna movements. It may, however, be possible to reduce the impact of any future flyover by incorporating tunnels/fauna corridors in the roadworks.

Conclusion

Lots 35 and 48 Brixton Street have conservation value due to the presence of the flora and fauna species detailed above, vegetation associations that are not well reserved on a regional basis, and their location as a corridor to link the prime conservation areas of Lots 37 and 47 Brixton Street, with the University of Western Australia "botany reserve".

Urbanisation of Lots 35 and 48 is also considered likely to affect regional conservation values due to the increased urban pressure placed on existing conservation areas.

This Department could undertake the management of Lots 35 and 48 in conjunction with Lots 37 and 47 Brixton Street, should it be decided that the area be reserved for conservation purposes.

The acquisition of this area if required (Section 6.2.2 of the CER), would however need to be assessed in relation to State priorities and the requirements of the proponents. Cost of acquisition would be high and beyond CALM's available land acquisition budget. CALM would look to the involvement of DPUD in any acquisition and the use of funds available in the Metropolitan Region Improvement Fund, administered by that Department.

Syd Shea
EXECUTIVE DIRECTOR

14 February 1992

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the apex, ribbed or rarely winged. 170 species, confined to the Australian mainland and concentrated in W.A., over 125 species occurring in W.A.

1. Leaves sessile, broadly ovate. Corolla white to lilac, 8-10 mm long..... **E. brevifolia**
1. Leaves petiolate, obovate. Corolla red to yellow or green, 16-30 mm long..... **E. glabra**

E. brevifolia (A. DC.) F. Muell.

Erect shrub, up to 2 m high, glabrous. Leaves alternate, sessile and somewhat stem-clasping, broadly ovate, usually 3-6 x 2.5-5 mm, obtuse, entire or coarsely toothed. Flowers 1 or rarely 2 per leaf axil, very shortly pedicellate. Sepals narrowly oblong to narrowly triangular, ca 4 mm long, acute. Corolla 2-lipped, white to pink-lilac, 8-10 mm long; tube shortly cylindric at the base, expanding in the distal part to a broad obliquely campanulate throat, glabrous outside, woolly in the throat; abaxial lip 3-lobed; adaxial lip 2-lobed; lobes 2-3 mm long, obtuse. Stamens scarcely exserted from the corolla throat; anther ca 1 x 1.5 mm.

Recorded once or twice from the Darling Range east of Perth. Elsewhere the only records are from Geraldton and the Moore River.

Flowers probably August-November.

E. glabra (R. Br.) Ostenf. Tar Bush

Shrub, up to 1.5 m high; young growth with small stellate hairs and some glandular hairs, sometimes silvery or viscid. Leaves 22-65 x 4-13 mm including the petiole; blade narrowly obovate to elliptic, tapering gradually to the petiole. Pedicels 3-6 mm long. Sepals ovate to almost linear, 5-8 mm long, enlarged in fruit, sparsely or densely stellate-hairy. Corolla yellow to red or green, often 2-coloured, elongate, somewhat incurved, 16-30 mm long, with minute glandular hairs, 2-lipped, acutely lobed; abaxial lip a single lobe, narrowly oblong, 5-12 mm long, reflexed; adaxial lip 4-lobed, 1-3 mm long. Stamens well exserted; anther 1.6-2 mm broad.

Occurs from Rockingham northward, mainly in sandy limestone areas along the coast, less frequently recorded from winter-wet depressions on the eastern side of the Coastal Plain. Extends north to Exmouth Gulf and east across most of southern Australia, occurring in all mainland states.

Flowers mainly July-January.

This is a very variable species. In the Perth Region there appear to be 2 main variants, one with yellow to red flowers and occurring mainly on coastal limestone and the other with greenish flowers and occupying damp habitats further inland. Elsewhere in W.A. the species shows a greater range of variation and frequently has shorter leaves.

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EXTRACT FROM "FLORA OF THE PERTH REGION"

MARCHANT et al. (1987)